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S. 2182

[Report No. 107-239]

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 (for himself, Mr. ALLEN, and Mrs. CLINTON) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

AUGUST 1, 2002

Reported by Mr. HOLLINGS, with an amendment

[Strike out all after the enacting clause and insert the part printed in *italic*]

A BILL

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

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 ~~This Act may be cited as the “Cyber Security Re-~~
5 ~~search and Development Act”.~~

1 **SEC. 2. FINDINGS.**

2 The Congress finds the following:

3 (1) Revolutionary advancements in computing
4 and communications technology have interconnected
5 government, commercial, scientific, and educational
6 infrastructures—including critical infrastructures for
7 electric power, natural gas and petroleum production
8 and distribution, telecommunications, transportation,
9 water supply, banking and finance, and emergency
10 and government services—in a vast, interdependent
11 physical and electronic network.

12 (2) Exponential increases in interconnectivity
13 have facilitated enhanced communications, economic
14 growth, and the delivery of services critical to the
15 public welfare, but have also increased the con-
16 sequences of temporary or prolonged failure.

17 (3) A Department of Defense Joint Task Force
18 concluded after a 1997 United States information
19 warfare exercise that the results “clearly dem-
20 onstrated our lack of preparation for a coordinated
21 cyber and physical attack on our critical military
22 and civilian infrastructure”.

23 (4) Computer security technology and systems
24 implementation lack—

25 (A) sufficient long term research funding;

1 ~~(B) adequate coordination across Federal~~
 2 ~~and State government agencies and among gov-~~
 3 ~~ernment, academia, and industry; and~~

4 ~~(C) sufficient numbers of outstanding re-~~
 5 ~~searchers in the field.~~

6 ~~(5) Accordingly, Federal investment in com-~~
 7 ~~puter and network security research and develop-~~
 8 ~~ment must be significantly increased to—~~

9 ~~(A) improve vulnerability assessment and~~
 10 ~~technological and systems solutions;~~

11 ~~(B) expand and improve the pool of infor-~~
 12 ~~mation security professionals, including re-~~
 13 ~~searchers, in the United States workforce; and~~

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

17 **SEC. 3. DEFINITIONS.**

18 For purposes of this Act—

19 ~~(1) the term “Director” means the Director of~~
 20 ~~the National Science Foundation; and~~

21 ~~(2) the term “institution of higher education”~~
 22 ~~has the meaning given that term in section 101 of~~
 23 ~~the Higher Education Act of 1965 (20 U.S.C.~~
 24 ~~1001).~~

1 **SEC. 4. NATIONAL SCIENCE FOUNDATION RESEARCH.**

2 (a) **COMPUTER AND NETWORK SECURITY RESEARCH**
3 **GRANTS.—**

4 (1) **IN GENERAL.—**The Director shall award
5 grants for basic research on innovative approaches
6 to the structure of computer and network hardware
7 and software that are aimed at enhancing computer
8 security. Research areas may include—

9 (A) authentication and cryptography;

10 (B) computer forensics and intrusion de-
11 tection;

12 (C) reliability of computer and network ap-
13 plications, middleware, operating systems, and
14 communications infrastructure;

15 (D) privacy and confidentiality;

16 (E) firewall technology;

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

19 (G) vulnerability assessments;

20 (H) operations and control systems man-
21 agement; and

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

24 (2) **MERIT REVIEW; COMPETITION.—**Grants
25 shall be awarded under this section on a merit-re-
26 viewed competitive basis.

1 (3) AUTHORIZATION OF APPROPRIATIONS.—

2 There are authorized to be appropriated to the Na-
3 tional Science Foundation to carry out this
4 subsection—

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

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

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

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

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

10 (b) COMPUTER AND NETWORK SECURITY RESEARCH
11 CENTERS.—

12 (1) IN GENERAL.—The Director shall award
13 multiyear grants, subject to the availability of appro-
14 priations, to institutions of higher education (or con-
15 sortia thereof) to establish multidisciplinary Centers
16 for Computer and Network Security Research. Insti-
17 tutions of higher education (or consortia thereof) re-
18 ceiving such grants may partner with one or more
19 government laboratories or for-profit institutions.

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

23 (3) PURPOSE.—The purpose of the Centers
24 shall be to generate innovative approaches to com-
25 puter and network security by conducting cutting-

1 edge, multidisciplinary research in computer and
2 network security, including the research areas de-
3 scribed in subsection (a)(1).

4 (4) APPLICATIONS.—An institution of higher
5 education (or a consortium of such institutions)
6 seeking funding under this subsection shall submit
7 an application to the Director at such time, in such
8 manner, and containing such information as the Di-
9 rector may require. The application shall include, at
10 a minimum, a description of—

11 (A) the research projects that will be un-
12 dertaken by the Center and the contributions of
13 each of the participating entities;

14 (B) how the Center will promote active col-
15 laboration among scientists and engineers from
16 different disciplines, such as computer sci-
17 entists, engineers, mathematicians, and social
18 science researchers;

19 (C) how the Center will contribute to in-
20 creasing the number of computer and network
21 security researchers and other professionals;
22 and

23 (D) how the center will disseminate re-
24 search results quickly and widely to improve

1 cybersecurity in information technology net-
2 works, products, and services.

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

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

10 ~~(B)~~ the experience of the applicant in con-
11 ducting research on computer and network se-
12 curity and the capacity of the applicant to fos-
13 ter new multidisciplinary collaborations;

14 ~~(C)~~ the capacity of the applicant to attract
15 and provide adequate support for under-
16 graduate and graduate students and
17 postdoctoral fellows to pursue computer and
18 network security research; and

19 ~~(D)~~ the extent to which the applicant will
20 partner with government laboratories or for-
21 profit entities; and the role the government lab-
22 oratories or for-profit entities will play in the
23 research undertaken by the Center.

24 ~~(6) ANNUAL MEETING.—~~The Director shall
25 convene an annual meeting of the Centers in order

1 to foster collaboration and communication between
 2 Center participants.

3 (7) AUTHORIZATION OF APPROPRIATIONS.—

4 There are authorized to be appropriated for the Na-
 5 tional Science Foundation to carry out this
 6 subsection—

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

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

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

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

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

12 **SEC. 5. NATIONAL SCIENCE FOUNDATION COMPUTER AND**
 13 **NETWORK SECURITY PROGRAMS.**

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

16 (1) IN GENERAL.—The Director shall establish
 17 a program to award grants to institutions of higher
 18 education (or consortia thereof) to establish or im-
 19 prove undergraduate and master's degree programs
 20 in computer and network security, to increase the
 21 number of students who pursue undergraduate or
 22 master's degrees in fields related to computer and
 23 network security, and to provide students with expe-
 24 rience in government or industry related to their
 25 computer and network security studies.

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

4 (3) USE OF FUNDS.—Grants awarded under
5 this subsection shall be used for activities that en-
6 hance the ability of an institution of higher edu-
7 cation (or consortium thereof) to provide high-qual-
8 ity undergraduate and master’s degree programs in
9 computer and network security and to recruit and
10 retain increased numbers of students to such pro-
11 grams. Activities may include—

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

15 (B) establishing degree and certificate pro-
16 grams in computer and network security;

17 (C) creating opportunities for under-
18 graduate students to participate in computer
19 and network security research projects;

20 (D) acquiring equipment necessary for stu-
21 dent instruction in computer and network secu-
22 rity, including the installation of testbed net-
23 works for student use;

24 (E) providing opportunities for faculty to
25 work with local or Federal Government agen-

1 cies, private industry, or other academic institu-
2 tions to develop new expertise or to formulate
3 new research directions in computer and net-
4 work security;

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

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

12 (H) establishing or enhancing bridge pro-
13 grams in computer and network security be-
14 tween community colleges and universities; and

15 (I) any other activities the Director deter-
16 mines will accomplish the goals of this sub-
17 section.

