Statement of Dr. Christopher L. Greer
Director, National Coordination Office for
Networking and Information Technology Research and Development
to the Committee on Science and Technology
U.S. House of Representatives
July 31, 2008

Good morning. My name is Chris Greer and I am Director of the National Coordination Office (NCO) for Networking and Information Technology Research and Development (NITRD). With my colleague, Dr. Jeannette Wing of the National Science Foundation (NSF), I co-chair the NITRD Subcommittee of the National Science and Technology Council's (NSTC) Committee on Technology. I want to thank Chairman Gordon, Ranking Member Hall, and the members of the Committee for the opportunity to come before you today to discuss the Federal government's multiagency NITRD effort.

The NITRD Program – now in its 17th year – represents the Federal government's portfolio of unclassified investments in fundamental, long-term research and development (R&D) in advanced networking and information technology (IT), including high-end computing, large-scale networking, cyber security and information assurance, human-computer interaction, information management, high-confidence software and systems, software design, and socioeconomic, education and workforce implications of IT. NITRD research is performed in universities, Federal research centers and laboratories, Federally funded R&D centers, private companies, and nonprofit organizations across the country. Agencies participating in the NITRD program – including 13 member agencies and a number of other participating agencies and offices – support vital investments in R&D and research infrastructure to further our nation's goals for national defense and national security, health care, energy, education, economic competitiveness, environmental sustainability, and other national priorities. Through the NITRD program, Federal agencies work together to ensure that the impact of their efforts is greater than the sum of their individual investments. This is accomplished through interaction across the government, academic, commercial, and international sectors using cooperation, coordination, information sharing, and joint planning to identify critical needs, avoid duplication of effort, maximize resource sharing, and partner in investments to pursue higher-level goals.

Mandate for coordination

Seventeen years ago, when Congress passed the bipartisan High-Performance Computing (HPC) Act of 1991 (Public Law 102-194), the Act's mandate for interagency coordination of Federal networking and IT R&D was remarkably farsighted. The Act established a powerful, resilient framework for Federal networking and IT R&D activities. That framework combined ambitious research goals with specific requirements for interagency cooperation, collaboration, and partnerships with industry and academia. The validation of the HPC Act's core vision can be found in the success and vitality of today's NITRD Program, which has become a model for coordination across Federal agencies.

The HPC Act was amended by the Next Generation Internet Research Act of 1998 (Public Law 105-305) and the America COMPETES Act of 2007 (Public Law 110-69). These Acts extended the scope of responsibilities for interagency coordination to include human-centered systems; flexible, extensible, interoperable, and accessible network technologies and implementations; education, training, and human resources; and other areas. As a result, the NITRD Program now provides for cooperation and coordination across a broad landscape, allowing it to tackle the inherently multidisciplinary, multi-technology, and multisector challenges of today's networking and IT research horizons.

The Office of Science and Technology Policy (OSTP), with the support of the Office of Management and Budget (OMB) and the participating NITRD agencies, has taken a vigorous approach to implementing the enabling NITRD legislation. The NCO Director is a member of the OSTP technical staff group with direct access to and active support by OSTP and OMB staff and leadership. In addition to their financial contributions, the participating agencies provide the time of some of their most capable experts and senior managers to pursue NITRD goals. The success of NITRD is due in large measure to the dedication and commitment of those who implement the program.

Program history in brief

In its first annual report to the Congress, the then-High Performance Computing and Communications (HPCC) Program reported an estimated 1991 multiagency budget of $489.4 million and a proposed 1992 budget of $638.3 million. Eight Federal agencies were represented in that budget: Defense Advanced Research Projects Agency (DARPA), Department of Energy (DOE), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), National Institute of Standards and Technology (NIST), National Oceanic and Atmospheric Administration (NOAA), and National Science Foundation (NSF). The HPCC program had four major research areas called Program Component Areas (PCAs): High Performance Computing Systems (HPCS); Advanced Software Technology and Algorithms (ASTA); National Research and Education Network (NREN); and Basic Research and Human Resources (BRHR).

Since 1991, the Federal IT R&D program has evolved continuously, addressing the continuing, dramatic expansion in computing and networking technologies, applications, and societal needs by adjusting the research focus and adding new, emerging areas of interest. This includes disaggregating investments in high-end computing infrastructure and applications from those in high-end computing (HEC) systems and system software research, and adding software design and productivity, high-confidence software and systems, and societal and workforce implications of IT.

Today, the NITRD Program, which is successor to the original HPCC Program, encompasses $3.5 billion (2009 Budget Request) in R&D funding and comprises 13 member agencies – the original eight agencies plus Agency for Healthcare Research and Quality (AHRQ), National Archives and Records Administration (NARA), Department of Energy/National Nuclear Security Administration (DOE/NNSA), National Security

Agency (NSA), and Office of the Secretary of Defense and Department of Defense Service research organizations (OSD and DoD Service research organizations). About a dozen other agencies that are not formal NITRD members also participate in the 8 Program Component Areas (PCAs) and other NITRD activities. (See Appendix 1 on page 14 for a list of the current NITRD agencies and PCAs and a NITRD organizational chart.)

