U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY

HEARING CHARTER

Networking and Information Technology Research and Development Act of 2009

Wednesday, April 1, 2009
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

1. Purpose

The purpose of this hearing is to receive testimony on the *Networking and Information Technology Research and Development Act of 2009*. The legislation is based on findings and recommendations included in a recent assessment of the program conducted by the President's Council of Advisors on Science and Technology (PCAST) and proposes changes to the research content and planning and implementation mechanisms of the program.

A section-by-section summary of the legislation is attached as an appendix to this memo.

2. Witnesses:

- **Dr. Chris L. Greer,** Director, National Coordination Office for Networking and Information Technology Research and Development (NCO/NITRD)

- **Dr. Peter Lee,** Professor and Head, Computer Science Department, Carnegie Mellon University

- **Mr. Amit Yoran**, Chairman and Chief Executive Officer, NetWitness Corporation

- **Dr. Deborah Estrin**, Director, Center for Embedded Networked Sensing, University of California, Los Angeles

3. Overarching Questions:

- Does the legislation ensure that the NITRD program is positioned to help maintain U.S. leadership in networking and information technology? What are industry's priorities for the NITRD program and are they adequately addressed in the legislation? What are the research community's needs for this program and are they adequately addressed?

- Does the legislation address the key recommendations of the recent PCAST assessment for making the NITRD program more effective and more relevant to the research needs and opportunities in information technology?

- Are there key research gaps or program management concerns not covered in this legislation? Are the mechanisms for industry and academic input into the planning process sufficient?

- Does the legislation effectively implement the PCAST recommendation for support of large-scale, multidisciplinary research and development projects? What are the most appropriate mechanisms to undertake these projects? Are the requirements for these projects sufficient to encourage industry/university partnerships?

4. Background

NITRD Program

The Networking and Information Technology Research and Development (NITRD) program, originally authorized in the High Performance Computing Act of 1991 (P.L. 102-194), is a multi-agency research effort to accelerate progress in the advancement of computing and networking technologies and to support leading edge computational research in a range of science and engineering fields. The 1991 statute established a set of mechanisms and procedures to provide for the interagency planning, coordination, and budgeting of the research and development activities carried out under the program.

The NITRD Subcommittee of the National Science and Technology Council (NSTC) is the working body for interagency planning and coordination and includes representatives from each of the participating NITRD agencies as well as the Office of Management and Budget (OMB). For FY 2009, 13 Federal agencies contributed funding to the NITRD program; however additional agencies that do not contribute funding participate in planning activities. The FY 2009 budget request for the NITRD program was $3.548 billion, an increase of $0.207 billion or approximately 6 percent, over the FY 2008 level of $3.341 billion. A summary of the major research components of the program and funding levels by major component and by agency is available at: http://www.nitrd.gov/pubs/2009supplement/index.aspx

The National Coordination Office (NCO) provides staff support for the NITRD Subcommittee and the program's advisory committee and serves as the public interface for the program.

PCAST Assessment

In August 2007, PCAST completed an assessment of the NITRD program and issued a report entitled, "*Leadership Under Challenge: Information Technology R&D in a Competitive World*" [http://www.nitrd.gov/pcast/reports/PCAST-NIT-FINAL.pdf].

The PCAST report includes several findings and recommendations related to the research content of the program, as well as suggestions for improving the program's planning, prioritization and coordination. The recommendations from the PCAST report include:

- Federal agencies should rebalance their NITRD funding portfolios by increasing support for important problems that require larger-scale, longer-term, multidisciplinary R&D and increasing emphasis on innovative and therefore higher-risk but potentially higher-payoff explorations.

- As new funding becomes available for the NITRD program, disproportionately larger increases should go for:
    - research on NIT systems connected with the physical world (which are also called embedded, engineered, or cyber-physical systems);
    - software R&D;
    - a national strategy and implementation plan to assure the long-term preservation, stewardship, and widespread availability of data important to science and technology; and
    - networking R&D, including upgrading the Internet and R&D in mobile networking technologies.

- The NITRD agencies should:

    - develop, maintain, and implement a strategic plan for the NITRD program;
    - conduct periodic assessments of the major components of the NITRD program and restructure the program when warranted;
    - develop, maintain, and implement public R&D plans or roadmaps for key technical areas that require long-term interagency coordination and engagement; and
    - develop a set of metrics and other indicators of progress for the NITRD program, including an estimate of investments in basic and applied research, and use them to assess NITRD program progress.

- The NITRD National Coordination Office should support the development, maintenance, and implementation of the NITRD strategic plan and R&D plans for key technical areas; and it should be more proactive in communicating with outside groups.

Cyber-Physical Systems

The top recommendation of the PCAST report for new research investments in the NITRD program is in the area of computer-driven systems connected with the physical world – also called embedded, engineered, or cyber-physical systems (CPS). CPS are connected to the physical world through sensors and actuators to perform crucial monitoring and control functions. Such systems would include the air-traffic-control system, the power-grid, water-supply systems, and industrial process control systems. On a more individual level, they are found in automobiles and home health-care devices.

Examples of CPS are already in widespread use but growing demand for new capabilities and applications will require significant technical advances. Such systems can be difficult and costly to design, build, test, and maintain. They often involve the intricate integration of myriad networked software and hardware components, including multiple subsystems. In monitoring and controlling the functioning of complex, fast-acting physical systems (such as medical devices, weapons systems, manufacturing processes, and power-distribution facilities), they must operate reliably in real time under strict constraints on computing, memory, power, speed, weight, and cost. Moreover, most uses of cyber-physical systems are safety-critical: they must continue to function even when under attack or stress.

