107TH CONGRESS
2D SESSION

S. 2182

To authorize funding for computer and network security research and development and research fellowship programs, and for other purposes.

IN THE SENATE OF THE UNITED STATES

APRIL 17, 2002

Mr. WYDEN introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

---

A BILL

To authorize funding for computer and network security research and development and research fellowship programs, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ''Cyber Security Research and Development Act''.

SEC. 2. FINDINGS.

The Congress finds the following:

(1) Revolutionary advancements in computing and communications technology have interconnected government, commercial, scientific, and educational

infrastructures—including critical infrastructures for electric power, natural gas and petroleum production and distribution, telecommunications, transportation, water supply, banking and finance, and emergency and government services—in a vast, interdependent physical and electronic network.

(2) Exponential increases in interconnectivity have facilitated enhanced communications, economic growth, and the delivery of services critical to the public welfare, but have also increased the consequences of temporary or prolonged failure.

(3) A Department of Defense Joint Task Force concluded after a 1997 United States information warfare exercise that the results ''clearly demonstrated our lack of preparation for a coordinated cyber and physical attack on our critical military and civilian infrastructure''.

(4) Computer security technology and systems implementation lack—

(A) sufficient long term research funding;

(B) adequate coordination across Federal and State government agencies and among government, academia, and industry; and

(C) sufficient numbers of outstanding researchers in the field.

(5) Accordingly, Federal investment in computer and network security research and development must be significantly increased to—

(A) improve vulnerability assessment and technological and systems solutions;

(B) expand and improve the pool of information security professionals, including researchers, in the United States workforce; and

(C) better coordinate information sharing and collaboration among industry, government, and academic research projects.

SEC. 3. DEFINITIONS.

For purposes of this Act—

(1) the term ''Director'' means the Director of the National Science Foundation; and

(2) the term ''institution of higher education'' has the meaning given that term in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001).

SEC. 4. NATIONAL SCIENCE FOUNDATION RESEARCH.

(a) COMPUTER AND NETWORK SECURITY RESEARCH GRANTS.—

(1) IN GENERAL.—The Director shall award grants for basic research on innovative approaches to the structure of computer and network hardware

and software that are aimed at enhancing computer security. Research areas may include—

(A) authentication and cryptography;

(B) computer forensics and intrusion detection;

(C) reliability of computer and network applications, middleware, operating systems, and communications infrastructure;

(D) privacy and confidentiality;

(E) firewall technology;

(F) emerging threats, including malicious such as viruses and worms;

(G) vulnerability assessments;

(H) operations and control systems management; and

(I) management of interoperable digital certificates or digital watermarking.

(2) MERIT REVIEW; COMPETITION.—Grants shall be awarded under this section on a merit-reviewed competitive basis.

(3) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the National Science Foundation to carry out this subsection—

(A) $35,000,000 for fiscal year 2003;

(B) $40,000,000 for fiscal year 2004;

(C) $46,000,000 for fiscal year 2005;

(D) $52,000,000 for fiscal year 2006; and

(E) $60,000,000 for fiscal year 2007.

(b) COMPUTER AND NETWORK SECURITY RESEARCH CENTERS.—

(1) IN GENERAL.—The Director shall award multiyear grants, subject to the availability of appropriations, to institutions of higher education (or consortia thereof) to establish multidisciplinary Centers for Computer and Network Security Research. Institutions of higher education (or consortia thereof) receiving such grants may partner with one or more government laboratories or for-profit institutions.

(2) MERIT REVIEW; COMPETITION.—Grants shall be awarded under this subsection on a merit-reviewed competitive basis.

(3) PURPOSE.—The purpose of the Centers shall be to generate innovative approaches to computer and network security by conducting cutting-edge, multidisciplinary research in computer and network security, including the research areas described in subsection (a)(1).

(4) APPLICATIONS.—An institution of higher education (or a consortium of such institutions)

seeking funding under this subsection shall submit an application to the Director at such time, in such manner, and containing such information as the Director may require. The application shall include, at a minimum, a description of—

(A) the research projects that will be undertaken by the Center and the contributions of each of the participating entities;

(B) how the Center will promote active collaboration among scientists and engineers from different disciplines, such as computer scientists, engineers, mathematicians, and social science researchers;

(C) how the Center will contribute to increasing the number of computer and network security researchers and other professionals; and

(D) how the center will disseminate research results quickly and widely to improve cybersecurity in information technology networks, products, and services.

