

117TH CONGRESS
2D SESSION

S. 4109

To authorize the development of a national strategy for the research and development of distributed ledger technologies and their applications, to authorize awards to support research on distributed ledger technologies and their applications, and to authorize an applied research project on distributed ledger technologies in commerce.

IN THE SENATE OF THE UNITED STATES

APRIL 28, 2022

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

A BILL

To authorize the development of a national strategy for the research and development of distributed ledger technologies and their applications, to authorize awards to support research on distributed ledger technologies and their applications, and to authorize an applied research project on distributed ledger technologies in commerce.

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 “National R & D Strat-
5 egy for Distributed Ledger Technology Act of 2022”.

1 **SEC. 2. DEFINITIONS.**

2 In this Act:

3 (1) DIRECTOR.—Except as otherwise expressly
4 provided, the term “Director” means the Director of
5 the Office of Science and Technology Policy.

6 (2) DISTRIBUTED LEDGER.—The term “distrib-
7 uted ledger” means a ledger that—

8 (A) is shared across a set of distributed
9 nodes, which are devices or processes, that par-
10 ticipate in a network and store a complete or
11 partial replica of the ledger;

12 (B) is synchronized between the nodes;

13 (C) has data appended to it by following
14 the ledger’s specified consensus mechanism;

15 (D) may be accessible to anyone (public)
16 or restricted to a subset of participants (pri-
17 vate); and

18 (E) may require participants to have au-
19 thorization to perform certain actions
20 (permissioned) or require no authorization
21 (permissionless).

22 (3) DISTRIBUTED LEDGER TECHNOLOGY.—The
23 term “distributed ledger technology” means tech-
24 nology that enables the operation and use of distrib-
25 uted ledgers.

1 (4) INSTITUTION OF HIGHER EDUCATION.—The
2 term “institution of higher education” has the
3 meaning given the term in section 101 of the Higher
4 Education Act of 1965 (20 U.S.C. 1001).

5 (5) RELEVANT CONGRESSIONAL COMMIT-
6 TEES.—The term “relevant congressional commit-
7 tees” means—

8 (A) the Committee on Commerce, Science,
9 and Transportation of the Senate; and

10 (B) the Committee on Science, Space, and
11 Technology of the House of Representatives.

12 (6) SMART CONTRACT.—The term “smart con-
13 tract” means a computer program stored in a dis-
14 tributed ledger system that is executed when certain
15 predefined conditions are satisfied and wherein the
16 outcome of any execution of the program may be re-
17 corded on the distributed ledger.

18 **SEC. 3. NATIONAL DISTRIBUTED LEDGER TECHNOLOGY**

19 **R&D STRATEGY.**

20 (a) IN GENERAL.—The Director, or a designee of the
21 Director, shall, in coordination with the National Science
22 and Technology Council, and the heads of such other rel-
23 evant Federal agencies as the Director considers appro-
24 priate and in consultation with such nongovernmental en-
25 tities as the Director considers appropriate, develop a na-

1 tional strategy for the research and development of dis-
2 tributed ledger technologies and their applications, with
3 a particular focus on applications of public and
4 permissionless distributed ledgers. In developing the na-
5 tional strategy, the Director shall consider the following:

6 (1) Current efforts and coordination by Federal
7 agencies to invest in the research and development
8 of distributed ledger technologies and their applica-
9 tions, including through programs like the Small
10 Business Innovation Research and Small Business
11 Technology Transfer programs.

12 (2)(A) The potential benefits and risks of appli-
13 cations of distributed ledger technologies across dif-
14 ferent industry sectors, including their potential to—

15 (i) lower transactions costs and facilitate
16 new types of commercial transactions;

17 (ii) protect privacy and increase individ-
18 uals' data sovereignty;

19 (iii) reduce friction to the interoperability
20 of digital systems;

21 (iv) increase the accessibility, auditability,
22 security, efficiency, and transparency of digital
23 services;

24 (v) increase market competition in the pro-
25 vision of digital services;

1 (vi) enable dynamic contracting and con-
2 tract execution through smart contracts;

3 (vii) enable participants to collaborate in
4 trustless and disintermediated environments;

5 (viii) enable the operations and governance
6 of distributed organizations; and

7 (ix) create new ownership models for dig-
8 ital items.

9 (B) In consideration of the potential risks of
10 applications of distributed ledger technologies under
11 subparagraph (A), the Director shall take into ac-
12 count, where applicable—

13 (i) software vulnerabilities in distributed
14 ledger technologies and smart contracts;

15 (ii) limited consumer literacy on engaging
16 with applications of distributed ledger tech-
17 nologies in a secure way;

18 (iii) the use of distributed ledger tech-
19 nologies in illicit finance and their use in com-
20 bating illicit finance;

21 (iv) manipulative, deceptive, and fraudu-
22 lent practices that harm consumers engaging
23 with applications of distributed ledger tech-
24 nologies;

1 (v) the implications of different consensus
2 mechanisms for digital ledgers and governance
3 and accountability mechanisms for applications
4 of distributed ledger technologies, which may
5 include decentralized networks;

6 (vi) foreign activities in the development
7 and deployment of distributed ledger tech-
8 nologies and their associated tools and infra-
9 structure; and

10 (vii) environmental, sustainability, and eco-
11 nomic impacts of the computational resources
12 required for distributed ledger technologies.