Response to the Committee Request

The invitation to testify from this House Committee included a request to address three topic areas. Responses are provided in the numbered sections that follow.

Request #1: Current planning and coordination overview

The NITRD Program uses five general mechanisms to pursue its mission:

(1) Monthly meetings of the 7 Federal Interagency Working Groups (IWGs) and Coordinating Groups (CGs) chartered under the auspices of the NSTC
(2) Workshops, most including private-sector as well as Federal participants
(3) Formal reports, including the annual NITRD Supplement to the President's Budget and strategic planning documents
(4) Support for external studies and assessments
(5) Outreach to the Federal and private sectors

I'll illustrate how these are used with examples for each mechanism.

In each NITRD Program Component Area (PCA), agencies work together in a CG or IWG that meets monthly to identify research needs, plan programs, share best practices, and review progress. These regular meetings allow groups to explore complex research and development challenges. As an example, the High Confidence Software and Systems (HCSS) CG is playing a leadership role in engaging researchers and industry in assessing the national research needs in the complex life- and safety-critical technologies called cyber-physical systems[1] (defined here as IT embedded in and critical to the function of a physical system; aircraft avionics are an example). This analysis is being informed by a workshop series engaging the academic, commercial, and government sectors. Recent workshops in this series covered medical device software and systems, with participation by researchers, clinicians, hospital administrators, and industry representatives; another focused on automotive safety, engaging automobile designers, safety experts, and engineers and academic researchers. The next in the series, planned for Fall 2008, will focus on "High Confidence Cyber-Physical Transportation Systems: A look at the Commercial Aero, Auto, and Rail Sectors, and Military Ground and Aerial Unmanned Autonomous Vehicles (UAVs)."

During the 20-month period from October 2006 to May 2008, the NITRD Program planned and held a total of 27 workshops – an average of 1.5 workshops per month. Topics include composable cyber systems, supervisory control and data acquisition (SCADA) systems for industrial process/system control, and an upcoming event on national and international networking research challenges. An ongoing series, the

[1] In its 2007 assessment of the NITRD Program, the President's Council of Advisors on Science and Technology (PCAST) termed cyber-physical systems "a national priority for Federal R&D."

Collaborative Expedition Workshops, covers wide-ranging topics such as virtual work settings, evaluation of emerging technology and technology development programs, and scalable data management.

Formal reports produced during this same 20-month period include the 2007 and 2008 NITRD Supplement to the President's Budget and the following strategic planning documents produced by ad hoc interagency task groups of NITRD member agencies and others:

Federal Plan for Advanced Networking Research and Development
On January 30, 2007, OSTP Director Jack Marburger established an Interagency Task Force on Advanced Networking and charged it with developing a strategic vision and long-range plan for Federal networking R&D; he requested that the initial draft of the plan be completed in three months, by May 2007, to provide timely input for the FY 2009 budget process. Through intensive efforts, the 40-member task force of NITRD and other agency representatives produced a draft on schedule, including a detailed analysis of networking research challenges that has been extremely well received. The Task Force continued to refine the draft over the next 12 months; the final *Federal Plan for Advanced Networking Research and Development* is now being printed and will be sent to all members of Congress shortly. The preprint version of the Plan is available on the NITRD Web site at: http://www.nitrd.gov/ITFAN-preprint-061108.pdf

Plan for Coordination of Federal R&D and ***Plan for the Leap-Ahead Program of Research and Development***
In February 2008, OSTP called for an Interagency Task Force from NITRD agencies and others to develop two research-related planning documents on a fast-track basis under the Comprehensive National Cybersecurity Initiative (CNCI), established by National Security Presidential Directive 54/Homeland Security Presidential Directive 23 in January 2008. To expedite quick turnaround on this tasking, the 21 task force members divided into two groups. One developed the plan for overall coordination of the Federal cyber R&D portfolio; the other crafted the "Leap-Ahead" plan for accelerating high-risk, high-return research to help maintain our technological edge in cyberspace. These plans now provide the basis for the recent launch of the CNCI R&D planning activities.

Under the CNCI plans, the Cyber Security and Information Assurance Interagency Working Group (CSIA IWG) chartered by the NSTC in 2006 – augmented by a new Senior Steering Group – is tasked with two new assignments: leading the CNCI R&D coordination activity including improving coordination between the unclassified and classified Federal R&D sectors, and coordinating the "Leap-Ahead" initiative. The CSIA IWG's 2006 *Federal Plan for Cyber Security and Information Assurance Research and Development* provides a detailed technical baseline for setting Federal cyber R&D priorities under CNCI.

