

119TH CONGRESS
1ST SESSION

S. 3468

To establish a national programmable cloud laboratories network to enhance research efficiency, innovation, and collaboration, and for other purposes.

IN THE SENATE OF THE UNITED STATES

DECEMBER 11, 2025

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

A BILL

To establish a national programmable cloud laboratories network to enhance research efficiency, innovation, and collaboration, 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 “National Program-
5 mable Cloud Laboratories Network Act of 2025”.

6 **SEC. 2. DEFINITIONS.**

7 (a) DEFINITIONS.—In this Act:

8 (1) ARTIFICIAL INTELLIGENCE.—The term “ar-
9 tificial intelligence” has the meaning given such

1 term in section 5002 of the William M. (Mac)
2 Thornberry National Defense Authorization Act for
3 Fiscal Year 2021 (15 U.S.C. 9401).

4 (2) DIRECTOR.—Unless otherwise provided, the
5 term “Director” means the Director of the National
6 Science Foundation.

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

11 (4) NETWORK.—The term “Network” means
12 the National Programmable Cloud Laboratories Net-
13 work.

14 (5) NODE.—The term “node” means a pro-
15 grammable cloud laboratory designated as part of
16 the Network.

17 (6) NON-DESIGNATED LABORATORY.—The term
18 “non-designated laboratory” means any Federal,
19 academic, nonprofit, or private industry program-
20 mable cloud laboratory not selected as a node under
21 section 3.

22 (7) PROGRAMMABLE CLOUD LABORATORY.—
23 The term “programmable cloud laboratory” means a
24 physical laboratory that is equipped with research
25 instrumentation and advanced manufacturing capa-

1 bilities, including robotics and artificial intelligence,
2 that can be securely and remotely programmed and
3 controlled in order to conduct experiments and col-
4 lect associated data.

5 **SEC. 3. NATIONAL PROGRAMMABLE CLOUD LABORATORIES**

6 **NETWORK.**

7 (a) PURPOSES.—The purposes of the Network estab-
8 lished under this Act are—

9 (1) to maintain leadership by the United States
10 in advanced experimentation, laboratory automation,
11 and artificial intelligence for scientific research, ad-
12 vanced manufacturing, long-term economic competi-
13 tiveness, and national security;

14 (2) to reduce the cost of federally funded re-
15 search through automation and reproducibility;

16 (3) to accelerate national competitiveness by
17 transferring government-funded research to private-
18 sector commercial applications;

19 (4) to improve collaboration among federally
20 funded national laboratories, institutions of higher
21 education, and private industry;

22 (5) to ensure that investment in programmable
23 cloud laboratories results in measurable cost savings,
24 efficiencies, and long-term fiscal sustainability;

1 (6) to incentivize private-sector cost-sharing in
2 research infrastructure and equipment;

3 (7) to support workforce development aligned
4 with the technical needs of industry in the United
5 States;

6 (8) to advance the development of a domestic
7 industrial base for scientific automation tools, artificial
8 intelligence systems for experimentation, and robotics
9 platforms for use in laboratory settings; and

10 (9) to further programmable cloud laboratory
11 research in areas such as materials science, biotechnology,
12 chemistry, and other scientific or engineering disciplines
13 where automation and cloud-enabled experimentation can deliver
14 transformative results, including advanced materials synthesis
15 and characterization, scalable biotechnology experimentation,
16 and high-throughput chemical catalyst development.
17 development.

18 (b) ESTABLISHMENT.—

19 (1) IN GENERAL.—Not later than 1 year after
20 the date of enactment of this Act, the Director, in
21 consultation with the Director of the National Institute
22 of Standards and Technology, shall designate
23 and oversee a National Programmable Cloud Laboratories
24 Network of not more than 6 nodes to sup-
25

1 port secure, standards-based, and cost-effective re-
2 mote experimentation and automated research.

3 (2) ASSESSMENT SEQUENCING.—The assess-
4 ment required under section 5 shall be conducted
5 only after the final designation of nodes under para-
6 graph (1).

7 (3) NODES.—The Network shall consist of
8 nodes that—

9 (A) enable programmable workflows and
10 automated science;

11 (B) provide access to advanced scientific
12 and manufacturing instruments, including arti-
13 ficial intelligence-enabled tools;

14 (C) collaborate to establish and adopt com-
15 mon standards, protocols, and best practices;
16 and

17 (D) support interoperability across and be-
18 tween nodes.

19 (c) APPLICATION AND SELECTION.—

20 (1) IN GENERAL.—The Director shall issue a
21 public solicitation for eligible entities to apply for
22 node designation.

23 (2) ELIGIBLE ENTITIES.—Eligible entities that
24 may apply for designation as a node include—

25 (A) institutions of higher education;

- 1 (B) nonprofit research organizations;
- 2 (C) private-sector research entities; and
- 3 (D) consortia or collaborations of the enti-
- 4 ties described in subparagraphs (A) through
- 5 (C).

6 (d) APPLICATIONS FOR DESIGNATION.—An eligible
7 entity that desires to apply for designation as a node in
8 the Network shall submit an application to the Director
9 at such time and in such manner as the Director may re-
10 quire. The application shall include—

11 (1) a technical and programmatic plan for lab-
12 oratory operations, automation capabilities, and data
13 integration;

14 (2) a plan to achieve long-term self-sustain-
15 ability, including metrics, interim milestones, and a
16 timeline for reducing reliance on Federal funding;
17 and

18 (3) evidence of non-Federal cost share, private
19 capital, or other third-party contributions dem-
20 onstrating self-sustainability potential.