(5) CRITERIA.—In evaluating the applications submitted under paragraph (4), the Director shall consider, at a minimum—

(A) the ability of the applicant to generate innovative approaches to computer and network security and effectively carry out the research program;

(B) the experience of the applicant in conducting research on computer and network security and the capacity of the applicant to foster new multidisciplinary collaborations;

(C) the capacity of the applicant to attract and provide adequate support for undergraduate and graduate students and postdoctoral fellows to pursue computer and network security research; and

(D) the extent to which the applicant will partner with government laboratories or for-profit entities, and the role the government laboratories or for-profit entities will play in the research undertaken by the Center.

(6) ANNUAL MEETING.—The Director shall convene an annual meeting of the Centers in order to foster collaboration and communication between Center participants.

(7) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated for the Na-

tional Science Foundation to carry out this subsection—

(A) $12,000,000 for fiscal year 2003;

(B) $24,000,000 for fiscal year 2004;

(C) $36,000,000 for fiscal year 2005;

(D) $36,000,000 for fiscal year 2006; and

(E) $36,000,000 for fiscal year 2007.

SEC. 5. NATIONAL SCIENCE FOUNDATION COMPUTER AND NETWORK SECURITY PROGRAMS.

(a) COMPUTER AND NETWORK SECURITY CAPACITY BUILDING GRANTS.—

(1) IN GENERAL.—The Director shall establish a program to award grants to institutions of higher education (or consortia thereof) to establish or improve undergraduate and master's degree programs in computer and network security, to increase the number of students who pursue undergraduate or master's degrees in fields related to computer and network security, and to provide students with experience in government or industry related to their computer and network security studies.

(2) MERIT REVIEW.—Grants shall be awarded under this subsection on a merit-reviewed competitive basis.

(3) USE OF FUNDS.—Grants awarded under this subsection shall be used for activities that enhance the ability of an institution of higher education (or consortium thereof) to provide high-quality undergraduate and master's degree programs in computer and network security and to recruit and retain increased numbers of students to such programs. Activities may include—

(A) revising curriculum to better prepare undergraduate and master's degree students for careers in computer and network security;

(B) establishing degree and certificate programs in computer and network security;

(C) creating opportunities for undergraduate students to participate in computer and network security research projects;

(D) acquiring equipment necessary for student instruction in computer and network security, including the installation of testbed networks for student use;

(E) providing opportunities for faculty to work with local or Federal Government agencies, private industry, or other academic institutions to develop new expertise or to formulate

new research directions in computer and network security;

(F) establishing collaborations with other academic institutions or departments that seek to establish, expand, or enhance programs in computer and network security;

(G) establishing student internships in computer and network security at government agencies or in private industry;

(H) establishing or enhancing bridge programs in computer and network security between community colleges and universities; and

(I) any other activities the Director determines will accomplish the goals of this subsection.

(4) SELECTION PROCESS.—

(A) APPLICATION.—An institution of higher education (or a consortium thereof) seeking funding under this subsection shall submit an application to the Director at such time, in such manner, and containing such information as the Director may require. The application shall include, at a minimum—

(i) a description of the applicant's computer and network security research

and instructional capacity, and in the case of an application from a consortium of institutions of higher education, a description of the role that each member will play in implementing the proposal;

(ii) a comprehensive plan by which the institution or consortium will build instructional capacity in computer and information security;

(iii) a description of relevant collaborations with government agencies or private industry that inform the instructional program in computer and network security;

(iv) a survey of the applicant's historic student enrollment and placement data in fields related to computer and network security and a study of potential enrollment and placement for students enrolled in the proposed computer and network security program; and

(v) a plan to evaluate the success of the proposed computer and network security program, including post-graduation assessment of graduate school and job place-

ment and retention rates as well as the relevance of the instructional program to graduate study and to the workplace.

(B) AWARDS.—(i) The Director shall ensure, to the extent practicable, that grants are awarded under this subsection in a wide range of geographic areas and categories of institutions of higher education.

(ii) The Director shall award grants under this subsection for a period not to exceed 5 years.

(5) ASSESSMENT REQUIRED.—The Director shall evaluate the program established under this subsection no later than 6 years after the establishment of the program. At a minimum, the Director shall evaluate the extent to which the grants achieved their objectives of increasing the quality and quantity of students pursuing undergraduate or master's degrees in computer and network security.