18 (4) SELECTION PROCESS.—

19 (A) APPLICATION.—An institution of high-
20 er education (or a consortium thereof) seeking
21 funding under this subsection shall submit an
22 application to the Director at such time, in such
23 manner, and containing such information as the
24 Director may require. The application shall in-
25 clude, at a minimum—

1 (i) a description of the applicant's
2 computer and network security research
3 and instructional capacity; and in the case
4 of an application from a consortium of in-
5 stitutions of higher education, a descrip-
6 tion of the role that each member will play
7 in implementing the proposal;

8 (ii) a comprehensive plan by which the
9 institution or consortium will build instruc-
10 tional capacity in computer and informa-
11 tion security;

12 (iii) a description of relevant collabo-
13 rations with government agencies or pri-
14 vate industry that inform the instructional
15 program in computer and network secu-
16 rity;

17 (iv) a survey of the applicant's his-
18 toric student enrollment and placement
19 data in fields related to computer and net-
20 work security and a study of potential en-
21 rollment and placement for students en-
22 rolled in the proposed computer and net-
23 work security program; and

24 (v) a plan to evaluate the success of
25 the proposed computer and network secu-

1 rity program, including post-graduation as-
2 sessment of graduate school and job place-
3 ment and retention rates as well as the rel-
4 evance of the instructional program to
5 graduate study and to the workplace.

6 (B) AWARDS.—(i) The Director shall en-
7 sure, to the extent practicable, that grants are
8 awarded under this subsection in a wide range
9 of geographic areas and categories of institu-
10 tions of higher education.

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

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

22 (6) AUTHORIZATION OF APPROPRIATIONS.—
23 There are authorized to be appropriated to the Na-
24 tional Science Foundation to carry out this
25 subsection—

- 1 (A) \$15,000,000 for fiscal year 2003;
 2 (B) \$20,000,000 for fiscal year 2004;
 3 (C) \$20,000,000 for fiscal year 2005;
 4 (D) \$20,000,000 for fiscal year 2006; and
 5 (E) \$20,000,000 for fiscal year 2007.

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

8 (1) GRANTS.—The Director shall provide
 9 grants under the Scientific and Advanced Tech-
 10 nology Act of 1992 for the purposes of section 3(a)
 11 and (b) of that Act, except that the activities sup-
 12 ported pursuant to this subsection shall be limited to
 13 improving education in fields related to computer
 14 and network security.

15 (2) AUTHORIZATION OF APPROPRIATIONS.—
 16 There are authorized to be appropriated to the Na-
 17 tional Science Foundation to carry out this
 18 subsection—

- 19 (A) \$1,000,000 for fiscal year 2003;
 20 (B) \$1,250,000 for fiscal year 2004;
 21 (C) \$1,250,000 for fiscal year 2005;
 22 (D) \$1,250,000 for fiscal year 2006; and
 23 (E) \$1,250,000 for fiscal year 2007.

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

1 (1) IN GENERAL.—The Director shall establish
2 a program to award grants to institutions of higher
3 education to establish traineeship programs for
4 graduate students who pursue computer and net-
5 work security research leading to a doctorate degree
6 by providing funding and other assistance; and by
7 providing graduate students with research experience
8 in government or industry related to the students'
9 computer and network security studies.

10 (2) MERIT REVIEW.—Grants shall be provided
11 under this subsection on a merit-reviewed competi-
12 tive basis.

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

16 (A) providing fellowships to students who
17 are citizens, nationals, or lawfully admitted per-
18 manent resident aliens of the United States and
19 are pursuing research in computer or network
20 security leading to a doctorate degree;

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

23 (C) establishing scientific internship pro-
24 grams for students receiving fellowships under
25 subparagraph (A) in computer and network se-

1 curity at for-profit institutions or government
2 laboratories; and

3 ~~(D)~~ other costs associated with the admin-
4 istration of the program.

5 (4) FELLOWSHIP AMOUNT.—Fellowships pro-
6 vided under paragraph ~~(3)~~(A) shall be in the amount
7 of \$25,000 per year, or the level of the National
8 Science Foundation Graduate Research Fellowships,
9 whichever is greater, for up to ~~3~~ years.

10 (5) SELECTION PROCESS.—An institution of
11 higher education seeking funding under this sub-
12 section shall submit an application to the Director at
13 such time, in such manner, and containing such in-
14 formation as the Director may require. The applica-
15 tion shall include, at a minimum, a description of—

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

20 (B) the internship program to be estab-
21 lished, including the opportunities that will be
22 made available to students for internships at
23 for-profit institutions and government labora-
24 tories.

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

4 (A) the ability of the applicant to effec-
5 tively carry out the proposed program;

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

8 (C) the likelihood that the program will re-
9 cruit increased numbers of students to pursue
10 and earn doctorate degrees in computer and
11 network security;

12 (D) the nature and quality of the intern-
13 ship program established through collaborations
14 with government laboratories and for-profit in-
15 stitutions;

16 (E) the integration of internship opportu-
17 nities into graduate students' research; and

18 (F) the relevance of the proposed program
19 to current and future computer and network se-
20 curity needs.

21 (7) AUTHORIZATION OF APPROPRIATIONS.—

22 There are authorized to be appropriated to the Na-
23 tional Science Foundation to carry out this
24 subsection—

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

- 1 (B) \$20,000,000 for fiscal year 2004;
 2 (C) \$20,000,000 for fiscal year 2005;
 3 (D) \$20,000,000 for fiscal year 2006; and
 4 (E) \$20,000,000 for fiscal year 2007.

5 (d) **GRADUATE RESEARCH FELLOWSHIPS PROGRAM**
 6 **SUPPORT.**—Computer and network security shall be in-
 7 cluded among the fields of specialization supported by the
 8 National Science Foundation’s Graduate Research Fellow-
 9 ships program under section 10 of the National Science
 10 Foundation Act of 1950 (42 U.S.C. 1869).

11 **SEC. 6. CONSULTATION.**

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

14 **SEC. 7. FOSTERING RESEARCH AND EDUCATION IN COM-**
 15 **PUTER AND NETWORK SECURITY.**

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

- 18 (1) by striking “and” at the end of paragraph
 19 (6);
 20 (2) by striking the period at the end of para-
 21 graph (7) and inserting “; and”; and
 22 (3) by adding at the end the following new
 23 paragraph:

1 “(3) promote the development of a robust re-
2 search community working at the leading edge of
3 knowledge in subject areas relevant to the security
4 of computer systems by providing support for grad-
5 uate students, post-doctoral researchers, and senior
6 researchers.

7 “(b) FELLOWSHIPS.—(1) The Director is authorized
8 to establish a program to award post-doctoral research fel-
9 lowships to individuals who are citizens, nationals, or law-
10 fully admitted permanent resident aliens of the United
11 States and are seeking research positions at institutions,
12 including the Institute, engaged in research activities re-
13 lated to the security of computer systems, including the
14 research areas described in section 4(a)(1) of the Cyber
15 Security Research and Development Act.

16 “(2) The Director is authorized to establish a pro-
17 gram to award senior research fellowships to individuals
18 seeking research positions at institutions, including the In-
19 stitute, engaged in research activities related to the secu-
20 rity of computer systems, including the research areas de-
21 scribed in section 4(a)(1) of the Cyber Security Research
22 and Development Act. Senior research fellowships shall be
23 made available for established researchers at institutions
24 of higher education who seek to change research fields and
25 pursue studies related to the security of computer systems.