The NITRD Program supports external studies and reviews to expand its perspectives and take advantage of expertise from a diversity of sources. A study by the National Academies is currently underway to develop a better understanding of the potential

scientific and technological impact of high-end capability computing in science and engineering. Public release of the final report is expected in September 2008. The Program recently provided briefings and written inputs to the Networking and Information Technology Subcommittee of the President's Council of Advisors on Science and Technology (PCAST) for use in its assessment of the NITRD Program. Looking ahead, the Program developed a statement of work for the first of the fast-track studies on NIT postsecondary education called for by the PCAST assessment of NITRD.

The NITRD Program uses a variety of mechanisms to reach out to researchers, private-sector developers, resource providers, and end users. Examples include two groups under the Large Scale Networking CG: the Joint Engineering Team (JET) and Middleware and Grid Infrastructure Coordination (MAGIC) group, which have academic and industry members; the Federal Agency Administration of Science and Technology Education and Research (FASTER) Community of Practice (CoP), which seeks exchanges of information with the private sector and new technologies to streamline the management of Federal research; and the multisector NITRD research workshops held in all the PCAs.

A number of efforts are underway to improve the effectiveness of NITRD planning and coordination. These include revamping the NITRD web site (both public and Federal-only resources), providing improved web-based services to support remote participation and digital content sharing, and outreach visits by NCO technical staff to academic and commercial organizations as a required component of regular conference travel.

The high sustained level of collaborative engagement reflected in the diverse NITRD activities of the last two years is, in my judgment, a key measure of the effectiveness of the NITRD coordination model – it remains resilient amid the Program's increasing activities and expanding responsibilities. Another measure is the productive synergy gained through joint funding, partnerships with private-sector entities, and sometimes a combination of the two. For example:

Collaboration

Benchmarks for Federal HEC systems: The HEC agencies are collaborating to develop an interagency suite of HEC benchmarks that can accurately represent the demands of Federal advanced computing applications.

IPv6 debugging: DoD, DOE/SC, and NASA are collaborating, in cooperation with the university networking consortium Internet2, in a project that is conducting end-to-end debugging, performance measurement, and toolset enhancement of Internet Protocol version 6 (IPv6) over DoD's Defense Research and Education Network (DREN), DOE/SC's Energy Sciences network (ESnet), and Internet2Net.

Environmental databases and data distribution: Through the Earth System Modeling Framework activity and related efforts, NITRD agencies (DoD, EPA, NASA, NOAA, NSF) continue their long-range cooperative work to expand the interoperability and usability of diverse models and large-scale data sets for weather, climate, and environmental research.

Joint funding/Partnerships

High-Productivity Computing Systems (HPCS) Phase III: This DARPA effort, supported also by DOE/SC and NSA and with collaborative participation by other HEC agencies, involves design, fabrication, integration, and demonstration of full-scale prototypes by 2010 for a new generation of petascale, economically viable computing systems.

HEC-University Research Activity (HEC-URA): In 2004, HEC R&D agencies (DARPA, DOE/NNSA, DOE/SC, NASA, NSA, and NSF) initiated this program of high-risk R&D in technically challenging areas including HEC software tools and compilers; file systems, I/O, and storage design for high throughput; and new parallel programming models for thousands of processors. DARPA, DOE/SC, and NSF have contributed funding, and they and other HEC agencies participate in reviews and HEC-URA workshops.

DETERlab: DHS and NSF, with university and industry partners, are supporting the cyber-DEfense Technology Experimental Research laboratory testbed, a general-purpose experimental infrastructure that enables research and development on next-generation cyber security technologies.

Open Science Grid (OSG): NSF and DOE/SC are jointly supporting this growing consortium of about 100 researchers and software, service, and resource providers from universities, national laboratories, and computing centers across the U.S. OSG brings together distributed computing and storage resources from campuses and research communities in a common, shared grid infrastructure over research networks via a common set of middleware.

Trustworthy Cyber Infrastructure for the Power Grid (TCIP): In this effort co-funded by NSF, DOE (OE), and DHS, researchers from the University of Illinois at Urbana-Champaign, Dartmouth College, Cornell University, and Washington State University are seeking to better secure operations of the nation's power grid by improving the engineering of its underlying IT infrastructure, making it more secure, reliable, and safe.

Cluster Exploratory (CluE) program: NSF has formed a partnership with Google and IBM that will enable academic researchers to explore data-intensive computing applications in science and engineering using a 1,600-processor server farm set up and supported by the two companies.

