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FINAL DRAFT

Highlights of National Information Infrastructure Applications Activites

A Report for the FY 1996 Budget Process

Information Infrastructure Task Force

October 24, 1994

DRAFT

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Executive Summary

This package of information has been prepared by the Information Infrastructure Task Force (IITF), the inter-agency team chaired by the Secretary of Commerce, which is implementing the President's action plan for developing, in partnership with the private sector, an advanced information infrastructure, the National Information Infrastructure (NII). Development of the NII has the potential to significantly improve the way people use information in their jobs and other aspects of their daily lives by bringing vast amounts of information and greatly improved services to virtually every citizen.

Private industry will be responsible for virtually every major facet of the NII and the information marketplace it creates. Nevertheless, the government will play an important role in this process by complementing and enhancing the benefits of the private sector initiatives. As Vice President Gore has observed, "Our goal is not to design the [information] market of the future. It is to provide the principles that shape the market. And it is to provide the rules governing this difficult transition to an open market for information. We are committed in that transition to protect the availability, affordability and diversity of information and information technology as market forces replace regulations and judicial models that are simply no longer appropriate."

Earlier this year, the Vice President asked the IITF to prepare a budget highlight of NII-related activities. In this, the first year of such an effort, the IITF has prepared this report to identify and illustrate what the Administration is doing to accelerate the development and deployment of NII applications. Since NII applications permeate so much of the government's activities, the IITF has not attempted to catalog the entirety of the government's involvement in the NII. Instead, the IITF has focused on illustrating where the government is committing its resources by describing key initiatives within each of eight application areas. This information is intended to help guide the FY 1996 budget decision-making process.

We have identified new initiatives proposed for inclusion in the FY 1996 Budget, as well as existing programs that are restructuring their efforts in a significant way. The primary goal is to provide a clear and compelling description of key efforts to accelerate NII applications, and to increase the profile of NII-related activities in the core programs of all agencies. This document provides an input to the FY 1996 budget process. We also hope, at an appropriate time, to publish a FY 1996 National Information Infrastructure Applications Highlights Report to inform the public of the scope and range of the Administration's NII investments and efforts.

Introduction

This FY 1996 National Information Infrastructure Applications Highlights Report is designed to highlight key initiatives necessary to support the Administration's goals in the development and deployment of applications of the National Information Infrastructure (NII). This report has been prepared by the Administration's Information Infrastructure Task Force (IITF), the inter-agency team coordinating the development and use of the NII among the various agencies across government.

As noted in the Administration's *Agenda for Action*, the NII will consist of (1) conduits, interconnected, interoperable telecommunications networks, (2) information appliances including computer systems, televisions, fax machines and telephones (3) software, information services, and information databases (e.g. "digital libraries"), and (4) trained people who can build, maintain, and operate these systems. In the future, the NII will enable all Americans to get the information they need, when they need it and where they need it, at an affordable price. Secretary of Commerce Ronald Brown notes that the NII and the information revolution will result in "a fundamental change in the way we work, the way we learn, and the way we communicate. Knowing how the Industrial Revolution permanently altered American life, we can only begin to imagine how we will be transformed by becoming an information society."

Private industry will be responsible for virtually every major facet of the NII and the information marketplace it creates. Private industry will build and manage the networks, provide the information tools and most of the information that travels the networks, and develop most of the applications that use the networks. But government remains a major influence on the NII. Government policies on telecommunications reform, universal service, open access, privacy, security, interoperability, and standards, to name a few, will help shape the way the NII develops. In his State of the Union Address, President Clinton set as a National goal connection of the Nation's classrooms, libraries, schools, and clinics to the information infrastructure by the year 2000. Government actions, such as regulatory changes and intellectual property protection can help remove barriers to critical social and commercial applications of the NII. The federal government will use the networks to provide more efficient delivery of information and services to citizens. Another important role for government is coordinating U.S. activities with those of other countries, so that a truly international marketplace for information products and services can develop. As the Vice President has said, we are on our way to building a Global Information Infrastructure. Internet pioneer Robert Kahn believes that "Without government involvement on an international basis, it is unlikely that a global information infrastructure will emerge" [R.E. Kahn, CACM, Vol. 37, Nr. 8 (Aug 1994)].

The White House formed the IITF to articulate and implement the Administration's vision for the NII. The task force consists of high-level representatives of the federal agencies that play a major role in the development and application of information and telecommunications technologies. Working together with the private sector, the participating agencies are developing comprehensive technology, telecommunications, and information policies and promoting applications that best meet the needs of both the agencies and the country. By helping build consensus on difficult policy issues, the IITF enables agencies to make and implement policy more quickly and effectively.

The IITF's Committee on Applications and Technology (CAT), chaired by Arati Prabhakar, Director of the National Institute of Standards and Technology, coordinates the Administration's efforts to develop, demonstrate, and promote applications of information technology in manufacturing, education, health care, government services, libraries, environmental monitoring, electronic commerce, and other applications. To determine tasks and priorities, the CAT draws on a wealth of contributions from the private sector. Individuals, companies, and professional societies contributed to issues papers, an inventory of NII applications, and two reports on application areas. In addition, a partnership between industry and government resulted in a highly successful conference in September 1994: "Breaking the Barriers to the National Information Infrastructure." Nearly all the products from these activities are available to the public electronically through the Internet, providing a demonstration of the way government publications can be delivered using the NII.

This report was prepared by the CAT for consideration by the IITF, to identify new initiatives as well as existing programs that are significant to the NII. The primary goals are to increase the profile of federal NII-related activities and to assist Administration policy makers in determining where federal spending is being used on NII-related application areas. Earlier this year, the Vice President asked the IITF to prepare a budget highlight of NII-related activities. On June 24, Ronald Brown, Secretary of Commerce and Chairman of the IITF, and Leon Panetta, then Director of the Office of Management and Budget, directed the IITF's Committee on Applications and Technology to lead the IITF's budget cross-cut process. To accomplish this task, the CAT drew on the broad-based participation of people from across the government. In July, the CAT identified eight NII applications as categories into which agency submissions would be organized. The eight application areas are digital libraries; education; electronic commerce; environmental monitoring and natural resources management; government services; health care; manufacturing; and transportation. We identified these as the core set of applications because there are significant public interests to be served by the application of advanced information and communication technologies in these arenas.

From the end of July through October, a team of CAT participants from several federal agencies reviewed information on over 370 programs and initiatives from 20 agencies and developed a framework for highlighting the Administration's NII-related efforts. Of these programs, approximately 25 projects were identified as interagency efforts.

In addition to these contributions, we have also received preliminary input from the National Science and Technology Council (NSTC) Research and Development Budget Cross-cut. Agencies' NII-related programs and initiatives that have been submitted for the NSTC R&D Budget Cross-cut are noted in each of the eight application areas. Within the NSTC, the High Performance Computing and Communications (HPCC) Program has an important role in the development of the NII. The newest element of the HPCC Program, the Information Infrastructure Technology and Applications component, builds on and expands the research goals of the existing HPCC components and will produce critical enabling technologies that support each of the eight application areas. For a more detailed representation of agencies' HPCC efforts, please refer to the HPCC FY 1996 Budget Notebook.

The culmination of this effort is represented in this report, which was reviewed by the IITF at its meeting on October 4, 1994. Each of the eight applications areas provides a summary description of existing federal efforts and specific information to highlight key initiatives. We have also created a spreadsheet that organizes all agency submissions into categories that reflect important issues or objectives for that application. Recognizing that a number of programs have contributions that span across application areas, the report lists programs and initiatives in each of the application areas where they have relevance.