13 (3) Potential uses for distributed ledger tech-
14 nologies that could improve the operations and deliv-
15 ery of services by Federal agencies, taking into ac-
16 count the potential of digital ledger technologies
17 to—

18 (A) improve the efficiency and effectiveness
19 of privacy-preserving data sharing among Fed-
20 eral agencies and with State, local, territorial,
21 and Tribal governments;

22 (B) promote government transparency by
23 improving data sharing with the public;

1 (C) introduce or mitigate risks that may
2 threaten individuals' rights or access to Federal
3 services; and

4 (D) automate and modernize processes for
5 assessing and ensuring regulatory compliance.

6 (4) Ways to support public and private sector
7 dialogue on areas of research that could enhance the
8 efficiency, scalability, interoperability, security, and
9 privacy of applications using distributed ledger tech-
10 nologies.

11 (5) The need for increased coordination of the
12 public and private sectors on the development of vol-
13 untary standards, including those regarding security,
14 smart contracts, cryptographic protocols, virtual
15 routing and forwarding, interoperability, zero-knowl-
16 edge proofs, and privacy, for distributed ledger tech-
17 nologies and their applications.

18 (6) Applications of distributed ledger tech-
19 nologies that could positively benefit society but that
20 receive relatively little private sector investment.

21 (7) The United States position in global leader-
22 ship and competitiveness across research, develop-
23 ment, and deployment of distributed ledger tech-
24 nologies.

25 (b) CONSULTATION.—

1 (1) IN GENERAL.—In carrying out the Direc-
2 tor’s duties under this section, the Director shall
3 consult with the following:

4 (A) Private industry.

5 (B) Institutions of higher education.

6 (C) Nonprofit organizations, including
7 foundations dedicated to supporting distributed
8 ledger technologies and their applications.

9 (D) State governments.

10 (E) Such other persons as the Director
11 considers appropriate.

12 (2) REPRESENTATION.—The Director shall en-
13 sure consultations with the following:

14 (A) Rural and urban stakeholders from
15 across the Nation.

16 (B) Small, medium, and large businesses.

17 (C) Subject matter experts representing
18 multiple industrial sectors.

19 (c) COORDINATION.—In carrying out this section, the
20 Director shall, for purposes of avoiding duplication of ac-
21 tivities, consult, cooperate, and coordinate with the pro-
22 grams and policies of other relevant Federal agencies, in-
23 cluding the interagency process outlined in section 3 of
24 Executive Order 14067 (87 Fed. Reg. 14143; relating en-
25 suring responsible development of digital assets).

1 (d) NATIONAL STRATEGY.—Not later than 1 year
2 after the date of enactment of this Act, the Director shall
3 submit to the relevant congressional committees and the
4 President a national strategy that includes the following:

5 (1) Priorities for the research and development
6 of distributed ledger technologies and their applica-
7 tions.

8 (2) Plans to support public and private sector
9 investment and partnerships in research and tech-
10 nology development for societally beneficial applica-
11 tions of distributed ledger technologies.

12 (3) Plans to mitigate the risks of distributed
13 ledger technologies and their applications.

14 (4) An identification of additional resources, ad-
15 ministrative action, or legislative action rec-
16 ommended to assist with the implementation of such
17 strategy.

18 (e) RESEARCH AND DEVELOPMENT FUNDING.—The
19 Director shall, as the Director considers necessary, consult
20 with the Director of the Office of Management and Budget
21 and with the heads of such other elements of the Executive
22 Office of the President as the Director considers appro-
23 priate, to ensure that the recommendations and priorities
24 with respect to research and development funding, as ex-
25 pressed in the national strategy developed under this sec-

1 tion, are incorporated in the development of annual budget
2 requests for Federal research agencies.

3 (f) AUTHORIZATION OF APPROPRIATIONS.—There
4 are authorized to be appropriated to the Director
5 \$1,000,000 to carry out this section for fiscal years 2022
6 and 2023.