Committee Request #2: PCAST assessment of the NITRD Program
Periodic assessments of the multiagency networking and IT R&D program by a Presidential advisory committee are mandated by the HPC Act, as amended by the Next Generation Internet Research Act of 1998 and most recently by the America COMPETES Act of 2007. Executive Order 13385, signed September 29, 2005, assigned the assessment responsibility to PCAST, which in 2006 established a Networking and

Information Technology (NIT) Subcommittee to lead the process. The results of PCAST's assessment are presented in the August 2007 report *Leadership Under Challenge: Information Technology R&D in a Competitive World.*

Over all, the PCAST concluded that while the NITRD program, with NCO support, has in the past "been effective at meeting agency and national needs," for the future "changes are needed in order for the United States to ensure its continued leadership." This conclusion recognizes the advent of an era of global NIT competitiveness in which "other countries and regions have also recognized the value of NIT leadership and are mounting challenges." The changes recommended by PCAST are in the areas of education and workforce development, portfolio balance, new emphasis areas, and strategic planning. The PCAST conclusions and recommendations sharpen our focus on the central role of strategic planning in shaping NITRD growth and change; and even in the most technically difficult R&D areas such as complex software, the PCAST recommendations provide an opportunity to make progress toward our goals.

The PCAST makes 17 recommendations in its report. (The recommendations are listed numerically, in sequence by chapter, in Appendix 2 beginning on page 15. Recommendations are noted parenthetically by number in this testimony.) These recommendations can be categorized as follows:

(1) Seven focus on improved planning processes (#9,11-13,16,18,20)
(2) Four address issues of portfolio balance and emphasis areas (#2a,6,8,14)
(3) Two suggest studies or consultations (#1,10)
(4) Two focus on assessment (#17,19)
(5) Two are addressed to the Director of OSTP (#7,15)
(6) Three call for efforts to ease the visa process for international students, graduates, and visiting experts (#2b,2c,2d)

The final two categories fall outside the purview of NITRD and this testimony, and will not be addressed further. I would like to address the first four categories with a few comments and observations on each.

PCAST Category 1: Planning recommendations

The PCAST assessment comes at a developmental turning point for NITRD. In light of the maturation and increase in responsibilities I have described, it is clearly the right time in NITRD history to consider where we are going and how we can better manage the journey. For this reason, and in light of the PCAST assessment, the NITRD Subcommittee has initiated the development of a comprehensive strategic plan. The key features of this plan are that it is:

- Vision-driven with a theme of complexity in multiple dimensions
- Focused on goals and capabilities that can only be achieved through interagency cooperation and coordination, and the R&D capabilities and challenges required to achieve those goals
- Predictive of an effective organizational structure for the NITRD Program

With the development of a comprehensive strategic plan, we anticipate a point-by-point response to the PCAST recommendations informed and supported by the plan.

Process for developing NITRD Strategic Plan

At its November 2007 meeting, the NITRD Subcommittee approved an initiative to prepare a new Strategic Plan for NITRD as the critical initial task for entering a new phase of development. A detailed timeline for the strategic planning process, with milestones, is provided in Appendix 3 on page 17 (note that the timeline also lists the PCAST recommendations relevant to the various steps in the process). This timeline covers the period FY 2008-09 and has five major features:

(1) The plan development process has three subphases – initial content development March through September 2008; text drafting and revision September 2008 through March 2009; and concurrence review with a target for release in June 2009.
(2) The process provides multiple opportunities and mechanisms for public input including a Request for Input (RFI) for initial comments, a workshop to engage all sectors, and public comments on a full draft plan.
(3) The PCAST recommendations are fully integrated into and help guide the strategic planning process.
(4) The development of PCA strategic plans and roadmaps overlaps with and is informed by the culmination of the NITRD strategic planning process.
(5) The strategic planning process is viewed as ongoing with regular opportunities in the future for evolving and revising the plan as goals are achieved and the networking and IT landscape changes.

Agency representatives kicked off the strategic planning process with a two-day offsite meeting in March 2008. First principles agreed upon at that meeting were that the NITRD Strategic Plan should align with the strategic plans of the member agencies, and that the Plan should focus on long-term capabilities that require the research contributions of multiple agencies to achieve. An 18-member strategic planning team of agency representatives is now meeting weekly and is currently focused on the task of initial content development. A Request for Input (RFI) appeared in the *Federal Register* July 24 and notification has been sent to stakeholder organizations across the country as well as to the NCO's outreach list of approximately 1,700 contacts. The two-page RFI (see Appendix 3) asks all interested parties – individuals, groups, organizations, and representatives of companies and industries – to provide a two-page statement envisioning the future of networking and IT and the future role of NITRD.

In developing its strategic plan, NITRD is also coordinating closely with the NSTC Committee on Science's Interagency Working Group on Digital Data (IWGDD). The IWGDD is charged with developing and providing for the implementation of a plan to cultivate a framework for reliable preservation and effective access to digital scientific data. Along with Cita Furlani of NIST and Charles Romine of OSTP, I serve as co-chair of the IWGDD.

PCAST Category 2: Recommendations on portfolio balance and emphasis areas

This category of PCAST recommendations recognizes and supports the current NITRD portfolio while suggesting increases in:

(1) larger-scale, longer-term, multidisciplinary, and high-risk/high-payoff research; and
(2) support for NIT systems connected with the physical world, software, digital data, and networking, while continuing support for high-end computing, cyber security and information assurance, human-computer interaction, and NIT and the social sciences.