Highlighted NII Initiatives

Application Areas
Digital Libraries
Comprehensive Digital Library Initiatives (NASA, NSF, Library of Congress)
New Technologies (DoE, NASA, NARA, NSF)
Seamless Electronic Information Location and Access (DoC/Census, DoD/DISA, DoE, DoJ, DoL, NASA, SBA)
Library Infrastructure Grants (USDA/RDA, Ed)
Education
Federal Leadership Activities (DoC/NOAA, EPA, NASA, NSF, and other agencies)
Planning (Ed)
Research and Development, Including Demonstrations (Ed, NASA, NEH, NSF)
Deployment of Technology (USDA, USDA/RDA, USDA/REA, DoC/NTIA, Ed, DoL/OSHA, NEH)
Professional Development (Ed, NASA, NEH)
Electronic Commerce
Development of Technology (DoC/NIST, DoE)
Development of Standards (DoD/DISA, NASA)
Development of Architectures (DoC/NIST, DoD/DISA, DoE, Treasury, GSA, SBA, VA)
Development of Applications/Demonstrations (USDA, USDA/RDA, DoC/NIST, DoD/DISA, DoE, DHHS, DoL, Treasury, EPA, NASA, NSF, SBA, TVA,VA)
Environmental Monitoring and Natural Resources Management
Research and Modelling Programs (USDA/Forest Service, DoC/NOAA, DoE/Defense Programs, EPA, NASA)
Information Access/Connectivity (USDA/Forest Service, DoC/NOAA, DoE, DoI/NBS, EPA, NASA, NSF, and other agencies)
Data Standards and Interoperability (USDA, USDA/Forest Service, DoI/USGS, EPA)

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Highlighted NII Initiatives (cont'd)

Application Areas
Government Services
Information Access Projects (USDA, DoC, Ed, DHHS, DoI, DoJ, DoL, EPA, GSA, NASA, NEH, SBA, and other agencies)
National Performance Review Projects (USDA, DoC, DoD, DoE, DoJ, DHHS, DoL, Treasury, EPA, GSA, NARA, NEH, SBA, USPS, VA, and other agencies)
Service Delivery Projects (USDA, DHHS, HUD, DoI, DoL, NARA, VA, and other agencies)
Information Infrastructure Development (USDA, DoC, DoD, DoE, DHHS, HUD, DoI, DoJ, DoL, GSA, NASA, NARA, NEH, NSF, SBA, and other agencies)
Health Care
Health Care Access Programs (USDA/RDA, USDA/REA, DHHS/ACF, DHHS/HCFA, DHHS/NIH, DHHS/ORH, DHHS/PHS, NASA, VA)
Health Care Quality Programs (USDA/REA; DoE; DHHS: CDC, CRDL, HCFA, HSTAR, NHIC, NLM, ODPHP, SAMSHA, SSA; DoL; NASA)
Health Care Cost Containment Programs (DHHS/ACHPR, DHHS/HCFA, VA)
Infrastructure Investments Specific to Health (DoC/NIST, DHHS/NLM, NASA)
Manufacturing
Research and Development (DoC/NIST, DoE, NSF)
Deployment (USDA/RDA, DoC/NIST, DoE, NASA, TVA)
Education and Training (DoE)
Transportation
Intelligent Vehicle-Highway Systems IVHS, including APTS (DoT/FHWA, DoT/FTA, DoT/NHTSA)
Spatial Data and Reference Infrastructure (DoC/NOAA, DoT/FAA, NASA)
Mesoscale Weather Systems (DoT/FAA)
Air Traffic Management and Control (DoD, DoT/FAA, NASA)
Waterway Management & Vessel Traffic Systems (DoC/NOAA, DoD/ACE, DoT/MARAD, DoT/USCG)

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Digital Libraries

I. Overview of Application Area

A "digital library" is a collection of electronically accessible recordings on various storage media, consisting of text, video, images, numerical tables, data observations, software, audio and image sequences (narrated films), and recursive continuations of these for access, retrieval, browsing, query and display. Digital library technology supports the vision of linking of these resources and making them available to the citizen from their home, office or mobile environment through the National Information Infrastructure (NII). The ability of digital libraries to store and share knowledge, history, and culture will be central to the success of the NII.

Digital library initiatives, which are taking place in almost every federal agency, will provide access to an improved flow of electronic government information and world-wide digitized resources, and provide long-term access to the records and expressions of culture and scholarship. They will help to ensure that information is accessible to all and prevent the formation of a society divided into information haves and "have-nots". Most important, digital libraries will revolutionize our education methodology, and allow all elements of our society from Pre K to post 75 the ability to assimilate information according to one's own associative interest and curiosity.

Existing barriers to achieving the digital library vision fall into the areas of technology, policy/standards and education. Technology is required to store, locate, browse, retrieve and distribute digital library information. Conversion technology is needed to digitize text and images which currently exist in a non-digital format. Standards and policy are needed to ensure that consistent strategies can be deployed when utilizing digital libraries. Training on how to use digital libraries on the NII and on how to incorporate these resources into the home and workplace to improve our quality of life and standard of living will be key to meeting the vision.

Digital library initiatives will help breakdown the technological barriers to achieving the digital library vision. Some agencies such as NASA and the National Science Foundation have established comprehensive digital library programs that are structured to meet the goals of the NII. These efforts involved substantial private sector as well as government investment.

Other federal agencies have targeted the development of specific technologies relevant to digital libraries. For example, NIST is developing a spoken natural language interface to libraries. Digital library efforts to provide seamless electronic location of and access to existing sources of federal information are the most prevalent. The Department of Energy (DoE) and NASA efforts to make their scientific and technical information available in digital format are representative of this type of effort.

Financial assistance to help today's libraries acquire the infrastructure necessary to embrace digital technologies is another area of federal investment which is key to the development of digital libraries. The Department of Education's Interlibrary Collaboration grants program is one model of this type of activity.

Within the digital libraries application, investment gaps were noted in the areas of training programs, standards and intellectual property rights, and digitization of text and images. Future investment in these areas is critical to realizing the digital library vision.

Digital Libraries

II. Highlighted Initiatives

Within the digital libraries application, investment gaps were noted in the areas of training programs, standards and intellectual property rights, and digitization of text and images. Future investment in these areas is critical to realizing the digital library vision.

For the purposes of the budget cross-cut, the Federal government's digital library initiatives have been grouped into four categories: Comprehensive Digital Library Initiatives; New Technologies and Information Products; Seamless Electronic Information Discovery and Access; and Library Infrastructure Grants. Within the category "Seamless Electronic Information Location and Access there are subcategories for scientific and technical information, environmental data, software, business/economic information, and humanities information.

(1) Comprehensive Digital Library Initiatives. Both NASA and NSF established comprehensive, multi-year digital library initiatives during FY94 which are specifically targeted at achieving the NII goals for government action. As noted in his State of the Union Address, President Clinton set as a National goal connection of the Nation's classrooms, libraries, schools, and clinics to the information infrastructure by the year 2000. These initiatives encourage private sector participation and cost sharing in programs to promote technological innovation and new applications with regard to digital libraries on the NII. The NASA effort makes available a treasure of environmental and space science images by encouraging the access of remote sensing data products over the Internet and the projects involve broadcast TV, cable TV, industry, academia, K-12 schools, and museums. Areas of investigation address universal service and access, education, user interfaces, and intelligent searches. In addition, the NASA project reaches out to a much broader audience than ever addressed before on a regular basis (potentially millions of people over major TV networks nightly). The project also encourages the creation of new job opportunities and new industrial opportunities by bringing high-speed (ethernet capability) into homes and schools over standard cable TV channels at reasonable costs.

(2) New Technologies and Information Products. A number of agencies have focused on developing specific technologies related to digital libraries to further the goals of the NII. NIST is sponsoring research on a spoken natural language interface to digital libraries. The Department of Energy is developing digital library tools in their Digital SuperLab. The DoE Computer Incident Advisory Capability addresses information security issues, while their National Storage Lab seeks out new techniques for handling the massive storage requirements which are inherent in the NII vision. The DoD Intelligent Archive and the NASA Access Mechanism are technology projects seeking to advance the use of intelligent interfaces and agents for information retrieval.

(3) Seamless Electronic Information Location and Access. Digital library efforts to provide seamless electronic location of and access to existing sources of federal information are the most prevalent digital library applications currently being funded. These projects promote seamless, interactive access to government and other information. Initiatives in this area are addressing scientific and technical information, software, business/economic data, and humanities information. These projects will result in the enrichment and expansion of the knowledge base available via the NII.

Digital Libraries

II. Highlighted Initiatives (Continued)

(4) Library Infrastructure Grants. The role of libraries in the future will be to advocate and help provide information equity and universal access for the public. Libraries will continue to coordinate and facilitate preservation of records and expressions of the nation's intellectual and cultural life both in traditional and digital formats. Many libraries need financial assistance to help them acquire the infrastructure necessary to embrace digital technologies. The Department of Education's LSCA Title III Interlibrary Collaboration Grants and the Department of Agriculture's Community Facility Loans provide this assistance of this type.