1 “(3)(A) To be eligible for an award under this sub-
2 section, an individual shall submit an application to the
3 Director at such time, in such manner, and containing
4 such information as the Director may require.

5 “(B) Under this subsection, the Director is author-
6 ized to provide stipends for post-doctoral research fellow-
7 ships at the level of the Institute’s Post Doctoral Research
8 Fellowship Program and senior research fellowships at lev-
9 els consistent with support for a faculty member in a sab-
10 batical position.

11 “(c) AWARDS; APPLICATIONS.—The Director is au-
12 thorized to award grants or cooperative agreements to in-
13 stitutions of higher education to carry out the program
14 established under subsection (a). To be eligible for an
15 award under this section, an institution of higher edu-
16 cation shall submit an application to the Director at such
17 time, in such manner, and containing such information as
18 the Director may require. The application shall include,
19 at a minimum, a description of—

20 “(1) the number of graduate students antici-
21 pated to participate in the research project and the
22 level of support to be provided to each;

23 “(2) the number of post-doctoral research posi-
24 tions included under the research project and the
25 level of support to be provided to each;

1 ~~“(3) the number of individuals, if any, intend-~~
2 ~~ing to change research fields and pursue studies re-~~
3 ~~lated to the security of computer systems to be in-~~
4 ~~cluded under the research project and the level of~~
5 ~~support to be provided to each; and~~

6 ~~“(4) how the for-profit entities and any other~~
7 ~~partners will participate in developing and carrying~~
8 ~~out the research and education agenda of the part-~~
9 ~~nership.~~

10 ~~“(d) PROGRAM OPERATION.—(1) The program es-~~
11 ~~tablished under subsection (a) shall be managed by indi-~~
12 ~~viduals who shall have both expertise in research related~~
13 ~~to the security of computer systems and knowledge of the~~
14 ~~vulnerabilities of existing computer systems. The Director~~
15 ~~shall designate such individuals as program managers.~~

16 ~~“(2) Program managers designated under paragraph~~
17 ~~(1) may be new or existing employees of the Institute or~~
18 ~~individuals on assignment at the Institute under the Inter-~~
19 ~~governmental Personnel Act of 1970.~~

20 ~~“(3) Program managers designated under paragraph~~
21 ~~(1) shall be responsible for—~~

22 ~~“(A) establishing and publicizing the broad re-~~
23 ~~search goals for the program;~~

1 “(B) soliciting applications for specific research
2 projects to address the goals developed under sub-
3 paragraph (A);

4 “(C) selecting research projects for support
5 under the program from among applications sub-
6 mitted to the Institute, following consideration of—

7 “(i) the novelty and scientific and technical
8 merit of the proposed projects;

9 “(ii) the demonstrated capabilities of the
10 individual or individuals submitting the applica-
11 tions to successfully carry out the proposed re-
12 search;

13 “(iii) the impact the proposed projects will
14 have on increasing the number of computer se-
15 curity researchers;

16 “(iv) the nature of the participation by for-
17 profit entities and the extent to which the pro-
18 posed projects address the concerns of industry;
19 and

20 “(v) other criteria determined by the Di-
21 rector, based on information specified for inclu-
22 sion in applications under subsection (c); and

23 “(D) monitoring the progress of research
24 projects supported under the program.

1 “(e) REVIEW OF PROGRAM.—(1) The Director shall
2 periodically review the portfolio of research awards mon-
3 itored by each program manager designated in accordance
4 with subsection (d). In conducting those reviews, the Di-
5 rector shall seek the advice of the Computer System Secu-
6 rity and Privacy Advisory Board, established under section
7 21, on the appropriateness of the research goals and on
8 the quality and utility of research projects managed by
9 program managers in accordance with subsection (d).

10 “(2) The Director shall also contract with the Na-
11 tional Research Council for a comprehensive review of the
12 program established under subsection (a) during the 5th
13 year of the program. Such review shall include an assess-
14 ment of the scientific quality of the research conducted,
15 the relevance of the research results obtained to the goals
16 of the program established under subsection (d)(3)(A),
17 and the progress of the program in promoting the develop-
18 ment of a substantial academic research community work-
19 ing at the leading edge of knowledge in the field. The Di-
20 rector shall submit to Congress a report on the results
21 of the review under this paragraph no later than six years
22 after the initiation of the program.

23 “(f) DEFINITIONS.—For purposes of this section—

24 “(1) the term ‘computer system’ has the mean-
25 ing given that term in section 20(d)(1); and

1 (1) by redesignating subsection (d) as sub-
2 section (e); and

3 (2) by inserting after subsection (e) the fol-
4 lowing new subsection:

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

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

11 “(2) carry out research associated with improv-
12 ing the security of real-time computing and commu-
13 nications systems for use in process control; and

14 “(3) carry out multidisciplinary, long-term,
15 high-risk research on ways to improve the security
16 of computer systems.”.

17 **SEC. 11. AUTHORIZATION OF APPROPRIATIONS.**

18 There are authorized to be appropriated to the Sec-
19 retary of Commerce for the National Institute of Stand-
20 ards and Technology—

21 (1) for activities under section 22 of the Na-
22 tional Institute of Standards and Technology Act, as
23 added by section 8 of this Act—

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

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

1 (C) \$55,000,000 for fiscal year 2005;
 2 (D) \$70,000,000 for fiscal year 2006;
 3 (E) \$85,000,000 for fiscal year 2007; and
 4 (F) such sums as may be necessary for fis-
 5 eal years 2008 through 2012; and

6 (2) for activities under section 20(d) of the Na-
 7 tional Institute of Standards and Technology Act, as
 8 added by section 10 of this Act—

9 (A) \$6,000,000 for fiscal year 2003;
 10 (B) \$6,200,000 for fiscal year 2004;
 11 (C) \$6,400,000 for fiscal year 2005;
 12 (D) \$6,600,000 for fiscal year 2006; and
 13 (E) \$6,800,000 for fiscal year 2007.

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

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

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

5 (2) identify and assess gaps in technical capa-
6 bility for robust critical infrastructure network secu-
7 rity, and make recommendations for research prior-
8 ities and resource requirements; and

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

13 (b) REPORT.—The Director of the National Institute
14 of Standards and Technology shall transmit a report con-
15 taining the results of the study and recommendations re-
16 quired by subsection (a) to the Congress not later than
17 24 months after the date of enactment of this Act.

18 (c) SECURITY.—The Director of the National Insti-
19 tute of Standards and Technology shall ensure that no in-
20 formation that is classified is included in any publicly re-
21 leased version of the report required by this section.

22 (d) AUTHORIZATION OF APPROPRIATIONS.—There
23 are authorized to be appropriated to the Secretary of Com-
24 merce for the National Institute of Standards and Tech-

1 nology for the purposes of carrying out this section,
2 \$700,000.