As PCAST recognizes, the NITRD Program fields a number of efforts in this first item today, including R&D in petascale architectures, software, and applications; all-optical network technologies; quantum information technologies; and next-generation wireless and sensor capabilities. At the same time, a key goal of NITRD's current strategic planning activity is to enable us to identify new opportunities for long-term, high-risk research investments. The plan's specific emphasis on goals and capabilities that can only be achieved by agencies working together is intended to enable agencies to share funding for larger and longer-term projects and to share the risk in projects whose payoffs are broad enough to interest multiple agencies. Furthermore, the Program's ability to move nimbly to seize such new opportunities is contingent in part on the alignment of the PCAs in which agencies report their NITRD research dollars. For that reason, one focus of our strategic planning activities is an unfettered examination of the PCAs to assess whether, and what type of, realignment of NITRD research areas might be desirable to promote new strategic directions. (This kind of Subcommittee assessment is also called for by the PCAST in a separate recommendation.)

High payoffs can also come from good ideas that are not necessarily high-risk. Two such examples are the opening up of computing cycles on Federal leadership-class systems to the broader national research community and the investment by NSF in Track 2 HEC clusters. The NSF investment resulted in a dramatic increase in computational resources available over the Teragrid. The open solicitations for leading-edge computational research proposals by DOE/SC (under the Innovative and Novel Computational Impact on Theory and Experiment [INCITE] program) and NASA (under the former National Leadership Computing System [NCLS] program) have greatly broadened access for the national research community to the world's most powerful supercomputers. The 2008 INCITE competition resulted in awards of computing cycles on leadership-class Federal systems to 8 major U.S. corporations, 17 universities, and 20 smaller Federal agencies and labs as well as international research institutions – for a total of more than a quarter of a billion compute hours.

The topic areas listed in the second item above (focused on cyber-physical systems) are emerging as crucial in the discussions of the NITRD strategic planning group. We concur with PCAST in its assessment of the importance of these topics and expect them to be central in the final strategic plan.

Although the PCAST report states that "over all, technology transfer has worked well in networking and IT," the NITRD Program has several new opportunities to address the report's recommendation that NITRD do more to exploit existing tech transfer mechanisms. Already existing NITRD mechanisms that bring researchers and their results together with private-sector developers and end users include: the abovementioned

JET and MAGIC groups; the Federal Agency Administration of Science and Technology Education and Research (FASTER) community of practice group, which seeks exchanges of information with the private sector and new technologies to streamline the management of Federal research; and the multisector NITRD research workshops held in all the PCAs.

The new opportunities are presented by the two CNCI plans and the advanced networking plan, Each of these plans places substantial emphasis on developing new models for expanding substantive interactions with the private sector, such as cooperation on testbeds and increased meetings with industry organizations, and on expediting the movement of research results into prototyping and commercial implementation. The increasing pace of technological change is recognized in the NITRD community as a challenge in advancing research innovations, so there is eagerness now to explore ways to improve NITRD's outreach to private developers and industry.

The new CNCI activities also bear on the PCAST recommendation to increase the emphasis on long-term research and infrastructure in cyber security and information assurance**.** The NITRD Subcommittee has approved the addition of one FTE to the NCO staff to support the expanded responsibilities of the CSIA IWG and its new Senior Steering Group (SSG) for coordinating cyber R&D and the Leap-Ahead research initiative. Infrastructure for cyber security R&D is called for by both the CNCI planning documents and the CSIA IWG *Federal Plan.*

PCAST Category 3: Recommendations for consultations and studies

The dynamic and global networking and IT landscape will require a partnership across the government, academic, and commercial sectors if we are to maintain our nation's leadership role. This will require the Federal government to act as both leader to and partner with the other sectors. The NITRD agencies can lead by making effective R&D investments, including those in larger, longer-term, multidisciplinary, and high-risk/high-payoff efforts, and by setting examples, demonstrating feasibility, and developing initial implementation capabilities through their own NIT activities, such as achieving IPv6 capability. The NITRD agencies can be partners by being transparent and interactive in their R&D planning activities, exchanging information about emerging innovations and understanding the needs, opportunities, and capabilities in the other sectors.

This dual leadership/partnership role requires ongoing mechanisms for dialogue and interaction between the NITRD program and other sectors. As I mentioned earlier, the JET and MAGIC teams include academic and commercial-sector participation. This model could profitably be extended into other PCAs and focus areas. The NITRD workshops are designed to draw participation across sectors and to bring together groups with complementary interests and capabilities that do not have a history of interaction. This mechanism will continue to see extensive use. The PCAST assessment and its influence on NITRD activities demonstrates the value of high-level external review of the Program as an additional means for input. The America COMPETES Act calls for an ongoing, external review process.