21 (e) EVALUATION OF APPLICANTS.—The Director
22 shall ensure that the process for selecting eligible entities
23 for designation in the Network shall be competitive, merit-
24 reviewed, and transparent, evaluating—

1 (1) pre-existing laboratory infrastructure and
2 suitability for automated science;

3 (2) capacity to support distributed, cloud-en-
4 abled programmable workflows for multiple users;

5 (3) likelihood of achieving long-term sustain-
6 ability without continued Federal funding;

7 (4) demonstrated ability to collaborate with
8 other nodes, academic partners, industry partners,
9 or other Federal research agencies (as defined in
10 section 10002 of the Research and Development,
11 Competition, and Innovation Act (42 U.S.C.
12 18901));

13 (5) protocols for research security, cybersecu-
14 rity, and responsible access; and

15 (6) demonstration of user interest and research
16 needs.

17 (f) DESIGNATION.—In designating nodes, the Direc-
18 tor shall provide preference for applications demonstrating
19 meaningful third-party cost share and pre-existing infra-
20 structure.

21 (g) RESPONSIBILITIES.—Each node selected by the
22 Director shall—

23 (1) support the purposes described in sub-
24 section (a)(9);

1 (2) facilitate collaboration among Network
2 members to expand and integrate automated science
3 capabilities and best practices;

4 (3) actively participate with the Director of Na-
5 tional Institute of Standards and Technology in de-
6 veloping network-wide interoperability, data-sharing,
7 cybersecurity, and artificial intelligence-assisted ex-
8 perimentation standards;

9 (4) support secure sharing of experimental
10 data, models, and results across institutions of high-
11 er education participating in the Network, if applica-
12 ble;

13 (5) provide a secure digital infrastructure to en-
14 able remote experimentation, artificial intelligence-
15 assisted analysis, and reproducible science;

16 (6) engage in public-private partnerships to
17 streamline the transfer of technology developed
18 using Network infrastructure;

19 (7) develop and maintain a financial sustain-
20 ability plan to reduce long-term reliance on Federal
21 funds, including through user fees, licensing, con-
22 sortia membership, or other revenue-generating mod-
23 els;

24 (8) establish performance metrics, including sci-
25 entific output, cost-effectiveness, academic engage-

1 ment, private-sector engagement, user satisfaction,
2 and reproducibility of results; and

3 (9) where practicable, leverage commercially
4 available hardware and software solutions to mini-
5 mize cost and accelerate deployment of automated
6 science capabilities.

7 **SEC. 4. INTERAGENCY COLLABORATION.**

8 Not later than 180 days after all nodes of the Net-
9 work are designated, the Director of the National Institute
10 of Standards and Technology, in cooperation with the Di-
11 rector and participating eligible entities (including institu-
12 tions of higher education), shall—

13 (1) develop and promulgate standards to ensure
14 interoperability across Network nodes, including lab-
15 oratory instrumentation, data infrastructure, com-
16 munication protocols, and experiment execution sys-
17 tems;

18 (2) establish protocols for secure, seamless, and
19 standardized data-sharing among all members of the
20 Network aligned with node-level cybersecurity and
21 research security protocols;

22 (3) define minimum technical requirements and
23 operating procedures to support remote experimen-
24 tation, experiment reproducibility, and artificial in-
25 telligence-assisted workflows; and

1 (4) periodically update such standards in con-
2 sultation with private-sector partners and nodes of
3 the Network to reflect advancements in hardware,
4 software, and automation technology.

5 **SEC. 5. ASSESSMENT OF NON-DESIGNATED LABORATORIES.**

6 (a) **ASSESSMENT REQUIREMENT.**—Not later than
7 180 days after the Director designates the final node of
8 the Network under section 3, the Director, in consultation
9 with the Secretary of Energy and the Director of the Na-
10 tional Institute of Standards and Technology, shall con-
11 duct and submit to the appropriate committees of Con-
12 gress, a comprehensive assessment of non-designated lab-
13 oratories.

14 (b) **SCOPE.**—The assessment shall identify, to the ex-
15 tent practicable—

16 (1) Federal laboratories, institutions of higher
17 education, nonprofit organizations, and private-sec-
18 tor laboratories that possess or are developing pro-
19 grammable, automated, or remotely accessible re-
20 search infrastructure;

21 (2) the instrumentation, automation, and data
22 capabilities of such laboratories;

23 (3) cybersecurity and research security meas-
24 ures relevant to interoperability;

1 (4) existing or potential pathways for such lab-
2 oratories to coordinate with Network nodes in areas
3 such as data-sharing, standards adoption, or pilot
4 interoperability projects; and

5 (5) legal, contractual, or intellectual property
6 considerations that may affect participation.

7 (c) CONFIDENTIALITY AND SECURITY.—Proprietary
8 information shall be protected from public disclosure con-
9 sistent with applicable law. The Director shall publish a
10 nonproprietary public summary of the assessment and
11 may submit a proprietary annex to the congressional com-
12 mittees of jurisdiction.

13 **SEC. 6. REPORTING AND OVERSIGHT.**

14 (a) ANNUAL BRIEFINGS.—Not later than 1 year after
15 the date of enactment of this Act, and annually thereafter,
16 the Director shall brief the Committee on Commerce,
17 Science, and Transportation of the Senate and the Com-
18 mittee on Science, Space, and Technology of the House
19 of Representatives on the status of the Network.

20 (b) CONTENTS.—Each briefing required under sub-
21 section (a) shall include an assessment of—

22 (1) the alignment of supported research with
23 national scientific and economic priorities;

1 (2) the progress each node of the Network has
2 made toward achieving self-sustainability as de-
3 scribed in section 3(d)(2); and

4 (3) the performance metrics established in sec-
5 tion 3(g)(8).

6 **SEC. 7. SUNSET.**

7 The National Programmable Cloud Laboratories Net-
8 work, including all authorities, programs, and funding
9 provided under this Act, shall terminate on September 30,
10 2031.