Digital Libraries

Agency Contributions
Comprehensive Digital Library Initiatives
**Digital Library Projects (NASA, Library of Congress)
*Digital Library Project (NSF)
New Technologies
Computer Incident Advisory Capability (DoE)
Digital SuperLab (DoE)
Electronic Exchange of Full-text Documents (DoE)
Intelligent Archive (DoE)
National Storage Lab (DoE)
NASA Access Mechanism (NASA)
Archival Electronic Records Inspection and Control (AERIC) & Archival Preservation System (APS) (NARA)
Interactive Systems Program (NSF)
Seamless Electronic Information Location and Access
Scientific and Technical Information
Internet/NII Information Search Tools (DoE)
Information Locator Prototype (DoE)
Digital Library for Energy and the Environment (DoE)
Scientific Information Dissemination Project (DoE)
Combined DNA Index System (CODIS) (DoJ)
Computerized Information System (OCIS) (DoL)
NASA STI Program Infrastructure Upgrade (NASA)
National Technology Transfer Center (NASA)
Software
DISA Repository Systems (DoD/DISA)
NetLIB (DoE)
Repository-based Software Engineering Program (NASA)
SBA Software Clearinghouse (SBA)
Business/Economic
STAT-USA Data Dissemination (DoC/Census)
Humanities
Collaborative Projects Program (NEH)
Digital Information Evaluation (NEH)
Virtual Library Models (NEH)
Prototype Distribution of Cultural Materials through the NII (NEH)
Editions Program (NEH)
Archaeology Program (NEH)
Reference Materials Program (NEH)
Library Infrastructure Grants
Community Facility Loans (USDA/RDA)
LSCA Title III Interlibrary Collaboration Grants (Ed)

* Indicates initiative has been identified by the NSTC R&D Budget Cross-cut

**Although not formally part of the Administration's Budget Process, the Library of Congress wished to include this project for the report.

Education

I. Overview of Application Area

The National Information Infrastructure (NII) promises every business, government agency, hospital, home, library, and school in the nation access anywhere, anytime to voice, data, full-motion video, and multimedia applications. The impact of these capabilities on learning -- for children, advanced students, and lifelong learners -- will be substantial. When fully realized and available equitably in all learning sites, these technologies will support the transformation of education into an active, hands-on process that engages the minds and imaginations of all learners and fosters the promise of lifelong learning.

Through the use of these technologies and a national commitment to quality education, students of all ages and abilities will reach the highest standards of academic achievement. Students will be able to access multimedia electronic libraries and museums containing text, images, video, music, simulations, and instructional software. Teachers, engineers, business managers, and all knowledge workers will have available new methods of working and learning, and will collaborate and share ideas with one another.

Significant gaps in the Federal Government's investments exist in support for planning; research, development, and demonstration; technical assistance; and professional development. For planning, technical assistance, and professional development, more resources could effectively be used under existing authorities. In research, development, and demonstration, the most immediate need is for a more coherent and focused Federal investment. However, it must be noted that the bulk of investments needed to bring about the NII must come from state and local governments, which together provide 93% of K-12 education funds and the majority of support for education at other levels. As reflected in the Department of Education's Goals 2000 program, close cooperation between Federal, state and local education agencies will therefore be an essential element to the timely development of important educational applications.

II. Highlighted Initiatives

The Federal Government's current efforts that support the development of the NII for lifelong learning span at least six different agencies. For the purposes of this exercise, the Federal Government's efforts can be organized into five categories:

(1) Federal Leadership Activities. The Clinton Administration has made technology for education a policy priority. In his State of the Union Address, President Clinton set as a National goal connection of the Nation's classrooms, libraries, schools, and clinics to the information infrastructure by the year 2000. Both the Department of Education and the White House Office of Science and Technology Policy have focused new resources on providing leadership to the nation in this area. Components of this effort include the development of a long-range plan for technology in education, to be completed in FY 1995; conferences drawing together educators, private sector leaders, regulators, and others; development of better statistical information about current uses of telecommunications in K-12 schools; support for legislative and regulatory changes; and other activities.

Education

II. Highlighted Initiatives (Continued)

(2) Planning. The Clinton Administration's K-12 education policy focusses on providing support for state and local systemic education reform. New legislation provides support for states and communities to focus all activities on the achievement of high standards by learners. Highlighted programs in this category include:

- ***Goals 2000: Educate America Act (Ed)***. This program represents the Administration's framework for education reform and is designed to provide resources to states and communities to develop and implement comprehensive education reforms that help all students reach high academic and occupational skill standards. In FY 1994, it provided grants for the integration of technology and information infrastructure into state education improvement plans. Grants in FY 1995 and successive years will support the implementation of state plans and the development of local plans.

(3) Research and Development. Five Federal agencies engage in research, development and demonstrations. Under this rubric are activities such as research on educational outcomes facilitated by technology; the development and testing of new software and applications; the development of network models in educational settings; and support for pilot projects that provide visible examples of success and failure and critical experience and evaluation data. Highlighted programs in this category include:

- ***Challenge Grants (Ed)***. The Department of Education will support grants to consortia that include school districts in high-poverty areas and other entities such as private sector firms, universities, and museums to develop technology-supported learning opportunities.

- ***Network Infrastructure for Education Program (NSF)***. As part of the Education and Human Resources Directorate's Education and Training contribution to the High Performance Computing and Communications (HPCC) Program , this initiative provides grants to alliances of academic institutions, school districts, professional societies, state agencies, and others concerned with education reform to complete policy studies and research, development and demonstration projects related to the role of electronic networks in support of reform education.

II. Highlighted Initiatives (Continued)

(4) Deployment of Technology. Programs in the Departments of Commerce and Education support the deployment of communications and information technologies into learning settings. Highlighted programs in this category include:

- ***Title I (Ed)***. Title I of the Elementary and Secondary Education Act, previously known as Chapter 1, is the largest Federal education program, providing support for services to help over 6 million poor children and children in high-poverty areas learn to high standards in over 53,000 schools. Funds are distributed by formula according to student population and poverty statistics, and spending decisions are made at the school district level. A significant fraction of Title I dollars (approximately 15%) will support the acquisition of computers, software, and networking equipment to support instruction and administration.

- ***Technology Information Infrastructure Applications Program (TIIAP) (DoC/NTIA)***. This program supports grants to non-profit entities, including schools and school districts, for the planning and construction of telecommunications networks for the provision of educational and other social services.

(5) Professional Development . The development of skills among the nation's educators -- including teachers, administrators, and instructors of all kinds -- is a major bottleneck for the development of the NII. New technology tools must become familiar to and accepted by the nation's educators. Professional development is costly and time-consuming; it takes as many as two years of experience with new equipment for teachers and instructors to become fluent users of new technology tools. Highlighted programs in this category include:

- ***Eisenhower Professional Development Program (Ed)***. This program will provide grants to states, school districts, and institutions of higher education to provide access to professional development that support state and local systemic reform efforts. It is anticipated that a significant share of these funds will support training related to instructional technology, networking, and distance learning.

- ***Regional Educational Technology Support and Professional Development Consortia (Ed)***. The Department of Education will support a system of regional educational technology support and professional development consortia, which assists states, school districts, and schools in the use of technology, including networks, and will provide professional development opportunities for educators.

Education

Agency Contributions
Federal Leadership Activities
Global Learning and Observation to Benefit the Environment (DoC/NOAA, NASA, NSF, EPA, and other agencies)
Planning
*Goals 2000: Educate America Act (Ed)
Regional Education Laboratories (Ed)
Research and Development, Including Demonstrations
Basic Research and Dissemination Authority -- Regional Education Labs (Ed)
Challenge Grants (Ed)
Dept. of Education Research Activities (Ed)
Fund for Improvement of Post Secondary Education (Ed)
Fund for Innovation in Education -- Computer-based Instruction and Teacher Networking Grants (Ed)
*National Institute on Disability and Rehabilitation Research (Ed)
Special Education -- Technology Applications (Ed)
Technology, Educational Media, and Materials Program (Ed)
Funds for Interactive Learning Centers (NEH)
Funds for Collaborative Projects Linking Institutions (NEH)
Leadership Opportunity in Science and Humanities Education (NEH)
Special Opportunities in Foreign Language Education Grants (NEH)
*K-12 Education Project (NASA)
*Education & Human Resources Directorate (MOSIS, Superquest, Networking Infrastructure for Education, etc.) (NSF)
Deployment of Technology
Distance and Community Learning from the Cooperative Extension Service (USDA)
Community Facility Loans (USDA/RDA)
Distance Learning-Medical Link Grant Program (USDA/REA)
Distance Learning-Medical Link Loan Program (USDA/REA)
Technical Assistance Program (USDA/REA)
TIIAP (DoC/NTIA)
New Elementary and Secondary Education Act Initiatives -- Consolidated ESEA Technical Assistance Centers (Ed)
Special Education Grants (Ed)
Star Schools (Ed)
*Technology-related Assistance for Individuals with Disabilities (Ed)
Title I (Ed)
OSHA Employee and Employer Education and Training (DoL/OSHA)
Equipment for Multimedia Exhibits (NEH)
Nebraska Plan to Link Rural-Urban Resources (NEH)

* Indicates initiative has been identified by the NSTC R&D Budget Cross-cut

Table continues on next page.