7 **SEC. 4. DISTRIBUTED LEDGER TECHNOLOGY RESEARCH.**

8 (a) IN GENERAL.—The Director of the National
9 Science Foundation shall make awards, on a competitive
10 basis, to institutions of higher education or nonprofit orga-
11 nizations (or consortia of such institutions or organiza-
12 tions) to support research, including socio-technical re-
13 search, on distributed ledger technologies and their appli-
14 cations, with a particular focus on applications of public
15 and permissionless distributed ledgers, which may include
16 research on—

17 (1) the implications on trust, transparency, pri-
18 vacy, accountability, and energy consumption of dif-
19 ferent consensus mechanisms and hardware choices,
20 and approaches for addressing these implications;

21 (2) approaches for improving the security, pri-
22 vacy, resiliency, interoperability, performance, and
23 scalability of distributed ledger technologies and
24 their applications, which may include decentralized
25 networks;

1 (3) approaches for identifying and addressing
2 vulnerabilities and improving the performance and
3 expressive power of smart contracts;

4 (4) the implications of quantum computing on
5 applications of distributed ledger technologies, in-
6 cluding long-term protection of sensitive information
7 (such as medical or digital property), and techniques
8 to address them;

9 (5) game theory, mechanism design, and eco-
10 nomics underpinning and facilitating the operations
11 and governance of decentralized networks enabled by
12 distributed ledger technologies;

13 (6) the social behaviors of participants in decen-
14 tralized networks enabled by distributed ledger tech-
15 nologies;

16 (7) human-centric design approaches to make
17 distributed ledger technologies and their applications
18 more usable and accessible; and

19 (8) use cases for distributed ledger technologies
20 across various industry sectors and government, in-
21 cluding applications pertaining to—

22 (A) digital identity, including trusted iden-
23 tity and identity management;

24 (B) digital property rights;

25 (C) delivery of public services;

- 1 (D) supply chain transparency;
- 2 (E) medical information management;
- 3 (F) inclusive financial services;
- 4 (G) community governance;
- 5 (H) charitable giving;
- 6 (I) public goods funding;
- 7 (J) digital credentials;
- 8 (K) regulatory compliance;
- 9 (L) infrastructure resilience; and
- 10 (M) peer-to-peer transactions.

11 (b) ACCELERATING INNOVATION.—The Director of
12 the National Science Foundation shall consider supporting
13 startups that leverage distributed ledger technologies,
14 have the potential to positively benefit society, and have
15 the potential for commercial viability, through programs
16 like the Small Business Innovation Research and Small
17 Business Technology Transfer programs.

18 (c) CONSIDERATION OF NATIONAL DISTRIBUTED
19 LEDGER TECHNOLOGY RESEARCH AND DEVELOPMENT
20 STRATEGY.—In making awards under subsection (a), the
21 Director of the National Science Foundation shall take
22 into account the national strategy, as described in section
23 3(d).

24 (d) FUNDAMENTAL RESEARCH.—The Director of the
25 National Science Foundation shall continue to make

1 awards supporting fundamental research in areas related
2 to distributed ledger technologies and their applications,
3 such as applied cryptography and distributed systems.

4 **SEC. 5. DISTRIBUTED LEDGER TECHNOLOGY APPLIED RE-**
5 **SEARCH PROJECT.**

6 (a) APPLIED RESEARCH PROJECT.—Subject to the
7 availability of appropriations, the Director of the National
8 Institute of Standards and Technology, shall carry out an
9 applied research project to study and demonstrate the po-
10 tential benefits and unique capabilities of distributed ledg-
11 er technologies.

12 (b) ACTIVITIES.—In carrying out the applied re-
13 search project, the Director of the National Institute of
14 Standards and Technology shall—

15 (1) identify potential applications of distributed
16 ledger technologies, including those that could ben-
17 efit activities at the Department of Commerce or at
18 other Federal agencies, considering applications that
19 could—

20 (A) improve the privacy and interoper-
21 ability of digital identity and access manage-
22 ment solutions;

23 (B) increase the integrity and transparency
24 of supply chains through the secure and limited
25 sharing of relevant supplier information;

1 (C) facilitate increased interoperability
2 across healthcare information systems and con-
3 sumer control over the movement of their med-
4 ical data; or

5 (D) be of benefit to the public or private
6 sectors, as determined by the Director in con-
7 sultation with relevant stakeholders;

8 (2) solicit and provide the opportunity for pub-
9 lic comment relevant to potential projects;

10 (3) consider, in the selection of a project,
11 whether the project addresses a pressing need not
12 already addressed by another organization or Fed-
13 eral agency;

14 (4) establish plans to mitigate potential risks,
15 for example those to privacy, of potential projects;

16 (5) produce an example solution leveraging dis-
17 tributed ledger technologies for 1 of the applications
18 identified in paragraph (1);

19 (6) hold a competitive process to select private
20 sector partners, if they are engaged, to support the
21 implementation of the example solution;

22 (7) consider hosting the project at the National
23 Cybersecurity Center of Excellence; and

24 (8) ensure that cybersecurity best practices con-
25 sistent with the Cybersecurity Framework of the Na-

1 tional Institute of Standards and Technology are
2 demonstrated in the project.

3 (c) BRIEFINGS TO CONGRESS.—Not later than 1 year
4 after the date of enactment of this Act, the Director of
5 the National Institute of Standards and Technology shall
6 offer a briefing to the relevant congressional committees
7 on the progress and current findings from the project
8 under this section.

9 (d) PUBLIC REPORT.—Not later than 12 months
10 after the completion of the project under this section, the
11 Director of the National Institute of Standards and Tech-
12 nology shall make public a report on the results and find-
13 ings from the project.

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