3 **SECTION 1. SHORT TITLE.**

4 *This Act may be cited as the “Cyber Security Research*
5 *and Development Act”.*

6 **SEC. 2. FINDINGS.**

7 *The Congress finds the following:*

8 *(1) Revolutionary advancements in computing*
9 *and communications technology have interconnected*
10 *government, commercial, scientific, and educational*
11 *infrastructures—including critical infrastructures for*
12 *electric power, natural gas and petroleum production*
13 *and distribution, telecommunications, transportation,*
14 *water supply, banking and finance, and emergency*
15 *and government services—in a vast, interdependent*
16 *physical and electronic network.*

17 *(2) Exponential increases in interconnectivity*
18 *have facilitated enhanced communications, economic*
19 *growth, and the delivery of services critical to the*
20 *public welfare, but have also increased the con-*
21 *sequences of temporary or prolonged failure.*

22 *(3) A Department of Defense Joint Task Force*
23 *concluded after a 1997 United States information*
24 *warfare exercise that the results “clearly demonstrated*
25 *our lack of preparation for a coordinated cyber and*

1 *physical attack on our critical military and civilian*
2 *infrastructure”.*

3 (4) *Computer security technology and systems*
4 *implementation lack—*

5 (A) *sufficient long term research funding;*

6 (B) *adequate coordination across Federal*
7 *and State government agencies and among gov-*
8 *ernment, academia, and industry; and*

9 (C) *sufficient numbers of outstanding re-*
10 *searchers in the field.*

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

14 (A) *improve vulnerability assessment and*
15 *technological and systems solutions;*

16 (B) *expand and improve the pool of infor-*
17 *mation security professionals, including re-*
18 *searchers, in the United States workforce; and*

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

22 (6) *While African-Americans, Hispanics, and*
23 *Native Americans constitute 25 percent of the total*
24 *United States workforce and 30 percent of the college-*
25 *age population, members of these minorities comprise*

1 *less than 7 percent of the United States computer and*
 2 *information science workforce.*

3 **SEC. 3. DEFINITIONS.**

4 *For purposes of this Act—*

5 (1) *the term “Director” means the Director of the*
 6 *National Science Foundation;*

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

10 (3) *“Federal agency benchmark security stand-*
 11 *ards” means a baseline minimum security configura-*
 12 *tion for specific computer hardware or software com-*
 13 *ponents, an operational procedure or practice, or or-*
 14 *ganizational structure that increases the security of*
 15 *the information technology assets of a department or*
 16 *agency of the Federal Government.*

17 **SEC. 4. NATIONAL SCIENCE FOUNDATION RESEARCH.**

18 (a) *COMPUTER AND NETWORK SECURITY RESEARCH*
 19 *GRANTS.—*

20 (1) *IN GENERAL.—The Director shall award*
 21 *grants for basic research on innovative approaches to*
 22 *the structure of computer and network hardware and*
 23 *software that are aimed at enhancing computer secu-*
 24 *urity. Research areas may include—*

25 (A) *authentication and cryptography;*

1 (B) computer forensics and intrusion detec-
2 tion;

3 (C) reliability of computer and network ap-
4 plications, middleware, operating systems, and
5 communications infrastructure;

6 (D) privacy and confidentiality;

7 (E) network security architecture, including
8 tools for security administration and analysis
9 such as firewall technology;

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

12 (G) vulnerability assessments and tech-
13 niques for quantifying risk;

14 (H) operations and control systems man-
15 agement;

16 (I) management of interoperable digital cer-
17 tificates or digital watermarking; and

18 (J) remote access and wireless security.

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

22 (3) *AUTHORIZATION OF APPROPRIATIONS.*—
23 There are authorized to be appropriated to the Na-
24 tional Science Foundation to carry out this
25 subsection—

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

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

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

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

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

6 (b) *COMPUTER AND NETWORK SECURITY RESEARCH*
7 *CENTERS.*—

8 (1) *IN GENERAL.*—*The Director shall award*
9 *multiyear grants, subject to the availability of appro-*
10 *priations, to institutions of higher education (or con-*
11 *sortia thereof) to establish multidisciplinary Centers*
12 *for Computer and Network Security Research. Insti-*
13 *tutions of higher education (or consortia thereof) re-*
14 *ceiving such grants may partner with one or more*
15 *government laboratories or for-profit institutions.*

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

19 (3) *PURPOSE.*—*The purpose of the Centers shall*
20 *be to generate innovative approaches to computer and*
21 *network security by conducting cutting-edge, multi-*
22 *disciplinary research in computer and network secu-*
23 *urity, including the research areas described in sub-*
24 *section (a)(1).*

1 (4) *APPLICATIONS.*—*An institution of higher*
2 *education (or a consortium of such institutions) seek-*
3 *ing funding under this subsection shall submit an ap-*
4 *plication to the Director at such time, in such man-*
5 *ner, and containing such information as the Director*
6 *may require. The application shall include, at a min-*
7 *imum, a description of—*

8 (A) *the research projects that will be under-*
9 *taken by the Center and the contributions of each*
10 *of the participating entities;*

11 (B) *how the Center will promote active col-*
12 *laboration among scientists and engineers from*
13 *different disciplines, such as computer scientists,*
14 *engineers, mathematicians, and social science re-*
15 *searchers;*

16 (C) *how the Center will contribute to in-*
17 *creasing the number of computer and network se-*
18 *curity researchers and other professionals among*
19 *all cultures; and*

20 (D) *how the center will disseminate research*
21 *results quickly and widely to improve cyber secu-*
22 *rity in information technology networks, prod-*
23 *ucts, and services.*

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

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

8 (B) *the experience of the applicant in con-*
9 *ducting research on computer and network secu-*
10 *rity and the capacity of the applicant to foster*
11 *new multidisciplinary collaborations;*

12 (C) *the capacity of the applicant to attract*
13 *and provide adequate support for a diverse*
14 *group of undergraduate and graduate students*
15 *and postdoctoral fellows to pursue computer and*
16 *network security research; and*

17 (D) *the extent to which the applicant will*
18 *partner with government laboratories or for-prof-*
19 *it entities, and the role the government labora-*
20 *tories or for-profit entities will play in the re-*
21 *search undertaken by the Center.*

22 (6) *ANNUAL MEETING.*—*The Director shall con-*
23 *vene an annual meeting of the Centers in order to fos-*
24 *ter collaboration and communication between Center*
25 *participants.*

1 (7) *AUTHORIZATION OF APPROPRIATIONS.—*

2 *There are authorized to be appropriated for the Na-*
3 *tional Science Foundation to carry out this*
4 *subsection—*

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

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

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

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

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

10 **SEC. 5. NATIONAL SCIENCE FOUNDATION COMPUTER AND**
11 **NETWORK SECURITY PROGRAMS.**

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

14 *(1) IN GENERAL.—The Director shall establish a*
15 *program to award grants to institutions of higher*
16 *education (or consortia thereof) to establish or im-*
17 *prove undergraduate and master's degree programs in*
18 *computer and network security, to increase the num-*
19 *ber and diversity of students who pursue under-*
20 *graduate or master's degrees in fields related to com-*
21 *puter and network security, and to provide students*
22 *with experience in government or industry related to*
23 *their computer and network security studies.*

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

4 (3) *USE OF FUNDS.*—*Grants awarded under this*
5 *subsection shall be used for activities that enhance the*
6 *ability of an institution of higher education (or con-*
7 *sortium thereof) to provide high-quality under-*
8 *graduate and master’s degree programs in computer*
9 *and network security and to recruit and retain in-*
10 *creased numbers of students to such programs. Activi-*
11 *ties may include—*

12 (A) *revising curriculum to better prepare*
13 *undergraduate and master’s degree students for*
14 *careers in computer and network security;*

15 (B) *establishing degree and certificate pro-*
16 *grams in computer and network security;*

17 (C) *creating opportunities for under-*
18 *graduate students to participate in computer*
19 *and network security research projects;*

20 (D) *acquiring equipment necessary for stu-*
21 *dent instruction in computer and network secu-*
22 *rity, including the installation of testbed net-*
23 *works for student use;*

24 (E) *providing opportunities for faculty to*
25 *work with local or Federal Government agencies,*

1 *private industry, or other academic institutions*
2 *to develop new expertise or to formulate new re-*
3 *search directions in computer and network secu-*
4 *rity;*

5 *(F) establishing collaborations with other*
6 *academic institutions or departments that seek to*
7 *establish, expand, or enhance programs in com-*
8 *puter and network security;*

9 *(G) establishing student internships in com-*
10 *puter and network security at government agen-*
11 *cies or in private industry;*

12 *(H) establishing collaborations with other*
13 *academic institutions to establish or enhance a*
14 *web-based collection of computer and network se-*
15 *curity courseware and laboratory exercises for*
16 *sharing with other institutions of higher edu-*
17 *cation and community colleges;*

18 *(I) providing outreach to teachers in kin-*
19 *dergarten through grade 12 to increase their*
20 *awareness, and the awareness of their students,*
21 *of computer security careers and practices; and*

22 *(J) establishing or enhancing bridge pro-*
23 *grams in computer and network security between*
24 *community colleges and universities; and*

1 (K) any other activities the Director deter-
2 mines will accomplish the goals of this sub-
3 section.