(6) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the National Science Foundation to carry out this subsection—

(A) $15,000,000 for fiscal year 2003;

(B) $20,000,000 for fiscal year 2004;

(C) $20,000,000 for fiscal year 2005;

(D) $20,000,000 for fiscal year 2006; and

(E) $20,000,000 for fiscal year 2007.

(b) SCIENTIFIC AND ADVANCED TECHNOLOGY ACT OF 1992.—

(1) GRANTS.—The Director shall provide grants under the Scientific and Advanced Technology Act of 1992 for the purposes of section 3(a) and (b) of that Act, except that the activities supported pursuant to this subsection shall be limited to improving education in fields related to computer and network security.

(2) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the National Science Foundation to carry out this subsection—

(A) $1,000,000 for fiscal year 2003;

(B) $1,250,000 for fiscal year 2004;

(C) $1,250,000 for fiscal year 2005;

(D) $1,250,000 for fiscal year 2006; and

(E) $1,250,000 for fiscal year 2007.

(c) GRADUATE TRAINEESHIPS IN COMPUTER AND NETWORK SECURITY RESEARCH.—

(1) IN GENERAL.—The Director shall establish a program to award grants to institutions of higher

education to establish traineeship programs for graduate students who pursue computer and network security research leading to a doctorate degree by providing funding and other assistance, and by providing graduate students with research experience in government or industry related to the students' computer and network security studies.

(2) MERIT REVIEW.—Grants shall be provided under this subsection on a merit-reviewed competitive basis.

(3) USE OF FUNDS.—An institution of higher education shall use grant funds for the purposes of—

(A) providing fellowships to students who are citizens, nationals, or lawfully admitted permanent resident aliens of the United States and are pursuing research in computer or network security leading to a doctorate degree;

(B) paying tuition and fees for students receiving fellowships under subparagraph (A);

(C) establishing scientific internship programs for students receiving fellowships under subparagraph (A) in computer and network security at for-profit institutions or government laboratories; and

(D) other costs associated with the administration of the program.

(4) FELLOWSHIP AMOUNT.—Fellowships provided under paragraph (3)(A) shall be in the amount of $25,000 per year, or the level of the National Science Foundation Graduate Research Fellowships, whichever is greater, for up to 3 years.

(5) SELECTION PROCESS.—An institution of higher education seeking funding under this subsection shall submit an application to the Director at such time, in such manner, and containing such information as the Director may require. The application shall include, at a minimum, a description of—

(A) the instructional program and research opportunities in computer and network security available to graduate students at the applicant's institution; and

(B) the internship program to be established, including the opportunities that will be made available to students for internships at for-profit institutions and government laboratories.

(6) REVIEW OF APPLICATIONS.—In evaluating the applications submitted under paragraph (5), the Director shall consider—

(A) the ability of the applicant to effectively carry out the proposed program;

(B) the quality of the applicant's existing research and education programs;

(C) the likelihood that the program will recruit increased numbers of students to pursue and earn doctorate degrees in computer and network security;

(D) the nature and quality of the internship program established through collaborations with government laboratories and for-profit institutions;

(E) the integration of internship opportunities into graduate students' research; and

(F) the relevance of the proposed program to current and future computer and network security needs.

(7) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the National Science Foundation to carry out this subsection—

(A) $10,000,000 for fiscal year 2003;

(B) $20,000,000 for fiscal year 2004;

(C) $20,000,000 for fiscal year 2005;

(D) $20,000,000 for fiscal year 2006; and

(E) $20,000,000 for fiscal year 2007.

(d) GRADUATE RESEARCH FELLOWSHIPS PROGRAM SUPPORT.—Computer and network security shall be included among the fields of specialization supported by the National Science Foundation's Graduate Research Fellowships program under section 10 of the National Science Foundation Act of 1950 (42 U.S.C. 1869).

SEC. 6. CONSULTATION.

In carrying out sections 4 and 5, the Director shall consult with other Federal agencies.

SEC. 7. FOSTERING RESEARCH AND EDUCATION IN COMPUTER AND NETWORK SECURITY.

Section 3(a) of the National Science Foundation Act of 1950 (42 U.S.C. 1862(a)) is amended—

(1) by striking ''and'' at the end of paragraph (6);

(2) by striking the period at the end of paragraph (7) and inserting ''; and''; and

(3) by adding at the end the following new paragraph:

''(8) to take a leading role in fostering and supporting research and education activities to improve the security of networked information systems.''.