Education (cont'd)

Agency Contributions
Professional Development
*AskERIC Service (Ed)
Eisenhower Professional Development Program (Ed)
Gopher-FTP-WWW site (Ed)
Regional Educational Technology Support and Professional Development Consortia (Ed)
Spacelink (NASA)
Division of Education Programs (NEH)
Expanded Exemplary Award Program (NEH)
Funds for Professional Development (NEH)
Division of Fellowship and Seminars (NEH)
Teaching with Technology Initiative (NEH)

* Indicates initiative has been identified by the NSTC R&D Budget Cross-cut

Electronic Commerce

I. Overview of Application Area

The vision of Electronic Commerce is to enable U.S. companies to increase productivity and adaptability to changing markets. Electronic Commerce will provide an integrated collection of low-cost, reliable services to handle tremendous volumes of business and technical transactions and to amass, analyze, and control large quantities of data. Organizations will be able to improve efficiency and accuracy, and reduce costs, while providing faster, more reliable, and more convenient services. U.S. companies will be able to reengineer their business processes, and then use the National Information Infrastructure (NII) to realize the productivity potential of their current and future information technology investments. Smaller firms will be able to enter and participate at lower cost and with greater efficiency in new markets, and larger firms will be able to evaluate, select, and more readily work with other companies. New ways of doing business and new forms of economic activities will become commonplace, including telecommuting, global sourcing arrangements, new training and education capabilities, and disaggregated alliances or networks of companies.

Electronic Commerce will provide the services to achieve this vision by integrating communications, data management, and security services, to allow business applications within different organizations to automatically interchange information. Communications services transfer the information from the originator to the recipient, according to formats defined by the data management services. Security services authenticate the source of information, verify the integrity of the information received by the recipient, prevent disclosure of the information to unauthorized users, and verify that the information was received by the intended recipient. Electronic Commerce applies and integrates these infrastructure services to support business applications such as electronic bidding, ordering and payments, and exchange of digital product specifications and design data.

Many companies and government agencies use Electronic Commerce to facilitate internal operations and interact seamlessly with their trading partners, but they usually require highly structured, previously established agreements on communications, data formats, and security. The resulting costs and lead times create economic barriers to widespread use of Electronic Commerce applications by small and medium-sized companies. Other barriers to Electronic Commerce include real or potential problems with scalability, interoperability, and ease of use. Developing and implementing Electronic Commerce is a top priority throughout the Federal Government, but many public and private investments are concentrated on short-range payoff. There is insufficient long-range investment in the standards and technologies needed by industry to develop the next generation of Electronic Commerce. For example, collaborative engineering and agile manufacturing may require high volumes of very complex data. High-speed communications, transaction management, and the management of many interrelated versions of data are needed to support these requirements, and to seamlessly integrate research, design, engineering, production, marketing, and sales.

Electronic Commerce

II. Highlighted Initiatives

The Electronic Commerce spreadsheet is divided into the following sub-categories:

(1) Development of Technologies. Initiatives in this category focus on developing and improving communications, data management and security services.

(2) Development of Standards. Initiatives in this category focus on developing standards for the content and structure of Electronic Commerce transactions, or standards for the supporting technologies.

(3) Development of Architectures. Initiatives in this category focus on interacting and combining standards and technologies to form complete Electronic Commerce systems. An important element of the development of new architetures is the Administration's Federal Electronic Commerce Acquisition Team (FECAT). FECAT is defining the Electronic Commerce architecture called for in the President's Executive Memorandum of October 26, 1993 on "Streamlining Procurement Through Electronic Commerce." The Memorandum directs the head of each executive department or agency to ensure that budgetary resources are available for electronic commerce implementation in each respective department or agency.

(4) Developing Applications/Demonstrations. These programs focus on a specific application of Electronic Commerce, demonstrating the value or feasibility of a particular Electronic Commerce architecture.

Electronic Commerce

Agency Contributions
Development of Technology
Federal Public Key Infrastructure Pilot Program (DoC/NIST)
Electronic Component Development (DoE)
Development of Standards
Defense Message System (DoD/DISA)
Digital Signature and Security Services System (NASA)
Development of Architectures
Electronic Billing and Payment for the Manufacturing Industry (DoC/NIST, DoE, Treasury)
Technical Architecture Framework for Information Management (DoD/DISA)
Electronic Acquisitions (GSA, VA)
Infrastructure Security Projects (DoD/DISA, DoE, SBA)
Development of Applications/Demonstrations
Rural Business Enterprise Grants Program (USDA/RDA)
Electronic Commerce & Electronic Data Interchange Projects (USDA, DoD/DISA, DoE, EPA, DHHS, DoL, NSF, VA)
TECNET network and database (DoC/NIST, DoE)
Electronic Proposal Project (DoE)
AMTEX - Demand Activated Manufacturing programs (DoE)
CALS Roadmap 2000 (DoE)
Open Systems Laboratory (DoE)
Electronic Data Interchange for Selected Industry Sector Reporting (EPA)
Postal Electronic Commerce Services (NASA)
International Trade Data System (Treasury)
Technology 2020 (TVA, DoE)
**Electronic Copyright/Management System (ECMS) (Library of Congress)

**Although not formally part of the Administration's Budget Process, the Library of Congress wished to include this project for the report.

Environmental Monitoring and Natural Resources Management

I. Overview of Application Area

Just as we monitor industrial output, consumption of goods and services and other indicators of economic health, so must we monitor environmental indicators to judge the state of the environment. An improved National Information Infrastructure (NII) will allow for the development of a nationally integrated network of observing systems, computational centers, archives, libraries and information dissemination systems to address the Nation's needs for environmental data and information. Such an infrastructure will serve as an enabling integrating agent for diverse observational data and information by building upon the national investment (both public and private) in environmental monitoring, protection, and natural resources management activities.

Past and current environmental monitoring have proven highly effective for collecting and processing large quantities of environmental data. However, the ability to perform comprehensive environmental monitoring currently is limited in two critical areas. First, the infrastructure for data collection and analysis is extremely fragmented. This limits the capacity to provide timely access to data and/or information in standard formats. Secondly, there is a lack of information tools to make detailed, comprehensive environmental measurements, and then to integrate and interpret them in support of a host of scientific, policy and operational uses. Raw data needs to be converted into useful information which conveys the multi-disciplinary nature and interconnectedness of environmental factors, thus providing a framework for improved policy and investment decisions.

The nationally integrated networks and tools proposed for development under the NII agenda will permit analysts, scientists, policy makers and the general public to have better access to more reliable information. Measurable progress in this regard will be observed in several areas: (1) reduced time to assemble environmental information for emergency action; (2) enhanced ability to locate and retrieve comprehensive, up-to-date, critical data for economic analysis and environmental policy considerations; (3) improved quality of environmental research, due to improved access to multiple agency databases; and (4) enhanced enforcement of government regulation for pollution control and natural resource utilization. There is the additional benefit that environmental information will be made more transparent, allowing both the public and policymakers to better track the economic benefits of annual investments in environmental observation and protection.

Environmental Monitoring and Natural Resources Management

II. Highlighted Initiatives

The programs highlighted for environmental monitoring and natural resources management activities promote the goals of environmental research and modeling, information access/connectivity, and interoperability of heterogeneous information systems. Critical to achieving these goals is the role of the High Performance Computing and Communications (HPCC) Program. Technologies developed by HPCC participating agencies and others will provide new algorithms; computational and information processing tools; transport mechanisms; and data translation services to support the environmental monitoring and natural resources management applications of the NII.

(1) Environmental Research and Modeling. The US Global Change Research Program, which involves academia, the private sector and most US agencies with environmental programs, consists of research activities that involve deployment of a number of new environmental observing systems. The networking component of this program is embodied in the Global Change Data and Information System (GCDIS), which is intended to provide the appropriate level of communications technology, interoperability, and connectivity to allow easy exchange of data among participating agencies. Other smaller projects are also being undertaken to support research applications with environmental monitoring data.