4 (4) *SELECTION PROCESS.*—

5 (A) *APPLICATION.*—An institution of higher
6 education (or a consortium thereof) seeking fund-
7 ing under this subsection shall submit an appli-
8 cation to the Director at such time, in such man-
9 ner, and containing such information as the Di-
10 rector may require. The application shall in-
11 clude, at a minimum—

12 (i) a description of the applicant's
13 computer and network security research and
14 instructional capacity, and in the case of
15 an application from a consortium of insti-
16 tutions of higher education, a description of
17 the role that each member will play in im-
18 plementing the proposal;

19 (ii) a comprehensive plan by which the
20 institution or consortium will build instruc-
21 tional capacity in computer and informa-
22 tion security;

23 (iii) a description of relevant collabo-
24 rations with government agencies or private

1 *industry that inform the instructional pro-*
2 *gram in computer and network security;*

3 *(iv) a survey of the applicant's historic*
4 *student enrollment and placement data in*
5 *fields related to computer and network secu-*
6 *rity and a study of potential enrollment*
7 *and placement for students enrolled in the*
8 *proposed computer and network security*
9 *program; and*

10 *(v) a plan to evaluate the success of the*
11 *proposed computer and network security*
12 *program, including post-graduation assess-*
13 *ment of graduate school and job placement*
14 *and retention rates as well as the relevance*
15 *of the instructional program to graduate*
16 *study and to the workplace.*

17 *(B) AWARDS.—(i) The Director shall en-*
18 *sure, to the extent practicable, that grants are*
19 *awarded under this subsection in a wide range*
20 *of geographic areas and categories of institutions*
21 *of higher education, including minority serving*
22 *institutions.*

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

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

9 (6) *AUTHORIZATION OF APPROPRIATIONS.*—
10 *There are authorized to be appropriated to the Na-*
11 *tional Science Foundation to carry out this*
12 *subsection—*

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

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

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

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

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

18 (b) *SCIENTIFIC AND ADVANCED TECHNOLOGY ACT OF*
19 *1992.—*

20 (1) *GRANTS.*—*The Director shall provide grants*
21 *under the Scientific and Advanced Technology Act of*
22 *1992 (42 U.S.C. 1862i) for the purposes of section*
23 *3(a) and (b) of that Act, except that the activities*
24 *supported pursuant to this subsection shall be limited*

1 *to improving education in fields related to computer*
2 *and network security.*

3 (2) *AUTHORIZATION OF APPROPRIATIONS.—*

4 *There are authorized to be appropriated to the Na-*
5 *tional Science Foundation to carry out this*
6 *subsection—*

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

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

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

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

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

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

14 (1) *IN GENERAL.—The Director shall establish a*
15 *program to award grants to institutions of higher*
16 *education to establish traineeship programs for grad-*
17 *uate students who pursue computer and network secu-*
18 *rity research leading to a doctorate degree by pro-*
19 *viding funding and other assistance, and by pro-*
20 *viding graduate students with research experience in*
21 *government or industry related to the students' com-*
22 *puter and network security studies.*

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

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

3 (A) *providing fellowships to students who*
4 *are citizens, nationals, or lawfully admitted per-*
5 *manent resident aliens of the United States and*
6 *are pursuing research in computer or network*
7 *security leading to a doctorate degree;*

8 (B) *paying tuition and fees for students re-*
9 *ceiving fellowships under subparagraph (A);*

10 (C) *establishing scientific internship pro-*
11 *grams for students receiving fellowships under*
12 *subparagraph (A) in computer and network se-*
13 *curity at for-profit institutions or government*
14 *laboratories; and*

15 (D) *other costs associated with the adminis-*
16 *tration of the program.*

17 (4) *FELLOWSHIP AMOUNT.*—*Fellowships pro-*
18 *vided under paragraph (3)(A) shall be in the amount*
19 *of \$25,000 per year, or the level of the National*
20 *Science Foundation Graduate Research Fellowships,*
21 *whichever is greater, for up to 3 years.*

22 (5) *SELECTION PROCESS.*—*An institution of*
23 *higher education seeking funding under this sub-*
24 *section shall submit an application to the Director at*
25 *such time, in such manner, and containing such in-*

1 *formation as the Director may require. The applica-*
2 *tion shall include, at a minimum, a description of—*

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

7 *(B) the internship program to be estab-*
8 *lished, including the opportunities that will be*
9 *made available to students for internships at for-*
10 *profit institutions and government laboratories.*

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

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

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

18 *(C) the likelihood that the program will re-*
19 *cruit increased numbers and a more diverse pop-*
20 *ulation of students to pursue and earn doctorate*
21 *degrees in computer and network security;*

22 *(D) the nature and quality of the internship*
23 *program established through collaborations with*
24 *government laboratories and for-profit institu-*
25 *tions;*

1 (E) the integration of internship opportuni-
2 ties into graduate students' research; and

3 (F) the relevance of the proposed program to
4 current and future computer and network secu-
5 rity needs.

6 (7) *AUTHORIZATION OF APPROPRIATIONS.*—
7 *There are authorized to be appropriated to the Na-*
8 *tional Science Foundation to carry out this*
9 *subsection—*

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

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

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

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

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

15 (d) *GRADUATE RESEARCH FELLOWSHIPS PROGRAM*
16 *SUPPORT.*—*Computer and network security shall be in-*
17 *cluded among the fields of specialization supported by the*
18 *National Science Foundation's Graduate Research Fellow-*
19 *ships program under section 10 of the National Science*
20 *Foundation Act of 1950 (42 U.S.C. 1869).*

21 (e) *CYBER SECURITY FACULTY DEVELOPMENT FEL-*
22 *LOWSHIP PROGRAM.*—

23 (1) *IN GENERAL.*—*The Director shall establish a*
24 *program to award grants to institutions of higher*
25 *education to establish traineeship programs to enable*

1 *graduate students to pursue academic careers in cyber*
2 *security upon completion of doctoral degrees.*

3 (2) *APPLICATION.*—*Each institution of higher*
4 *education desiring to receive a grant under this sub-*
5 *section shall submit an application to the Director at*
6 *such time, in such manner, and containing such in-*
7 *formation as the Director shall require.*

8 (3) *USE OF FUNDS.*—*Funds received by an insti-*
9 *tution of higher education under this paragraph*
10 *shall—*

11 (A) *be made available to individuals on a*
12 *merit-reviewed competitive basis and in accord-*
13 *ance with the procedures established in para-*
14 *graph (5);*

15 (B) *be in an amount that is sufficient to*
16 *cover annual tuition and fees for doctoral study*
17 *at an institution of higher education for the du-*
18 *ration of the graduate fellowship, and shall in-*
19 *clude, in addition, an annual living stipend of*
20 *\$25,000; and*

21 (C) *be provided to individuals for a dura-*
22 *tion of no more than 5 years, the specific dura-*
23 *tion of each graduate fellowship to be determined*
24 *by the institution of higher education, on a case-*
25 *by-case basis.*