SEC. 8. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY RESEARCH PROGRAM.

The National Institute of Standards and Technology Act is amended—

(1) by moving section 22 to the end of the Act and redesignating it as section 32;

(2) by inserting after section 21 the following new section:

''RESEARCH PROGRAM ON SECURITY OF COMPUTER SYSTEMS

''SEC. 22. (a) ESTABLISHMENT.—The Director shall establish a program of assistance to institutions of higher education that enter into partnerships with for-profit entities to support research to improve the security of computer systems. The partnerships may also include government laboratories. The program shall—

''(1) include multidisciplinary, long-term, high-risk research;

''(2) include research directed toward addressing needs identified through the activities of the Computer System Security and Privacy Advisory Board under section 20(f); and

''(3) promote the development of a robust research community working at the leading edge of knowledge in subject areas relevant to the security of computer systems by providing support for grad-

uate students, post-doctoral researchers, and senior researchers.

''(b) FELLOWSHIPS.—(1) The Director is authorized to establish a program to award post-doctoral research fellowships to individuals who are citizens, nationals, or lawfully admitted permanent resident aliens of the United States and are seeking research positions at institutions, including the Institute, engaged in research activities related to the security of computer systems, including the research areas described in section 4(a)(1) of the Cyber Security Research and Development Act.

''(2) The Director is authorized to establish a program to award senior research fellowships to individuals seeking research positions at institutions, including the Institute, engaged in research activities related to the security of computer systems, including the research areas described in section 4(a)(1) of the Cyber Security Research and Development Act. Senior research fellowships shall be made available for established researchers at institutions of higher education who seek to change research fields and pursue studies related to the security of computer systems.

''(3)(A) To be eligible for an award under this subsection, an individual shall submit an application to the Director at such time, in such manner, and containing such information as the Director may require.

''(B) Under this subsection, the Director is authorized to provide stipends for post-doctoral research fellowships at the level of the Institute's Post Doctoral Research Fellowship Program and senior research fellowships at levels consistent with support for a faculty member in a sabbatical position.

''(c) AWARDS; APPLICATIONS.—The Director is authorized to award grants or cooperative agreements to institutions of higher education to carry out the program established under subsection (a). To be eligible for an award under this section, an institution of higher education shall submit an application to the Director at such time, in such manner, and containing such information as the Director may require. The application shall include, at a minimum, a description of—

''(1) the number of graduate students anticipated to participate in the research project and the level of support to be provided to each;

''(2) the number of post-doctoral research positions included under the research project and the level of support to be provided to each;

''(3) the number of individuals, if any, intending to change research fields and pursue studies related to the security of computer systems to be in-

cluded under the research project and the level of support to be provided to each; and

''(4) how the for-profit entities and any other partners will participate in developing and carrying out the research and education agenda of the partnership.

''(d) PROGRAM OPERATION.—(1) The program established under subsection (a) shall be managed by individuals who shall have both expertise in research related to the security of computer systems and knowledge of the vulnerabilities of existing computer systems. The Director shall designate such individuals as program managers.

''(2) Program managers designated under paragraph (1) may be new or existing employees of the Institute or individuals on assignment at the Institute under the Intergovernmental Personnel Act of 1970.

''(3) Program managers designated under paragraph (1) shall be responsible for—

''(A) establishing and publicizing the broad research goals for the program;

''(B) soliciting applications for specific research projects to address the goals developed under subparagraph (A);

''(C) selecting research projects for support under the program from among applications submitted to the Institute, following consideration of—

''(i) the novelty and scientific and technical merit of the proposed projects;

''(ii) the demonstrated capabilities of the individual or individuals submitting the applications to successfully carry out the proposed research;

''(iii) the impact the proposed projects will have on increasing the number of computer security researchers;

''(iv) the nature of the participation by for-profit entities and the extent to which the proposed projects address the concerns of industry; and

''(v) other criteria determined by the Director, based on information specified for inclusion in applications under subsection (c); and

''(D) monitoring the progress of research projects supported under the program.

''(e) REVIEW OF PROGRAM.—(1) The Director shall periodically review the portfolio of research awards monitored by each program manager designated in accordance with subsection (d). In conducting those reviews, the Di-

rector shall seek the advice of the Computer System Security and Privacy Advisory Board, established under section 21, on the appropriateness of the research goals and on the quality and utility of research projects managed by program managers in accordance with subsection (d).