(2) Information Access/Connectivity. The Federal Geographic Data Committee (FGDC) has as its goal the creation of a national digital geographic information resource, known as the National Spatial Data Infrastructure (NSDI). The scope of the NSDI includes all geographic or "spatial" data including climatic, demographic, natural resource, oceanographic, and geophysical data. The GCDIS, mentioned above, plans to develop network interconnectivity, interagency gateways, and establish procedures and policies for global change data and information dissemination among the participating agencies. Other initiatives include projects for increasing access to energy efficiency and renewable energy information available via the Internet. This information, which includes databases, bulletin board systems, on-line catalogs, and lists of manufacturers and vendors, will assist state governments in implementing provisions of the Energy Policy Act of 1992 and voluntary initiatives of the Climate Change Action Plan.

(3) Standards and Interoperability. The issue of common standards and/or interoperability is a central component to most of the highlighted initiatives. The FGDC has taken a lead role in the development of data content exchange and metadata standards needed to implement the NSDI. The primary focus of the GCDIS is to establish and maintain effective mechanisms to integrate the disparate elements of global change information and data. Current plans call for the adoption of common standards for data exchange.

Environmental Monitoring and Natural Resources Management

Agency Contributions
Environmental Research and Modelling Programs
Infrastructure Project (USDA/Forest Service)
Eastside Ecosystem Management Program (USDA/Forest Service)
Resource Management Applications Program (USDA/Forest Service)
Satellite Active Archive for on-line environmental satellite imagery dissemination (DoC/NOAA)
MOSIAC implementation on environmental information dissemination systems (DoC/NOAA)
Support Seasonal Forecasting (DoC/NOAA)
*Geophysical Fluid Dynamics Laboratory atmospheric and oceanic modelling (DoC/NOAA)
*Support for National Meteorological Center (NMC) (DoC/NOAA)
Distributed Generation and Use of a Synthetic 3D Seismic Dataset (DoE/Defense Programs)
NII Accessibility for Independent Gas and Oil Producers (DoE/Defense Programs)
Clean Water Act, Section 305 (b) (EPA)
Information Collection Rule (EPA)
Remote Sensing Databases (NASA)
Information Access/Connectivity
Natural Resource Data Management and Dissemination (NSDI) (USDA/Forest Service)
Base Network Connectivity (DoC/NOAA)
Interagency National Environmental Index (DoC/NOAA)
Management and Dissemination of Weather Data in Near-real-time (DoC/NOAA)
Global Learning and Observation to Benefit the Environment (DoC/NOAA, NASA, NSF, EPA, and other agencies)
*Information Dissemination Activities (DoC/NOAA)
Digital Library for Energy and the Environment (DoE)
Energy Efficiency and Renewable Energy -- The Energy Efficiency and Renewable Energy Network (DoE)
Energy Efficiency and Renewable Energy -- FEMP Electronic Superhighway (DoE)
Energy Information Highway Program (DoE)
Development of Safe Drinking Water Information System (EPA)
Inventory and Reporting of Chemical Usage (EPA)
TRI Information Systems (EPA)
Support for Enforcement Targeting, Tracking, and Compliance Activities, including FFTS, FFIS, and FAHWCD (EPA)
Support for IDEA to Analyze and Develop Enforcement Targeting Possibilities (EPA)
Second Phase of Technology Transfer Network (EPA)
Electronic Review and Revision System for SIPS (EPA)
Public Access Efforts (EPA)
National Biological Survey (NBS) / National Biological Information Infrastructure - NBII (DoI/NBS)
Earth Observing System (EOS) Program Digital Library and Data & Information System (NASA)
Global Meteorological Satellites (GMS) Online (NASA)
Data Standards and Interoperability
Resources Management Applications Program (USDA/Forest Service)
NSDI - Environmental Data - Soil Conservation Service (USDA)
NSDI - Orthophotography and Digitized Soils Maps - Soil Conservation Service (USDA)
Common Survey Data Structure Project (USDA/Forest Service)
Data Integration and Management efforts (EPA)
Modernization of STORET National Water Quality System (EPA)
Development of Environmental Information Acquisition and Architecture (EPA)
Standardization of Key Information Identifiers (EPA)
US Geological Survey / National Spatial Data Infrastructure - NSDI (DoI/USGS)

* Indicates initiative has been identified by the NSTC R&D Budget Cross-cut

Government Services

I. Overview of Application Area

Today, the use of information technology (IT) can create a government that overcomes the barriers of time and distance to perform the business of government and provide information and services to the public. Information technology can swiftly be employed to transfer funds, answer questions, collect and validate data and keep information flowing smoothly within and outside government. In an electronic world, high speed information links will carry the data necessary to support government operations. The development of this infrastructure will enable the creation of "virtual agencies" which will allow citizens access to integrated program information and services.

The National Performance Review (NPR) has been an important element of the Administration's efforts to improve the delivery of government services. In the NPR report, Vice President Al Gore recommended an executive order to create a customer driven government. The President signed this order on September 7, 1993 and set a standard for government services to equal the best in business.

The NPR's Reengineering Through Information Technology team noted that customers of government services often find dealing with the Federal bureaucracy to be complicated, slow, and confusing. Uncoordinated, cumbersome, paper based delivery of government services further complicates the customers' efforts. To address this problem, the NPR IT report outlined a three part agenda for spreading information technology's benefits to the Federal Government: (1) strength leadership in information technology, (2) implement electronic government, and (3) establish support mechanisms for "electronic government." The NII initiatives highlighted below will help accelerate the Administration's move towards "electronic government."

II. Highlighted Initiatives

NII programs fund the development of information systems and support services in the following five categories:

(1) Proposed Information Access. Information access programs will improve public access to government information by allowing agencies to make such information available electronically. These investments include the National Telecommunications and Information Administration's (NTIA) Technology Information Infrastructure Applications Program (TIIAP), which fund competitively-selected matching grants to connect other governments, public institutions, and non-profit entities to existing networks. These grants provide seed money for organizations that normally would not have access to government computer networks and information sources.

Government Services

II. Highlighted Initiatives (Continued)

(2) Proposed Implementation of National Performance Review (NPR). Implementation of the Administration's NPR information technology recommendations will provide the necessary investments to move towards "electronic government." Projects include investments to establish an electronic mail address directory for the entire Federal Government; reduce the burden on employers of filing wage and tax data by sharing information among States and the IRS; create multi-agency electronic benefits transfer (EBT) for payment of government assistance services; and speed import/export processing while providing integrated trade data to policy makers. Investments in agencies' existing information infrastructure will make agency connectivity a reality.

(3) Proposed Investments in Service Delivery This category encompasses programs that will use information technology to deliver services such as loans, benefits, and grants directly to the public. These investments build on some HPCC research, including voice and signature recognition, to bring the benefits of Federally-sponsored R&D into the lives of Americans on an everyday basis. Benefits from these proposed investments include improving the timeliness of service delivery, making government services more readily available to the public through electronic means, and allowing the use of electronic filing of information collections wherever possible.

(4) Proposed Initiatives Supporting General Information Infrastructure Development. As the Federal Government moves closer to an "electronic government," the agencies will need to provide upgrades to their existing communications networks. This category captures a broad range of agency initiatives that will enhance the existing telecommunications backbone to assist in the development of employee bulletin board systems and local and wide area networks. This category also includes programs that will accelerate critical NII enabling technologies and provide direct funding and loans for telecommunications and computer network infrastructure enhancements in both the public and private sector.