1 (4) *REPAYMENT.*—*Each graduate fellowship*
2 *shall—*

3 (A) *subject to subparagraph (4)(B), be sub-*
4 *ject to full repayment upon completion of the*
5 *doctoral degree according to a repayment sched-*
6 *ule established and administered by the institu-*
7 *tion of higher education;*

8 (B) *be forgiven at the rate of 20 percent of*
9 *the total amount of the graduate fellowship as-*
10 *sistance received under this section for each aca-*
11 *demie year that a recipient is employed as a*
12 *full-time faculty member at an institution of*
13 *higher education for a period not to exceed 5*
14 *years; and*

15 (C) *be monitored by the institution of high-*
16 *er education to ensure compliance with this sub-*
17 *section.*

18 (5) *ELIGIBILITY.*—*To be eligible to receive a*
19 *graduate fellowship under this section, an individual*
20 *shall—*

21 (A) *be a citizen, national, or lawfully ad-*
22 *mitted permanent resident alien of the United*
23 *States;*

24 (B) *demonstrate a commitment to a career*
25 *in higher education.*

1 (6) *CONSIDERATION.*—*In making selections for*
2 *graduate fellowships under this paragraph, the Direc-*
3 *tor, to the extent possible and in consultation with in-*
4 *stitutions of higher education, shall consider a diverse*
5 *pool of applicants whose interests are of an inter-*
6 *disciplinary nature, encompassing the social scientific*
7 *as well as the technical dimensions of cyber security.*

8 (7) *AUTHORIZATION OF APPROPRIATIONS.*—
9 *There are authorized to be appropriated to the Na-*
10 *tional Science Foundation to carry out this para-*
11 *graph \$5,000,000 for each of fiscal years 2003*
12 *through 2007.*

13 **SEC. 6. CONSULTATION.**

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

16 **SEC. 7. FOSTERING RESEARCH AND EDUCATION IN COM-**
17 **PUTER AND NETWORK SECURITY.**

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

20 (1) *by striking “and” at the end of paragraph*
21 *(6);*

22 (2) *by striking “Congress.” in paragraph (7)*
23 *and inserting “Congress ; and”; and*

24 (3) *by adding at the end the following:*

1 *System Security and Privacy Advisory Board under*
2 *section 20(f); and*

3 “(3) *promote the development of a robust re-*
4 *search community working at the leading edge of*
5 *knowledge in subject areas relevant to the security of*
6 *computer systems by providing support for graduate*
7 *students, post-doctoral researchers, and senior re-*
8 *searchers.*

9 “(b) *FELLOWSHIPS.—*

10 “(1) *IN GENERAL.—The Director is authorized to*
11 *establish a program to award post-doctoral research*
12 *fellowships to individuals who are citizens, nationals,*
13 *or lawfully admitted permanent resident aliens of the*
14 *United States and are seeking research positions at*
15 *institutions, including the Institute, engaged in re-*
16 *search activities related to the security of computer*
17 *systems, including the research areas described in sec-*
18 *tion 4(a)(1) of the Cyber Security Research and De-*
19 *velopment Act.*

20 “(2) *SENIOR RESEARCH FELLOWSHIPS.—The Di-*
21 *rector is authorized to establish a program to award*
22 *senior research fellowships to individuals seeking re-*
23 *search positions at institutions, including the Insti-*
24 *tute, engaged in research activities related to the secu-*
25 *rity of computer systems, including the research areas*

1 *described in section 4(a)(1) of the Cyber Security Re-*
2 *search and Development Act. Senior research fellow-*
3 *ships shall be made available for established research-*
4 *ers at institutions of higher education who seek to*
5 *change research fields and pursue studies related to*
6 *the security of computer systems.*

7 *“(3) ELIGIBILITY.—*

8 *“(A) IN GENERAL.—To be eligible for an*
9 *award under this subsection, an individual shall*
10 *submit an application to the Director at such*
11 *time, in such manner, and containing such in-*
12 *formation as the Director may require.*

13 *“(B) STIPENDS.—Under this subsection, the*
14 *Director is authorized to provide stipends for*
15 *post-doctoral research fellowships at the level of*
16 *the Institute’s Post Doctoral Research Fellowship*
17 *Program and senior research fellowships at levels*
18 *consistent with support for a faculty member in*
19 *a sabbatical position.*

20 *“(c) AWARDS; APPLICATIONS.—*

21 *“(1) IN GENERAL.—The Director is authorized to*
22 *award grants or cooperative agreements to institu-*
23 *tions of higher education to carry out the program es-*
24 *tablished under subsection (a).*

1 “(2) *ELIGIBILITY.*—*To be eligible for an award*
2 *under this section, an institution of higher education*
3 *shall submit an application to the Director at such*
4 *time, in such manner, and containing such informa-*
5 *tion as the Director may require. The application*
6 *shall include, at a minimum, a description of—*

7 “(A) *the number of graduate students an-*
8 *ticipated to participate in the research project*
9 *and the level of support to be provided to each;*

10 “(B) *the number of post-doctoral research*
11 *positions included under the research project and*
12 *the level of support to be provided to each;*

13 “(C) *the number of individuals, if any, in-*
14 *tending to change research fields and pursue*
15 *studies related to the security of computer sys-*
16 *tems to be included under the research project*
17 *and the level of support to be provided to each;*
18 *and*

19 “(D) *how the for-profit entities and any*
20 *other partners will participate in developing and*
21 *carrying out the research and education agenda*
22 *of the partnership.*

23 “(d) *SLIDING SCALE COST-SHARING.*—*In awarding a*
24 *grant under this section, the Director shall require up to*
25 *50 percent of the costs of the project funded by the grant*

1 *to be met by the for-profit entity or entities in the partner-*
2 *ship. The Director shall base the percentage of cost-sharing*
3 *required under this paragraph on a sliding scale reflecting*
4 *the degree to which the results of the research undertaken*
5 *by a partnership may reasonably be expected to be applied*
6 *and shared, with—*

7 “(1) *the smallest percentage of cost-sharing re-*
8 *quired for projects the anticipated results of which are*
9 *reasonably expected to be of broadest potential appli-*
10 *cation and broadly shared; and*

11 “(2) *the greatest percentage of cost-sharing re-*
12 *quired for projects the anticipated results of which are*
13 *reasonably expected—*

14 “(A) *to be of narrow or proprietary appli-*
15 *cation; or*

16 “(B) *not to be broadly shared.*

17 “(e) *PROGRAM OPERATION.—*

18 “(1) *MANAGEMENT.—The program established*
19 *under subsection (a) shall be headed by the Director*
20 *of the Office for Information Security Programs and*
21 *managed by individuals who shall have both expertise*
22 *in research related to the security of computer systems*
23 *and knowledge of the vulnerabilities of existing com-*
24 *puter systems. The Director shall designate such indi-*

1 *viduals, on a competitive basis, as program man-*
2 *agers.*

3 “(2) *MANAGERS MAY BE EMPLOYEES.*—*Program*
4 *managers designated under paragraph (1) may be*
5 *new or existing employees of the Institute.*

6 “(3) *MANAGER RESPONSIBILITY.*—*Program*
7 *managers designated under paragraph (1) shall be re-*
8 *sponsible for—*

9 “(A) *establishing and publicizing the broad*
10 *research goals for the program;*

11 “(B) *soliciting applications for specific re-*
12 *search projects to address the goals developed*
13 *under subparagraph (A);*

14 “(C) *selecting research projects for support*
15 *under the program from among applications*
16 *submitted to the Institute, following consider-*
17 *ation of—*

18 “(i) *the novelty and scientific and*
19 *technical merit of the proposed projects;*

20 “(ii) *the demonstrated capabilities of*
21 *the individual or individuals submitting the*
22 *applications to successfully carry out the*
23 *proposed research;*

1 “(iii) the impact the proposed projects
2 will have on increasing the number of com-
3 puter security researchers;

4 “(iv) the nature of the participation by
5 for-profit entities and the extent to which
6 the proposed projects address the concerns of
7 industry; and

8 “(v) other criteria determined by the
9 Director, based on information specified for
10 inclusion in applications under subsection
11 (c); and

12 “(D) monitoring the progress of research
13 projects supported under the program.