There is evidence that CPS will be an area of international economic competition. For example, the European Union's Advanced Research and Technology for Embedded Intelligence and Systems (ARTEMIS) program, funded by a public-private investment of 5.4 billion euros (over $7 billion in mid-2007 dollars) between 2007 and 2013, is pursuing R&D to achieve "world leadership in intelligent electronic systems" by 2016.

Recent Amendments to NITRD Program [included in COMPETES Act]

A 1999 assessment of the program found that the sponsored research was shifting too much toward support for near-term, mission focused objectives; that there was a growing gap between the power of high performance computers available to support agency mission requirements and those supporting the general academic research community; and that total federal information technology investment was inadequate. In response to that report, the Committee developed legislation that became part of the COMPETES Act (section 7024(a)) and amends the 1991 Act in two significant ways: requires the advisory committee to conduct periodic evaluations of the funding, management, coordination, implementation, and activities of the program and requires OSTP to develop and maintain a roadmap for developing and deploying very high-performance computing (high-end) systems necessary to ensure that the U.S. research community has sustained access to the most capable computing systems.

5. Witness Questions

All witnesses were asked to give their views on the provisions of the bill, including any recommendations for ways to improve it. The list of overarching questions (item 3 above) was included in the invitation letters of all of the witnesses except Dr. Greer.

Dr. Greer

Dr. Greer was asked to please provide an update (since his last testimony before the Committee in July, 2008) of any significant changes to the NITRD Program and any actions the NITRD agencies have taken or plan to take in response to the recommendations of the 2007 PCAST report. In addition, he was asked to answer the following specific questions:

- The NITRD subcommittee of the National Science and Technology Council is in the midst of developing a strategic plan. Please describe those efforts and how, if at all, they address the requirements for strategic planning as described in the legislation. In particular, what are the current mechanisms for industry and academic input into the planning process, and how is the NITRD subcommittee addressing the need for the NITRD program to place more emphasis on higher-risk, long-term projects? What is the timeline for completing the strategic plan?

- Please describe the current responsibilities and activities of the National Coordination Office (NCO). How do those responsibilities and activities compare to the responsibilities and activities required for the NCO in the legislation? In particular, how has the NCO responded to the 2007 PCAST recommendation for improved communication with and outreach to outside groups?

SUMMARY

DRAFT NETWORKING AND INFORMATION TECHNOLOGY RESEARCH AND DEVELOPMENT ACT OF 2009

SECTION 1. SHORT TITLE.

"Networking and Information Technology Research and Development Act of 2009".

SEC. 2. PROGRAM PLANNING AND COORDINATION.

PERIODIC REVIEWS. – Responds to the PCAST report recommendation to require the NITRD agencies to periodically assess the NITRD program contents and funding levels and make changes as appropriate. Also requires that the program content include activities authorized under section 3.

STRATEGIC PLAN. –

- Responds to the PCAST report recommendation to require the NITRD agencies to develop and periodically update (3 year intervals) a strategic plan for the program. The characteristics and content of the strategic plan are described.

- Adds to the responsibilities of the OSTP Director oversight responsibility to see that the strategic plan is developed and executed effectively.

- Specifies that the annual report now required for the NITRD program explicitly describe how the program activities planned and underway relate to the objectives specified in the strategic plan.

REPORT. - Specifies that the annual report now required for the NITRD program include a description of research areas supported in accordance with section 3, including the same budget information as is required for the Program Component Areas

SEC. 3. LARGE-SCALE RESEARCH IN AREAS OF NATIONAL IMPORTANCE.

Generally addresses the PCAST recommendation to increase the NITRD investment in larger scale, high-risk / high-payoff, and multidisciplinary research. These competitive awards must be made through collaborations between at least 2 agencies.

Characteristics of the projects supported include:

- collaborations among researchers in academic institutions and industry, and may involve nonprofit research institutions and federal laboratories;

- when possible, leveraging of federal investments through collaboration with related State initiatives; and
- plans for fostering the transfer of research discoveries and the results of technology demonstration activities to industry for commercial development.

Authorizes support of activities under this section through interdisciplinary research centers that are organized to investigate basic research questions and carry out technology demonstration activities

SEC. 4. CYBER-PHYSICAL SYSTEMS.

The first PCAST recommendation regarding NITRD program content was for developing and implementing a plan for research on cyber-physical systems.

Directs that cyber-physical systems be one of the areas supported in accordance with SEC. 3. Specifies R&D objectives and types of activities authorized based on the PCAST recommendations and the results of the community workshops (CPS Steering Group).

Requires the NCO Director to convene an industry/university task force to explore mechanisms for carrying out collaborative research and development activities for cyber-physical systems through a consortium with participants from academic institutions and industry. The goal of the task force is to develop recommendations for the structure and mode of operation of a joint industry/university research consortium and to report the recommendations to Congress. This provision is based on the recommendations of the Boeing witness (Winter) at July 31, 2008 hearing.

SEC. 5. NATIONAL COORDINATION OFFICE.

This section formally establishes the National Coordination Office; delineates the office's responsibilities; mandates annual operating budgets; specifies the source of funding for the office, which mirrors the current practice; and stresses the role of the office in developing the strategic plan and in public outreach and communication with outside communities of interest, following the PCAST recommendations.