Government Services

Agency Contributions
Information Access Projects
Electronic Information Delivery at the National Agriculture Library (USDA/NAL)
National Agriculture Statistics (USDA/NASD)
NSDI Environmental Data - digitization and increased access (USDA/SCS, interagency)
STAT-USA Data Dissemination (DoC/Census)
Information Infrastructure Grant Program (DoC/NTIA)
Office of Defense Conversion (DoC/EDA)
Patent and Trademark Information On-line (DoC/PTO)
Libraries, Dissemination, and Distance Learning (Ed)
Agency Implementations of the Recommendations of the Electronic Mail Task Force (Government-wide)
Electronic Research Administration Program for the Management of Grants (DHHS/NIH)
Reengineered Disability System (DHHS/SSA)
Federal Geographic Data Committee - National Geospatial Data Clearinghouse (DoI)
National Biological Survey (NBS) / National Biological Information Infrastructure (DoI)
Agency Implementation of the Government Information Locator Service - GILS (DoI, interagency)
Combined DNA Index System (CODIS) (DoJ/FBI)
Freedom of Information and Privacy Act Document Processing System Project (DoJ/FBI)
Access to IMIS Information (DoL, EPA)
Training Technology Resource Center (DoL)
Employment and Training Administration - Training Technology Resource Center (DoL)
OSHA - Access to Integrated Management Information System Information (DoL/OSHA)
Data Integration and Public Access Efforts (EPA)
Clearinghouse on Computer Accommodation - IT Accommodation and Accessibility (GSA)
National Technology Transfer Center (NTTC) Gateway and Resource Center (NASA)
Division of Public Programs: A National Conversation on American Pluralism and Identity (NEH)
Export Assistance (SBA)
Business Information Centers (SBA)
National Performance Review Projects
Plan for the Effective Use of IT Throughout Government - Support of GITS, E-mail, etc. (DoE, GSA)
Electronic Benefit Transfer (USDA, DHHS, Treasury)
Coordinate, Recommend, and Implement IT Initiatives to Improve Customer Service (EPA, GSA)
Work with Private Industry to Advance the Implementation of IT to Provide Citizen Access to Government (GSA)
One-stop 800 Number Calling Service (DoE, DHHS/SSA, GSA, DoL, Treasury)
Implement an Integrated, One-stop Government Services Kiosk (DHHS/SSA, DoJ/INS, Treasury, GSA, USPS, VA)
Implement an Integrated, One-stop On-line Service (DoE, DHHS, DoL, GSA, NEH, SBA, NARA)
National Law Enforcement / Public Safety Network (USDA, DoJ/FBI, Treasury)
Intergovernmental Tax Filing (DHHS/SSA, Treasury/IRS)
International Trade Data Index (Treasury/Customs)
National Environmental Data Index (DoC/NOAA)
E-mail Networks and Support (DoE, DoL/OSHA, DHHS, GSA, SBA)
Telecommunications & Post-FTS2000 Environment (DoD/DISA, GSA)
Consolidate and Modernize Government Data Processing Centers (DHHS, DoL, Treasury)
Reengineer Basic Systems for Improved Delivery of Government Services (GSA, Treasury)
Consolidate and Integrate Federal Government Private Networks (GSA, Treasury)
Ensure Network System Privacy and Security (DoC, DoD/DISA, DoD/NSA, DoE, DoJ, GSA, SBA)
Provide Training and Technical Assistance in IT to Federal Employees (USDA, DoD/DISA, DoL, GSA, NEH)

Table continues on next page.

Government Services (cont'd)

Agency Contributions
Service Delivery Projects
InfoShare (USDA)
Medical Transaction System Initiative (DHHS/HCFA)
Reengineering Disability System (DHHS/SSA)
Social Security Automation Investments (DHHS/SSA)
Submission Management and Review Tracking (SMART) Program (DHHS/FDA)
Integrated Disbursement and Information System (HUD)
Electronic Submission of Single Family Claims (HUD)
Automated Land and Mineral Record System - ALMERS (DoI/BLM)
Implementation of "CSHO 2000" Project and Development of Electronic Reference Materials (DoL/OSHA)
Technological Innovation and New Applications (DoL)
Archival Information Infrastructure (NARA)
VBA Modernization (VA/VBA)
Initiatives Supporting General Information Infrastructure Development
Rural Telecommunications Loans (USDA/REA)
Rural Telecommunications Partnership Loans (USDA/REA)
Rural Business Enterprise Grants (USDA/RDA)
Rural Telephone Bank (USDA/REA)
Telecommunications and Information Infrastructure (USDA)
Americorps Program (USDA)
Advanced Technology Program -- Component Based Software (DoC/NIST)
Defense Information Systems Network (DISN) (DoD/DISA)
Office of the Future Pilot (DoE, DoD, DHHS, NASA, NSF)
*Exploration of High Speed Networking Technologies (DoE/Human Resources, DoE/Defense Programs)
eXperimental University NETwork (XUNET) (DoE)
*ARIES Testbed (DoE)
Electronic Component Development (DoE)
Interbank Check Image (DoE)
Automation Investment Fund (DHHS/SSA)
Integrated Disbursement and Information System (HUD)
Minerals Management Service (MMS) / Wide Area Network (DoI/MMS)
National Park Service (NPS) / ParkNet II (DoI/NPS)
Automation and Data Sharing Initiatives (DoJ/DEA, DoJ/FBI, DoL)
Office of the American Workplace BBS (DoL)
Integrated Management Information System (DoL/OSHA)
Local/Wide Area Network Deployment (DoE/Defense Programs, DHHS/SSA, DoI, DoL, NARA, SBA)
Implement Federal/State/Local Information Infrastructure Pilot (GSA)
Preservation and Dissemination of Humanities Resources (NEH)
Research on New Technologies for the NII (NSF)
Research Infrastructure (NSF)
Multi-disciplinary Challenges (NSF)
Computational Science and Engineering Applications (NSF)
NSFNet (NSF)
Supercomputer Centers (NSF)
Project ACCESS (SBA)

* Indicates initiative has been identified by the NSTC R&D Budget Cross-cut

Health Care

I. Overview of Application Area

National, state and local debate over the past year highlights the importance of health as a National Information Infrastructure (NII) application area. The goals of health care reform are to improve quality, expand access and contain costs. Health expenditures constitute a large and growing proportion of the Nation's economy. Applications such as automated claims and payment transactions, telemedicine, on-line access to clinical records, and on-line access to the latest treatment and prevention information, will help advance the health reform goals in fundamental ways.

Today's health sector, although information intensive, has not capitalized on computers and information networks as have other market sectors. Computers have been used in individual care settings and have begun to improve billing and claims transactions, but most clinical systems are not interoperable and patient information is created and re-entered numerous times. In addition, without easy communication among researchers, providers and consumers, new discoveries on prevention and care are not readily or rapidly disseminated.

Private and public sector interests in health care, health insurance, and health promotion have all begun to invest in and explore the many opportunities for the NII to improve health. Many of these initiatives show significant promise, but examine new, and as yet unproven, applications. In addition, some of the fundamental infrastructure needed to support broad implementation of new applications is lacking, most notably data exchange and content standards, such as those for medical records. The public comments on the draft health applications paper in "Putting the Information Infrastructure to Work" indicated strong support for Federal Government involvement in facilitating the NII and its health applications, in partnership with private sector efforts.

The Federal Government is both a provider and user of the many health applications the NII supports. Many of the existing National Library of Medicine (NLM) High Performance Computing and Communication (HPCC) projects represent important research and development initiatives in health. The Federal Government has also been involved in a number of key investment areas, including telemedicine, standards, increased public access to health information, and research and demonstrations projects that support health specific information infrastructure.

Current and planned Federal investments cover most of the important aspects of health applications, with a few exceptions. The most visible and perhaps biggest public concerns regarding health applications involve privacy and security. There is little Federal investment specific to health care regarding these concerns, probably because these concerns are better met by policies rather than investments. In the absence of legislation, health specific privacy and security guidelines should be pursued. Second, the uncertainty of health applications and the extreme pressure to contain health care costs, support a greater Federal role in evaluation of applications. Evaluation requirements will become an increasingly critical component in funded projects. Finally, increased government support is needed to expedite private initiatives for consensus standards development.

Health Care

II. Highlighted Initiatives

The programs highlighted for health applications promote four goals, three of which are the goals of health care reform, i.e., access, quality, and cost containment. The fourth goal is development of the supporting infrastructure that will facilitate linkages among the applications supporting the health goals.

(1) Access to Care. Highlighted projects supporting increased access to health care are telemedicine and health-oriented community network investments. The Office of Rural Health, Health Care Finance Administration (HCFA), the National Institutes of Health, and the National Aeronautics and Space Administration (NASA) are all investing in telemedicine projects that will increase access to care for remote areas nationally, and in the case of NASA's project, internationally. These projects also advance the NII goals of extending the universal service concept. The Administration for Children and Families (ACF) and Public Health Service (PHS) have invested in a project called the Community Services Work Station. This project provides a community network that links a broad array of health and social services to provide enhanced information and access to services regardless of where an individual initially comes for help. The workstation demonstrates the value the NII can bring to a community for health and other purposes. This project will extend the universal service concept and will help coordinate policies and approaches among levels of government, in this case local, state and Federal.