''(2) The Director shall also contract with the National Research Council for a comprehensive review of the program established under subsection (a) during the 5th year of the program. Such review shall include an assessment of the scientific quality of the research conducted, the relevance of the research results obtained to the goals of the program established under subsection (d)(3)(A), and the progress of the program in promoting the development of a substantial academic research community working at the leading edge of knowledge in the field. The Director shall submit to Congress a report on the results of the review under this paragraph no later than six years after the initiation of the program.

''(f) DEFINITIONS.—For purposes of this section—

''(1) the term 'computer system' has the meaning given that term in section 20(d)(1); and

''(2) the term 'institution of higher education' has the meaning given that term in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001).''; and

(3) in section 20(d)(1)(B)(i) (15 U.S.C. 278g–3(d)(1)(B)(i)), by inserting ''and computer networks'' after ''computers''.

SEC. 9. COMPUTER SECURITY REVIEW, PUBLIC MEETINGS, AND INFORMATION.

Section 20 of the National Institute of Standards and Technology Act (15 U.S.C. 278g–3) is amended by adding at the end the following new subsection:

''(f) There are authorized to be appropriated to the Secretary $1,060,000 for fiscal year 2003 and $1,090,000 for fiscal year 2004 to enable the Computer System Security and Privacy Advisory Board, established by section 21, to identify emerging issues, including research needs, related to computer security, privacy, and cryptography and, as appropriate, to convene public meetings on those subjects, receive presentations, and publish reports, digests, and summaries for public distribution on those subjects.''.

SEC. 10. INTRAMUTAL SECURITY RESEARCH.

Section 20 of the National Institute of Standards and Technology Act (15 U.S.C. 278g–3) is further amended—

(1) by redesignating subsection (d) as subsection (e); and

(2) by inserting after subsection (c) the following new subsection:

''(d) As part of the research activities conducted in accordance with subsection (b)(4), the Institute shall—

''(1) conduct a research program to address emerging technologies associated with assembling a networked computer system from components while ensuring it maintains desired security properties;

''(2) carry out research associated with improving the security of real-time computing and communications systems for use in process control; and

''(3) carry out multidisciplinary, long-term, high-risk research on ways to improve the security of computer systems.''.

SEC. 11. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the Secretary of Commerce for the National Institute of Standards and Technology—

(1) for activities under section 22 of the National Institute of Standards and Technology Act, as added by section 8 of this Act—

(A) $25,000,000 for fiscal year 2003;

(B) $40,000,000 for fiscal year 2004;

(C) $55,000,000 for fiscal year 2005;

(D) $70,000,000 for fiscal year 2006;

(E) $85,000,000 for fiscal year 2007; and

(F) such sums as may be necessary for fiscal years 2008 through 2012; and

(2) for activities under section 20(d) of the National Institute of Standards and Technology Act, as added by section 10 of this Act—

(A) $6,000,000 for fiscal year 2003;

(B) $6,200,000 for fiscal year 2004;

(C) $6,400,000 for fiscal year 2005;

(D) $6,600,000 for fiscal year 2006; and

(E) $6,800,000 for fiscal year 2007.

SEC. 12. NATIONAL ACADEMY OF SCIENCES STUDY ON COMPUTER AND NETWORK SECURITY IN CRITICAL INFRASTRUCTURES.

(a) STUDY.—Not later than 3 months after the date of the enactment of this Act, the Director of the National Institute of Standards and Technology shall enter into an arrangement with the National Research Council of the National Academy of Sciences to conduct a study of the vulnerabilities of the Nation's network infrastructure and make recommendations for appropriate improvements. The National Research Council shall—

(1) review existing studies and associated data on the architectural, hardware, and software vulnerabilities and interdependencies in United States critical infrastructure networks;

(2) identify and assess gaps in technical capability for robust critical infrastructure network security, and make recommendations for research priorities and resource requirements; and

(3) review any and all other essential elements of computer and network security, including security of industrial process controls, to be determined in the conduct of the study.

(b) REPORT.—The Director of the National Institute of Standards and Technology shall transmit a report containing the results of the study and recommendations required by subsection (a) to the Congress not later than 21 months after the date of enactment of this Act.

(c) SECURITY.—The Director of the National Institute of Standards and Technology shall ensure that no information that is classified is included in any publicly released version of the report required by this section.

(d) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary of Commerce for the National Institute of Standards and Technology for the purposes of carrying out this section, $700,000.

○