The partnership role also includes making good use of the expertise and perspectives available in the other sectors. External studies commissioned by NITRD are one means for achieving this. For example, the PCAST assessment identifies as a priority area ensuring an adequate supply of well-educated NIT professionals, a strategic goal that we share. To inform the development of our strategic plan, the NITRD agencies have launched an initial fast-track study of networking and IT education. A Statement of Work developed by a multiagency task group was approved at the March offsite meeting of the NITRD Subcommittee. We are also in the process of assessing the current NITRD educational activities including graduate fellowships to compare these against needs and against priorities of our strategic plan. Our initial plan includes a full-day workshop to discuss current programs across the Federal agencies. Thus, the strategic planning process itself is an example of the use of multiple consultation and input mechanisms to inform planning.

Additional examples of external inputs are in the areas of software development and advanced networking. The recent National Academies study *Software for Dependable Systems: Sufficient Evidence?* has been complemented by the ongoing workshop series supported by the HCSS group that has drawn input from academia, industry, user groups, and government on certifiably dependable software systems for critical applications. The Federal Plan for Advanced Networking Research and Development was informed by a series of eight workshops, RFIs, working groups, and external reports.

PCAST Category 4: Recommendations on assessment
The PCAST assessment included recommendations for periodic assessment of the NITRD PCA structure and the development of metrics and indicators to assess progress. As I stated earlier, an explicit goal in the strategic planning process is to evaluate the current PCA structure against our new strategic plan and to make changes as appropriate. We envision the strategic planning process and any associated PCA realignments as an ongoing process, to be revisited on a regular basis as the networking and IT landscape evolves and as strategic goals are achieved.

There are currently two types of metrics or indicators against which we intend to assess progress. Stage One indicators include successful completion of the Strategic Plan and the PCA strategic plans and roadmaps – including measures of progress – called for in the PCAST report. The timeline in Appendix 3 provides a series of specific milestones and events, which are examples of Stage One indicators. Stage Two indicators – measures of how well the Program is carrying out its Strategic Plan, how effectively the PCAs are pursuing their strategic plans and roadmaps, and the impact of these efforts – are being developed as part of the strategic planning process. These Stage Two indicators will be an important part of our implementation plan.

Committee Request #3: Role and functions of the National Coordination Office for NITRD (NCO/NITRD)
The NCO/NITRD is identified in the NSTC Committee on Technology charter for the NITRD Subcommittee. The Office provides technical, planning, budgetary, and logistical

support for all the activities of the NITRD Program, under the operative framework of relevant laws, charters, and Executive Branch directives. The Office also serves as the central point of contact for inquiries and requests for information about the Program and maintains the Program's Web site and documents, including current and archival documentation of NITRD subcommittee, IWG, and CG activities. The Director and Associate Director are Federal employees and serve as senior management. The staff of 13 contractors and one Federal employee on detail includes a contract manager and an office operations manager; five Technical Coordinators who support 11 IWGs, CGs, and technical groups; one writer/editor; three administrative support staff; a Web master and an IT systems manager; and a temporary full-time coordinator for the NITRD strategic planning process. The five Technical Coordinators are Ph.D.-level positions that provide expert knowledge of the R&D challenges in the NITRD fields.

Regular NCO activities include logistical preparations and staff support for all meetings of NITRD entities, including those of the Presidential advisory group on IT, and most NITRD-affiliated workshops; drafting, editing, and publishing support for publications (annual budget supplement, R&D plans, workshop reports, studies, and reviews) of the NITRD Program and those of the Presidential advisory group; and preparation of special budgetary and technical documents requested by the NITRD Subcommittee. The NCO Director maintains close communications with OSTP, OMB, the NITRD agencies, and this Committee, and represents the Program in presentations to organizations nationally.

The PCAST assessment includes three recommendations that explicitly reference the NCO. Two focus on NCO support for the Subcommittee in commissioning studies on networking and IT education and in developing metrics and progress indicators for assessment. These support efforts are underway, as described above.

The third recommendation is that NCO, with Subcommittee guidance, should develop and implement a plan for supporting the NITRD Program in developing strategic plans and roadmaps. Such a plan has been developed for the initial stages of this new NITRD activity and is being implemented. Under this initial plan, the NCO has committed significant resources to the process, including the hiring of a temporary coordinator for strategic planning. The Office has committed significant technical writing time in preparing text and has charged the Technical Coordinators with serving as liaisons between the Strategic Planning Group and the IWGs and CGs. The Office is supporting the weekly meetings of the Strategic Planning Group and providing logistical support for its outreach activities. Thus, the NCO is fully committed to supporting a successful NITRD strategic planning and roadmapping process.

In conclusion

The enabling NITRD legislation and its vigorous implementation by OSTP, OMB, and the NITRD agencies have created a robust, responsive, and resilient framework for effective cooperation and coordination in Federal networking and IT R&D planning and execution. The NITRD Program has matured and now encompasses a spectrum of NIT areas that allow it to take on the complex, multidisciplinary, multisector challenges characteristic of today's networking and IT landscape.