(2) Quality. Highlighted projects supporting improved quality of health care include the access projects already discussed, because increased access to care by its very nature can improve care. Also important are the many Federal initiatives to increase the public's access to health information and comparable initiatives to give providers access to patient information and the constantly expanding health research knowledge base. Although the individual projects are too numerous and to be identified individually, the crosscut highlights the broad array of such projects. For example public access projects include: the Directory of Information Resources Online (DIRLINE), the Physician Data Query (PDQ), AIDSLINE, AIDSTRIAL, AIDSDRUG, HSTAT, the Health Care Financing Administration's on-line project, the National Health Information Center, and 1-800 lines that service the same information links but without computer access. Provider patient care information and knowledge base projects include: Rural Extension Administration's Distant Learning Medical Link; NLM and the Agency for Health Care Policy and Research computer-based patient record initiatives; DoE's GRAIL program, NLM medical connections program; and, high performance communications for PDQ, Cancernet and electronic publishing as well as the current PDQ and HSTAT on-line services for providers. The CDC INPHO and WONDER projects also provide an integrated network for public health officials and an interactive information system for state, local, and academic health professionals respectively. Both the INPHO and WONDER will improve the accessibility and exchange of health promotion and disease prevention related information. All of these projects advance the NII goals of providing access to government information and furthering the universal service concept.

Health Care

II. Highlighted Initiatives (Continued)

(3) Cost Containment. The projects supporting health care cost containment include the information access and quality projects already discussed that will help consumers and providers know more about prevention and appropriate care. Highlighted cost containment projects include Federal investments in health data exchange and content standards and administrative streamlining applications. Within HHS, HCFA and the Agency for Health Care and Policy Research both have investments in standards development. Standards are recognized as the linchpin for the coordinated development and implementation of health applications. Standards are critical to create greater certainty for applications investments and support improved longitudinal health care records. In the short term standards will allow streamlined claims and payment that will reduce administrative costs. In addition to the standards themselves, HCFA is developing improved claims processing that will reduce the administrative costs for Medicare and Medicaid while allowing for improved interoperability with other insurers for coordination of benefits. These projects advance a number of the NII goals, but most notably promotion of seamless, interactive, user driven operation.

(4) Infrastructure Investments. There are numerous investments in support of infrastructure development particular to health applications. Some important projects to highlight include: NLM HPCC health care applications research and demonstrations support for test bed networks; NCRR Information Infrastructure Technology applications support; the National Institute of Standards and Technology's Advanced Technology Program's Information Infrastructure for Health care - a program designed to develop tools and prototype systems for health care that also accelerate infrastructure development; NASA's collaboration with the Health care Open Systems & Trials (HOST) consortium comprised of providers, insurers and IT companies working jointly to increase access to care through the use of advance information technology, initially focusing on computer-based patient records and an integrated community health care information network; grants from the National Telecommunications and Information Administration that are expected to support a number of health care demonstrations. All of these support expedited development of integrated health applications. This in turn supports the NII goals of promoting private sector investment, acting as a catalyst to technological innovation and new applications and promoting seamless interactive user driven operation.

Health Care

Agency Contributions
Health Care Access Programs
Community Facility Loans (USDA/RDA)
Community Services Work Station (DHHS/ACF, DHHS/PHS)
Telemedicine Demonstrations (USDA/REA, DHHS/HCFA, DHHS/NIH, DHHS/ORH, VA)
International Telemedicine Health Care Telecommunications Network (NASA)
Health Care Quality Programs
REA Distance Learning Medical Link Loan and Grant (USDA/REA)
1-800 telephone lines (DHHS/HCFA, DHHS/CDC, NHIC, & CANCER)
Internet/computer links (DoE; DHHS: CDC, CRDL, NHIC, HSTAR, HCFA, NLM, ODPHP, SAMSHA; DoL/OSHA; NASA)
Kiosk access to specific health applications (DHHS/SSA)
Wonder System (DHHS/CDC)
Health Care Cost Containment Programs
Medicare Transaction System (DHHS/HCFA)
Standards Initiatives (DHHS/HCFA, DHHS/AHCPR, VA)
Infrastructure Investments Specific to Health
ATP Information Infrastructure for Health Care (DoC/NIST)
NLM Medical Connections program (DHHS/NLM)
Global Health Monitoring Network (NASA)
Health Care Open Systems & Trials - HOST (NASA)

Manufacturing

I. Overview of Application

An advanced National Information Infrastructure (NII) will enable manufacturers to transform and significantly improve all stages of manufacturing operations, from technology/market assessment and R&D to after-sales support and product disposal or reuse. Manufacturers will be able to use the NII to quickly and efficiently transfer data within and among operations; to effectively and sensibly transact business and collaborate with customers and partners; to rapidly and "virtually" prototype, simulate, and test products and processes; and to make easily and readily available the best manufacturing tools, knowledge bases, product information, and training materials regardless of location.

However there are at present many barriers to achieving this vision. Much of the manufacturing of the future will be done at multiple sites that are networked together. At this time, there is not an effective network to make available the diverse manufacturing operations. In addition, the present manufacturing systems do not have interfaces that conform to national (or international) standards, making it expensive for sharing of manufacturing information which is necessary to the growth of "virtual enterprises." There is not a well developed framework of standard manufacturing processes that readily allows for the prototyping and testing of products from process models. There is a need for more structured information about manufacturing practices and processes. Finally, companies, especially small to medium size, will need to change their approach to manufacturing to adopt these new NII technologies, which also will require intense training for workers.

To overcome these barriers, the Administration, in cooperation with private industry, has initiated, expanded, and redirected programs designed to unleash the potential of the NII in a variety of civilian manufacturing areas. These efforts include research and development in support of advanced manufacturing technology and high performance computing and communications; programs to demonstrate, test, and deploy NII manufacturing applications into the private sector; and lastly, programs designed to improve manufacturing education and training.

While there are many government sponsored programs designed to facilitate the development, demonstration, and deployment of NII manufacturing applications, there are areas where the government should be investing more time and effort. For example, there is a need to accelerate the development and testing of industry-led standards for product data exchange, electronic commerce, and interoperability. There is also the need to provide more testbeds where NII applications can be prototyped and demonstrated in collaboration with industry as well as focused efforts in user-acceptability and information conversion. Lastly, and perhaps most importantly, the government needs to expand its technical assistance programs and to initiate serious efforts to address industry's needs in the areas of organizational learning and worker training.

II. Highlighted Initiatives

The Administration has crafted a government-wide strategy to speed the development and application of advanced manufacturing technologies. Federal involvement within the Manufacturing Arena can be divided into three categories: (1) Research and Development; (2) Deployment; and (3) Education and Training.

Manufacturing

II. Highlighted Initiatives (Continued)

(1) Research and Development. Programs falling under this category include infrastructure development that supports manufacturing applications. In addition to the base programs within the agencies there are two key thrust areas that are part of the research and development efforts within the National Science and Technology Council (NSTC): The High Performance Computing, Communications and Information Technology (HPCCIT) Subcommittee is promoting the application of information technology to the national challenge of manufacturing using the Information Infrastructure Technology and Applications (IITA) Initiative, and the Civilian Industrial Technologies (CIT) Committee is promoting a coordinated interagency effort to promote the development of advanced manufacturing technologies. Other important initiatives include:

- ***Systems Integration for Manufacturing Applications (SIMA) program (DoC/NIST)***. SIMA is an effort to develop, refine, test, and transfer advanced, computer-integrated, electronically-networked manufacturing technologies and associated applications. Research activities will focus on developing integration technologies, architectures, communication protocols and interface specifications for manufacturing software applications that support design, planning and production of products in the mechanical, apparel and process plant industries. A standards-based data exchange effort will target flexible computer integrated manufacturing issues to alleviate the lack of data exchange capability between manufacturing applications.

- ***Agile Manufacturing Initiative (NSF)***. This initiative includes a prototype of an information infrastructure to support distributed concurrent engineering, flexible manufacturing, and electronic commerce in manufacturing applications. The vision of agile manufacturing is to enable virtual companies to be formed by linking design and manufacturing operations that are physically distributed among a group of companies.

- ***Advanced Technology Program Computer-Integrated Manufacturing (CIM) for Electronics program (DoC/NIST)***. The Advanced Technology Program provides funding to support critical research needed to develop key commercial technologies, and to bring innovative products to market. CIM will increase substantially the base of suppliers of third-party electronics manufacturing software. The intention is that this supplier base would serve not only electronics manufacturers, but also other major manufacturing sectors such as automotive and aerospace. These goals will be achieved by encouraging electronics manufacturers to define and adopt an open CIM framework which will provide a market for others to design compliant software systems that require minimal manufacturers to rapidly respond to new market opportunities by being able to easily reconfigure their shop floor systems.