14 “(4) From amounts available for awards under
15 subsection (c), the Director, in consultation with the
16 Director of the Office for Information Security Pro-
17 grams established in section 20 of this Act, may as-
18 sign up to 5 percent to a Directors Fund which may
19 be awarded throughout the fiscal year at the discre-
20 tion of the Director to promising projects designed to
21 fulfill the goals stated in subsection (a). Such projects
22 should be innovative in nature and should meet
23 emerging needs in computer security.

24 “(f) REVIEW OF PROGRAM.—

1 “(1) *PERIODIC REVIEW.*—*The Director shall pe-*
2 *riodically review the portfolio of research awards*
3 *monitored by each program manager designated in*
4 *accordance with subsection (e). In conducting those*
5 *reviews, the Director shall seek the advice of the Com-*
6 *puter System Security and Privacy Advisory Board,*
7 *established under section 21, on the appropriateness*
8 *of the research goals and on the quality and utility*
9 *of research projects managed by program managers in*
10 *accordance with subsection (e).*

11 “(2) *COMPREHENSIVE 5-YEAR REVIEW.*—*The Di-*
12 *rector shall also contract with the National Research*
13 *Council for a comprehensive review of the program es-*
14 *tablished under subsection (a) during the 5th year of*
15 *the program. Such review shall include an assessment*
16 *of the scientific quality of the research conducted, the*
17 *relevance of the research results obtained to the goals*
18 *of the program established under subsection (e)(3)(A),*
19 *and the progress of the program in promoting the de-*
20 *velopment of a substantial academic research commu-*
21 *nity working at the leading edge of knowledge in the*
22 *field. The Director shall submit to Congress a report*
23 *on the results of the review under this paragraph no*
24 *later than 6 years after the initiation of the program.*

25 “(g) *DEFINITIONS.*—*In this section:*

1 “(1) *COMPUTER SYSTEM*.—The term ‘computer
2 system’ has the meaning given that term in section
3 20(d)(1).

4 “(2) *INSTITUTION OF HIGHER EDUCATION*.—The
5 term ‘institution of higher education’ has the meaning
6 given that term in section 101 of the Higher Edu-
7 cation Act of 1965 (20 U.S.C. 1001).”.

8 (b) *AMENDMENT OF COMPUTER SYSTEM DEFINI-*
9 *TION*.—Section 20(d)(1)(B)(i) of National Institute of
10 Standards and Technology Act (15 U.S.C. 278g–
11 3(d)(1)(B)(i)) is amended to read as follows:

12 “(i) computers and computer net-
13 works;”.

14 (c) *APPROPRIATE FEDERAL AGENCY BENCHMARK SE-*
15 *CURITY STANDARDS*.—

16 (1) *NIST REPORT*.—Not later than 180 days
17 after the date of enactment of this Act, the Director
18 of the National Institute of Standards and Technology
19 shall submit to Committee on Commerce, Science, and
20 Transportation of the Senate, the Committee on
21 Science of the House of Representatives, and the Com-
22 mittees on Appropriations of the Senate and the
23 House of Representatives a report that—

24 (A) identifies specific Federal agency bench-
25 mark security standards that should be developed

1 *by the Institute over the 12-month period begin-*
2 *ning on the date of the report, and that should*
3 *serve as the basis for security standards that will*
4 *eventually be adopted by the departments and*
5 *agencies of the Federal Government; and*

6 *(B) recommends, in consultation with the*
7 *Office of Management and Budget, any Federal*
8 *funding, in addition to levels authorized under*
9 *this title, that the Institute requires fully to*
10 *carry out its mission under this title.*

11 (2) *NIST RECOMMENDATIONS FOR FEDERAL*
12 *AGENCY BENCHMARK STANDARDS.—*

13 *(A) IN GENERAL.—Not later than 1 year*
14 *after the date of the report issued under para-*
15 *graph (1), Director of the National Institute of*
16 *Standards and Technology shall, in consultation*
17 *with appropriate public and private entities,*
18 *prepare a report for the Secretary of Commerce*
19 *and the Chairman of the Federal Chief Informa-*
20 *tion Officers council that contains recommenda-*
21 *tions for specific, reasonable Federal agency*
22 *benchmark security standards to be adopted by*
23 *the civilian departments and agencies of the Fed-*
24 *eral Government.*

1 (B) *UPDATES.*—*The Director shall review*
2 *the recommended standards under subparagraph*
3 *(A) not less than once every 6 months, and up-*
4 *date such standards or issue new standards as*
5 *necessary. Nothing in this title shall prohibit the*
6 *Director from updating any portion of such rec-*
7 *ommended standards more frequently if deter-*
8 *mines that circumstances so require.*

9 (C) *DISSEMINATION.*—*The Secretary of*
10 *Commerce shall widely disseminate the report*
11 *under subparagraph (A), and any update of the*
12 *report under subparagraph (B), among relevant*
13 *government (including State and local govern-*
14 *ment), private and academic entities.*

15 (3) *ADOPTION OF BENCHMARK SECURITY STAND-*
16 *ARDS GOVERNMENT-WIDE.*—

17 (A) *IN GENERAL.*—*Not later than 90 days*
18 *after the date of the report under paragraph*
19 *(2)(A), each civilian department and agency of*
20 *the Federal Government shall implement the ap-*
21 *propriate benchmark security standards rec-*
22 *ommended by such report.*

23 (B) *IMPLEMENTATION OF UPDATED STAND-*
24 *ARDS.*—*If the Director of the National Institute*
25 *of Standards and Technology, through the Sec-*

1 *retary of Commerce, updates recommended fed-*
2 *eral agency benchmark security standards pursu-*
3 *ant to paragraph (2), each civilian department*
4 *and agency of the Federal Government shall im-*
5 *plement such updated standards not later than*
6 *30 days after the date of the report containing*
7 *recommendations for updated standards.*

8 (C) *IMPLEMENTATION OF NEW STAND-*
9 *ARDS.—If the Director of the National Institute*
10 *of Standards and Technology, through the Sec-*
11 *retary of Commerce, recommends new Federal*
12 *agency benchmark security standards pursuant*
13 *to paragraph (2), each civilian department and*
14 *agency of the Federal Government shall imple-*
15 *ment such new standards no later than 90 days*
16 *after the date of the report containing rec-*
17 *ommendations for new standards.*

18 (4) *CURRENT FEDERAL AGENCY BENCHMARK SE-*
19 *CURITY STANDARDS.—*

20 (A) *IN GENERAL.—Not later than 90 days*
21 *after the date of enactment of this Act, the Direc-*
22 *tor of the Chairman of the Federal Chief Infor-*
23 *mation Officers Council shall provide to the Di-*
24 *rector of the National Institute of Standards and*
25 *Technology a list of the specific benchmarks that*

1 *each civilian department and agency of the Fed-*
2 *eral Government uses as its current minimum*
3 *security standards.*

4 *(B) CLASSIFIED REPORT.—The list under*
5 *this paragraph shall be provided in classified*
6 *form.*

7 *(5) AUTHORIZATION OF APPROPRIATIONS.—*
8 *There are hereby authorized to be appropriated for the*
9 *National Institute of Standards and Technology for*
10 *purposes of activities under this subsection,*
11 *\$15,000,000 for each of fiscal years 2003 through*
12 *2007*

13 *(d) REPORTS TO CONGRESS.—*

14 *(1) FEDERAL CHIEF INFORMATION OFFICERS RE-*
15 *PORT.—Not later than 36 months after the date of en-*
16 *actment of this Act, the Chairman of Federal Chief*
17 *Information Officers Council shall submit a report to*
18 *the appropriate committees of Congress including—*

19 *(A) a description of the status of implemen-*
20 *tation of the federal agency benchmark security*
21 *standards at each department and agency of the*
22 *Federal Government;*

23 *(B) a description of the costs associated*
24 *with such implementation; and*

1 (C) a description of any barriers to imple-
2 mentation and recommendation for overcoming
3 such barriers.