With this maturation comes the opportunity and responsibility for comprehensive strategic planning to ensure best use of this important resource for coordination. The NITRD Program is now deep into the process of a vigorous strategic planning and roadmapping effort. We are confident that this process and its attendant elements will fully address the valuable recommendations contained in the PCAST assessment.

A measure of the strength of the NITRD Program and the supporting National Coordination Office is the ability to simultaneously support a vigorous strategic planning process, the development of coordination and leap-ahead R&D activities under the Comprehensive National Cybersecurity Initiative, manage two external studies, facilitate a robust workshop series, and conduct the regular planning, coordinating, and reporting activities of the 11 IWGs, CGs, and teams. This is only accomplished because of the competence, dedication, and commitment of all of the members of the NITRD/NCO community.

As the PCAST concludes, leadership in networking and information technology is essential to U.S. economic prosperity, security, and quality of life. The Federal investments we make in research and development in this area are the keys to a future of promise for our nation and its citizens. I look forward to working with Congress to fulfill that promise.

Thank you.

Appendix 1: NITRD Agencies and Program Component Areas

Member agencies

AHRQ – Agency for Healthcare Research and Quality
DARPA – Defense Advanced Research Projects Agency
DOE/NNSA – Department of Energy/National Nuclear Security Administration
DOE/SC – Department of Energy/Office of Science
EPA – Environmental Protection Agency
NARA – National Archives and Records Administration
NASA – National Aeronautics and Space Administration
NIH – National Institutes of Health
NIST – National Institute of Standards and Technology
NOAA – National Oceanic and Atmospheric Administration
NSA – National Security Agency
NSF – National Science Foundation
OSD and Service research organizations (Office of the Secretary of Defense and DoD Air Force, Army, and Navy research organizations)

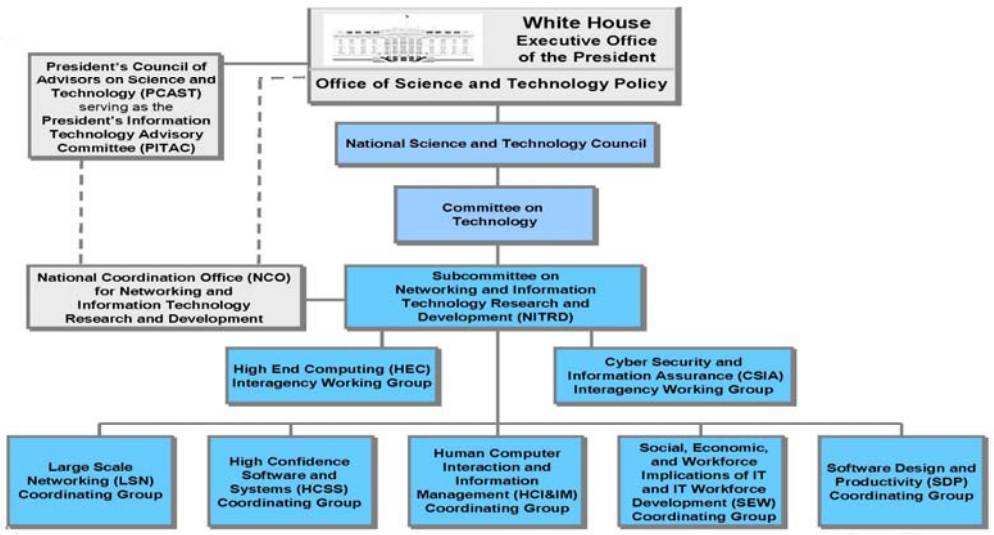
Participating agencies

CIA – Central Intelligence Agency
DHS – Department of Homeland Security
DNI – Office of the Director of National Intelligence
DOE (OE) – Department of Energy Office of Electricity Delivery and Energy Reliability
DOJ – Department of Justice
DOT – Department of Transportation
FAA – Federal Aviation Administration
FBI – Federal Bureau of Investigation
FDA – Food and Drug Administration
GSA – General Services Administration
IARPA – Infrastructure Advanced Research Projects Agency
State – Department of State
Treasury – Department of the Treasury
TSWG – Technical Support Working Group
USGS – U.S. Geological Survey

Program Component Areas, Interagency Working Groups/Coordinating Groups/Teams

High End Computing Infrastructure and Applications (HEC I&A) – HEC IWG
High End Computing Research and Development (HEC R&D) – HEC IWG
Cyber Security and Information Assurance (CSIA) – CSIA IWG
Human-Computer Interaction and Information Management (HCI&IM) – HCI&IM CG
Large Scale Networking (LSN) – LSN CG
LSN Teams:
Joint Engineering Team (JET)
Middleware and Grid Infrastructure Coordination (MAGIC)
High Confidence Software and Systems (HCSS) – HCSS CG
Social, Economic, and Workforce Implications of IT and IT Workforce Development (SEW) – SEW CG
Software Design and Productivity (SDP) – SDP CG

NITRD Program Structure



Appendix 2: PCAST Recommendations (numbered and by chapter)
(from *Leadership Under Challenge: Information Technology R&D in a Competitive World)*

Chapter 2: Networking and Information Technology Education and Training

Recommendation #1 (page 23)
To provide a solid basis for subsequent action, the NITRD Subcommittee should charge the NITRD National Coordination Office to commission one or more fast-track studies on the current state of and future requirements for networking and information technology undergraduate and graduate education.