Manufacturing

II. Highlighted Initiatives (Continued)

(2) Deployment. Programs in this category include initiatives that bring useful technologies into the marketplace and further their adoption by the private sector.

- ***Technologies Enabling Agile Manufacturing (TEAM) program (DoE)***. TEAM will enhance industrial competitiveness by advancing and deploying manufacturing technologies that promote agility. TEAM is leveraging the expertise and resources of private industry and Federal Agencies to develop, integrate, and deploy leap-ahead technologies enhancing the responsiveness, flexibility, and cost-effectiveness of U.S. industry. The technologies and methodologies deployed by TEAM in the five thrust areas of Product Design and Enterprise Concurrency, Virtual Manufacturing, Manufacturing Planning and Control, Intelligent Closed-Loop Processing, and Integration will enable manufacturers to transition products from design to production faster, more efficiently, and at lower cost.

- ***Manufacturing Extension Partnership (MEP) Program's Electronic Communication Linkages (DoC/NIST)***. The MEP is an industrial extension service designed to transfer developed technologies to applications appropriate for smaller businesses. The MEP is designed to be a comprehensive, yet locally responsive, network of centers that help firms upgrade their equipment, improve their processes, and strengthen their business performance. The MEP is sponsoring a specific pilot program which will demonstrate the potential value of linking the extension centers using a major network system.

(3) Education and Training. Programs that not only educate the manufacturing community as to the benefits of NII-related technologies, but also provide training to users of the technologies.

- ***Technology Information Environment for Industry (DoE)***. TIE-IN is a new mechanism being developed by Sandia Labs for technology transfer that can realistically reach a large percentage of the small to mid-sized companies in the U.S. It has two primary goals: 1) to reach thousands of establishments, and 2) to reduce the industry investment required to use National Laboratory technologies. TIE-IN will utilize the NII and information technologies to build smart front-ends for many existing DOE technical capabilities and electronically guide users through the process of obtaining solutions. By using these smart front-ends both the required amount of direct staff interaction with the users, and the investment required by industry can be minimized. TIE-IN will operate as an electronic extension service accessible from Internet or modem to allow the user to quickly obtain solutions to problems from remote locations.

Manufacturing

Agency Contributions
Research and Development
Rapid Response Manufacturing (DoE)
*Systems Integrated Manufacturing Applications (DoC/NIST)
Information Integration for Simulation Based Design & Manufacturing (NSF)
*Agile Manufacturing Program (NSF)
*Advanced Technology Program Computer-Integrated Manufacturing for Electronics (DoC/NIST)
Deployment
Rural Business Enterprise Grants (USDA/RDA)
Manufacturing Extension Partnership Electronic Communication Linkages (DoC/NIST, DoE)
Advanced Manufacturing-NII (AM-NII) (DoE)
Object Oriented Design of Integrated Distribution Systems (DoE)
Technologies Enabling Agile Manufacturing (TEAM) (DoE)
Affordable Design and Manufacturing (ADAM) initiative (NASA)
Oak Ridge Centers for Manufacturing Technology -- Skills Campus and Virtual Enterprise Resource Center (TVA, DoE)
Education and Training
*Computational Testbed for Industry (CTI) (DoE)
Technology Information Environment for Industry (TIE-IN) program (DoE)
CALS Roadmap 2000 (DoE)

* Indicates initiative has been identified by the NSTC R&D Budget Cross-cut

Transportation

I. Overview of Application Area

Effective use of existing transportation systems and infrastructure is central to achieving high levels of performance and efficiency in meeting our transportation needs. Overlaying the existing transportation infrastructure with a complementary information infrastructure could dramatically improve transportation service, cost, safety and efficiency. Collective advances in information technology permit the development of an "intelligent" transportation system, in which system operators and users share information and cooperate to enhance system performance, efficiency, capability, and user satisfaction.

At the policy level, the implications of wide-scale application of information technology to transportation -- technology development, economic and physical access to technology solutions, safety impacts of applying various technologies have yet to be thoroughly assessed. Existing agency programs have evolved individually and lack a comprehensive understanding of transportation information needs across agencies or the crosscutting needs of national significance.

Compared to the use of information technology in air traffic control at the applications level, the nation's transportation sector has yet to maximize its use of modern sensing, communication, and information technologies. These technologies have much to offer activities such as routing transit buses, managing harbor traffic, optimizing urban highway use at rush hour, or dispatching maintenance crews. Replacing conventional approaches with methods employing modern technology will require transportation providers to totally re-conceptualize and re-engineer these functions.

Technology development to support the vision of an "intelligent" transportation system is needed to address deficiencies in several key areas. Tools for timely production of electronic maps and charts for navigation and route planning are inadequate; methods for keeping safety-critical electronic map and chart information current are limited. New weather systems are poised to provide vast sources of information that can be used to avert transportation accidents and adverse travel situations, yet the ability to analyze and disseminate such information in meaningful ways is lagging. There is a need to better understand the impact of weather on transportation operations (particularly in the surface modes) and the potential for weather information to influence transportation safety and efficiency. Transportation command/control functions and surveillance options for increasing uniform situation awareness among system and vehicle operators represent areas where further technology development and application would be helpful.

The NII initiatives for transportation provide the basis upon which current deficiencies can be addressed. These initiatives also establish a framework for assessing and developing information technology for transportation. Short-term objectives of the initiatives include agreeing upon a unified system architecture with uniform standards, procedures, and protocols for system development, implementation, operation and maintenance. This will facilitate both establishing a consensus on the roles and responsibilities of participants in the transportation system and reaching agreement on strategies to balance efficiency, mobility, safety, health and environmental impacts.

Transportation

II. Highlighted Initiatives

The Federal Government's efforts within the transportation application area have been divided into five categories: Intelligent Vehicle-Highway Systems; Spatial Data and Reference Infrastructure; Mesoscale Weather Systems; Air Traffic Management and Control; and Waterway Management and Vessel Traffic Systems.

(1) Intelligent Vehicle-Highway Systems (IVHS). A public/private partnership to develop and apply a variety of vehicle, roadway, electronics, communications, and information processing technologies and services critical to improve the efficiency and/or safety of our surface transportation systems.

(2) Spatial Data and Reference Infrastructure. Initiatives in this category will accelerate the development of spatial relationships throughout all transportation systems that are critical for tracking and locating.

(3) Mesoscale Weather Systems. Programs in this category will help to develop real time weather systems able to forecast the weather in a small region.

(4) Air Traffic Management and Control. These programs will develop enhanced precision, more flexible, higher quality Air Traffic Control management capabilities to reduce delay and operating costs to system users during excessive system demands.

(5) Waterway Management & Vessel Traffic Systems. These programs will develop waterway management and control techniques, communication and presentation of infrastructure, and senior technology critical to waterway management and vessel traffic.

Transportation

Agency Contributions
Intelligent Vehicle-Highway Systems IVHS (including APTS)
*Wireless Microwave Communications and Sensors for IVHS (DoD)
*Demonstrations and Other Activities (DoT/FHWA, DoT/FTA, DoT/NHTSA)
*Research and Development (DoT/FHWA, DoT/FTA, DoT/NHTSA)
Spatial Data and Reference System
Differential Global Positioning System (DoT/FAA, NASA)
GPS Wide Area Augmentation System (DoT/FAA)
*Electronic Maps and Charts (DoT/FAA, DoC/NOAA)
*Satellite Navigation R&D (DoT/FAA)
Mesoscale Weather Systems
ASR Weather Systems Processor (DoT/FAA)
Aviation Weather Products Generator (DoT/FAA)
Integrated Terminal Weather System (DoT/FAA)
*Aviation Weather Detection / Dissemination (DoT/FAA)
*Weather System Planning and Impact Assessment (DoT/FAA)
Air Traffic Management and Control
*Sensors for Air Transportation System Capacity and Safety (DoD)
Terminal Area Productivity (TAP) (DoT/FAA, NASA)
ATC System Infrastructure (DoT/FAA, NASA)
*Airport Surface Traffic Automation (DoT/FAA)
*Air Traffic Management Technology (DoT/FAA)
*Oceanic ATC Automation (DoT/FAA)
*Terminal Area Surveillance System (DoT/FAA)
*Terminal ATC Automation (DoT/FAA)
Waterway Management & Vessel Traffic Systems
Infrastructure Deployment (DoT/USCG, DoT/MARAD, DoC/NOAA)
*Research and Development (DoT/USCG, DoT/MARAD, DoC/NOAA, DoD/ACE)

* Indicates initiative has been identified by the NSTC R&D Budget Cross-cut