4 (2) NATIONAL ACADEMY OF SCIENCES STUDY.—
5 Not later than 3 months after the date of enactment
6 of this Act, the Director of the National Institute of
7 Standards and Technology shall enter into an ar-
8 rangement with the National Research Council of the
9 National Academy of Sciences to conduct a study to
10 examine the impact of requiring Federal agencies to
11 implement benchmark security standards on the state
12 of national cyber security preparedness.

13 (A) MATTERS TO BE ASSESSED IN STUDY.—
14 At a minimum, the study shall address the fol-
15 lowing:

16 (i) The extent to which the cyber secu-
17 rity posture of federal agencies would be im-
18 proved with the adoption of the standards
19 described in subsection (c)(2)(A).

20 (ii) The operational benefits, costs and
21 consequences of the adoption of the stand-
22 ards described in subsection (c)(2)(A).

23 (iii) The operational consequences of
24 differing cyber security needs for different
25 Federal agencies.

1 (B) *CLASSIFIED REPORT.*—*To the maximum degree possible, the final report shall be*
2 *submitted in unclassified form with classified*
3 *annexes as necessary.*

5 (C) *INTERAGENCY COOPERATION WITH*
6 *STUDY.*—*All Federal agencies shall cooperate*
7 *fully with the National Research Council in its*
8 *activities in carrying out the study under this*
9 *section.*

10 (D) *EXPEDITED PROCESSING OF SECURITY*
11 *CLEARANCES FOR STUDY.*—*For the purpose of fa-*
12 *cilitating the commencement of the study under*
13 *this section, officials in relevant departments*
14 *and agencies of the Federal Government shall ex-*
15 *pedite to the fullest degree possible the processing*
16 *of security clearances that are necessary for the*
17 *National Research Council to conduct the study.*

18 (E) *REPORT.*—*The Director of the National*
19 *Institute of Standards and Technology shall*
20 *transmit a report to containing the results of the*
21 *study to the Congress not later than 21 months*
22 *after the date of enactment of this Act.*

23 (F) *AUTHORIZATION OF APPROPRIA-*
24 *TIONS.*—*There are authorized to be appropriated*
25 *to the Secretary of Commerce for the National*

1 *Institute of Standards and Technology for the*
2 *purposes of carrying out this subsection,*
3 *\$800,000.*

4 *(e) INFORMATION SECURITY PROGRAM OFFICE.—Sec-*
5 *tion 20 of the National Institute of Standards and Tech-*
6 *nology Act (15 U.S.C. 278g-3), is amended by redesign-*
7 *ating subsection (d) as subsection (e) and by inserting*
8 *after subsection (c) the following:*

9 *“(d) ESTABLISHMENT OF AN OFFICE FOR INFORMA-*
10 *TION SECURITY PROGRAMS.—*

11 *“(1) IN GENERAL.—There is established in*
12 *the Institute an Office for Information Security*
13 *Programs.*

14 *“(2) HEAD.—The Office for Information Se-*
15 *curity Programs shall be headed by a Director,*
16 *who shall be a senior executive and shall be com-*
17 *pensated at a level in the Senior Executive Serv-*
18 *ice under section 5382 of title 5, United States*
19 *Code, as determined by the Secretary of Com-*
20 *merce.*

21 *“(3) FUNCTION.—The Director of the Insti-*
22 *tute shall delegate to the Director of the Office of*
23 *Information Security Programs the authority to*
24 *administer all functions under this section, ex-*
25 *cept that any such delegation shall not relieve*

1 *the Director of the Institute of responsibility for*
2 *the administration of such functions. The Direc-*
3 *tor of the Office of Information Security Pro-*
4 *grams shall serve as principal adviser to the Di-*
5 *rector of the Institute on all functions under this*
6 *section.”*

7 **SEC. 9. COMPUTER SECURITY REVIEW, PUBLIC MEETINGS,**
8 **AND INFORMATION.**

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

12 “(f) *AUTHORIZATION OF APPROPRIATIONS.—There are*
13 *authorized to be appropriated to the Secretary \$1,060,000*
14 *for fiscal year 2003 and \$1,090,000 for fiscal year 2004*
15 *to enable the Computer System Security and Privacy Advi-*
16 *sory Board, established by section 21, to identify emerging*
17 *issues, including research needs, related to computer secu-*
18 *rity, privacy, and cryptography and, as appropriate, to*
19 *convene public meetings on those subjects, receive presen-*
20 *tations, and publish reports, digests, and summaries for*
21 *public distribution on those subjects.”.*

22 **SEC. 10. INTRAMURAL SECURITY RESEARCH.**

23 *Section 20 of the National Institute of Standards and*
24 *Technology Act (15 U.S.C. 278g-3), as amended by this Act,*
25 *is further amended by redesignating subsection (f) as sub-*

1 *section (g), and by inserting after subsection (e) the fol-*
 2 *lowing:*

3 “(f) *INTRAMURAL SECURITY RESEARCH.*—*As part of*
 4 *the research activities conducted in accordance with sub-*
 5 *section (b)(4), the Institute shall—*

6 “(1) *conduct a research program to address*
 7 *emerging technologies associated with assembling a*
 8 *networked computer system from components while*
 9 *ensuring it maintains desired security properties;*

10 “(2) *carry out research associated with improv-*
 11 *ing the security of real-time computing and commu-*
 12 *nications systems for use in process control; and*

13 “(3) *carry out multidisciplinary, long-term,*
 14 *high-risk research on ways to improve the security of*
 15 *computer systems.”.*

16 **SEC. 11. AUTHORIZATION OF APPROPRIATIONS.**

17 *There are authorized to be appropriated to the Sec-*
 18 *retary of Commerce for the National Institute of Standards*
 19 *and Technology—*

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

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

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

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

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

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

3 (2) for activities under section 20(f) of the Na-
4 tional Institute of Standards and Technology Act, as
5 added by section 10 of this Act—

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

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

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

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

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

11 **SEC. 12. NATIONAL ACADEMY OF SCIENCES STUDY ON COM-**
12 **PUTER AND NETWORK SECURITY IN CRITICAL**
13 **INFRASTRUCTURES.**

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

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

1 (1) by striking “and” after the semicolon in
2 paragraph (12);

3 (2) by redesignating paragraph (13) as para-
4 graph (14); and

5 (3) by inserting after paragraph (12) the fol-
6 lowing:

7 “(13) develop strategies, in consultation with the
8 Office of Homeland Security, the President’s Critical
9 Infrastructure Protection Board, and the relevant fed-
10 eral departments and agencies, to foster greater co-
11 ordination of federal research and development activi-
12 ties and promote cooperation between the Federal
13 Government, institutions of higher education, and
14 private industry in the field of cyber security; and”

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107TH CONGRESS
2^D SESSION

S. 2182

[Report No. 107-239]

A BILL

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

AUGUST 1, 2002

Reported with an amendment