Recommendation #2 (page 23)
To help meet national needs for personnel with advanced degrees in networking and information technology fields, the Federal government should:

- **#2a** Increase the number of multiyear fellowships for graduate study by American citizens in NIT fields each year, with the target number and fields of such fellowships informed by needs identified in sources such as the NIT education study
- **#2b** Streamline the process for obtaining visas for non-U.S. students admitted to accredited graduate degree programs in NIT subjects
- **#2c** Make it routine for foreign nationals who have obtained advanced degrees in NIT subjects at accredited U.S. universities to be permitted to work and gain citizenship in the United States by easing the visa and Green Card processes for them
- **#2d** Simplify the visa process for international NIT R&D experts who visit the United States on a regular or a frequent basis for professional purposes

Chapter 3: Profile of Federal Networking and Information Technology Research and Development

Recommendation #3 (page 26)
Federal agencies should rebalance their networking and information technology R&D funding portfolios by increasing: (1) support for important networking and information technology problems that require larger-scale, longer-term, multidisciplinary R&D and using existing or new mechanisms to address those problems and (2) emphasis on innovative and therefore higher-risk but potentially higher-payoff explorations.

Recommendation #4 (page 27)
The Director of the Office of Science and Technology Policy should call on senior officials from Federal agencies with large academic networking and information technology R&D budgets to meet with senior officials from the Nation's major research universities to address how better to conduct large-scale, long-term, multidisciplinary academic research in the development and application of networking and information technology important to the Nation.

Recommendation #5 (page 29)
The NITRD agencies should use, to the fullest extent practicable, available authorities and resources to facilitate the transfer of research results into practical application and commercial products.

Chapter 4: Technical Priorities for Networking and Information Technology Research and Development

Recommendation #6 (page 33)
The NITRD Subcommittee should develop and implement a Federal Plan for coordinated multiagency R&D in high-confidence NIT systems connected with the physical world to maximize the effectiveness of Federal investments and help ensure future U.S. competitiveness in these technologies.

Recommendation #7 (page 35)
The NITRD Subcommittee should facilitate efforts by leaders from academia, industry, and government to identify the critical issues in software design and development and help guide NITRD planning on software R&D.

Recommendation #8 (page 37)
The Interagency Working Group on Digital Data, in cooperation with the NITRD Subcommittee, should develop a national strategy and develop and implement an associated plan to assure the long-term preservation, stewardship, and widespread availability of data important to science and technology.

Recommendation #9 (page 38)
A key element of the Federal Plan for Advanced Networking Research and Development should be an R&D agenda for upgrading the Internet. To meet Federal agency needs and support the Nation's critical infrastructures, the Plan should include R&D in mobile networking technologies and ways to increase network security and reliability.

Recommendation #10 (page 40)
The NITRD Subcommittee should develop, implement, and maintain a strategic plan for Federal investments in HEC R&D, infrastructure, applications, and education and training. Based on the strategic plan, the NITRD Subcommittee should involve experts from academia and industry to develop and maintain a HEC R&D roadmap.

Recommendation #11 (page 42)
The Federal NIT R&D agencies should give greater emphasis to fundamental, longer-term CSIA R&D and the infrastructure for that R&D.

Chapter 5: The Networking and Information Technology Research and Development Program

Recommendation #12 (page 50)
The Director of the Office of Science and Technology Policy should take steps to ensure broad and vigorous agency involvement in the NITRD Program, given its critical importance to national security and economic competitiveness.

Recommendation #13 (page 50)
The NITRD Subcommittee should develop, maintain, and implement a cohesive strategic plan for the NITRD Program.

Recommendation #14 (page 51)
The NITRD Subcommittee should conduct periodic assessments of the NITRD PCAs, restructuring the NITRD Program when warranted.

Recommendation #15 (page 51)
The NITRD Interagency Working Groups and Coordinating Groups should develop, maintain, and implement public R&D plans or roadmaps for key technical areas that require long-term interagency coordination and engagement. The plans and roadmaps should be developed under the guidance of the NITRD Subcommittee and be aligned with the NITRD Program's strategic plan.

Recommendation #16 (page 52)
The NITRD Subcommittee, with support from the NITRD NCO, should develop a set of metrics and other indicators of progress for the NITRD Program and use them to assess NITRD Program progress.

Recommendation #17 (page 53)
Under NITRD Subcommittee guidance, the NITRD NCO should develop and implement a plan for supporting the development, maintenance, and implementation of the NITRD strategic plan and R&D plans.

Appendix 3: NITRD Strategic Planning Timeline