

**Calendar No. 375**

116TH CONGRESS }  
*1st Session* }

SENATE

{ REPORT  
116-179

DEVELOPING INNOVATION AND GROWING  
THE INTERNET OF THINGS ACT

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R E P O R T

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND  
TRANSPORTATION

ON

S. 1611



DECEMBER 17, 2019.—Ordered to be printed

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED SIXTEENTH CONGRESS

FIRST SESSION

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### DEVELOPING INNOVATION AND GROWING THE INTERNET OF THINGS ACT

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Mr. WICKER, from the Committee on Commerce, Science, and  
Transportation, submitted the following

### R E P O R T

[To accompany S. 1611]

[Including cost estimate of the Congressional Budget Office]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 1611) to ensure appropriate prioritization, spectrum planning, and interagency coordination to support the Internet of Things, having considered the same, reports favorably thereon with amendments and recommends that the bill (as amended) do pass.

#### PURPOSE OF THE BILL

S. 1611 would take steps to help develop a national strategy to encourage the development of the Internet of Things (IoT).

#### BACKGROUND AND NEEDS

IoT can be described as the widespread integration and proliferation of Internet-connected devices. Some commentators have observed that IoT brings the physical and digital world together.<sup>1</sup> IoT use cases include subcutaneous body sensors that provide a patient's real-time vital signs to medical providers to applications that allow users' phones to monitor and adjust household functions (like pre-heating an oven, running a bath, and controlling smart lightbulbs). IoT can also be used in infrastructure, such as smart cities where ubiquitous sensors allow for smoother flow of traffic;

<sup>1</sup>“Samsung CEO BK Yoon’s Internet of Things Keynote at CES 2015” (full transcript), The Sinju Post, Jan. 14, 2015 (<https://singjupost.com/samsung-ceo-bk-yoons-internet-of-things-keynote-at-ces-2015-full-transcript/>).

and roadways, buildings, bridges, and dams with embedded sensors that automatically communicate their structural integrity to officials, providing alerts when repairs or upgrades are needed.<sup>2</sup> Industries are expected to use IoT to speed processes, create operational and manufacturing efficiencies, and better serve consumers. Specifically, IoT may provide benefits in the following areas:

- Gains in health care through remote monitoring;
- Improvements in manufacturing efficiency and supply chain tracking;
- Reductions in peak electrical grid usage;
- Traffic management that adjusts traffic light timing and bus routes; and
- Improvements in agriculture through better water management and the ability to more closely track changes in soil temperature, as well as levels of carbon and nitrogen.<sup>3</sup>

IoT is rapidly growing.<sup>4</sup> In 2017, there were an estimated 8.4 billion IoT devices in use.<sup>5</sup> By the end of 2019, more than 26 billion IoT devices are predicted to be in use.<sup>6</sup> And by 2025, it is expected that the number of IoT devices will total at least 64 billion.<sup>7</sup>

It is forecast that worldwide technology spending on IoT will reach \$1.2 trillion in 2022.<sup>8</sup> One analyst group, McKinsey & Company, estimates that IoT has a potential to contribute as much as \$11.1 trillion to the world economy annually by 2025.<sup>9</sup> Health care applications alone could have an economic impact of more than \$163 billion by 2020<sup>10</sup> and \$1.1 trillion to \$2.5 trillion per year by

<sup>2</sup>Anderson, Janna and Lee Rainie, “The Internet of Things Will Thrive by 2025,” Pew Research Center (May 14, 2014) (<https://www.pewinternet.org/2014/05/14/internet-of-things/>); see also, Rainie, Lee and Janna Anderson, “The Internet of Things Connectivity Binge: What Are the Implications?,” Pew Research Center, Jun. 6, 2017 (<https://www.pewinternet.org/2017/06/06/the-internet-of-things-connectivity-binge-what-are-the-implications/>).

<sup>3</sup>McKinsey Global Institute, *Disruptive Technologies: Advances That Will Transform Life, Business, and the Global Economy*, May 2013, at pp. 56–58 (<https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/disruptive-technologies>).

<sup>4</sup>See, e.g., Manyika, James, et al, “Unlocking the Potential of the Internet of Things,” McKinsey Global Institute, Report, June 2015 (<https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world>); see also, Kranz, Maciej, “IoT For Economic And Social Good: How the Internet of Things Makes Our World Better,” *Forbes*, Jun. 14, 2018 (<https://www.forbes.com/sites/forbestechcouncil/2018/06/14/iot-for-economic-and-social-good-how-the-internet-of-things-makes-our-world-better/#1263aff0100f>); see also Rosenbush, Steve, “The Morning Download: Steelcase CIO Bets Big on the Connected Office,” *Wall Street Journal*, Apr. 6, 2018 (<https://blogs.wsj.com/cio/2018/04/06/the-morning-download-steelcase-cio-bets-big-on-the-connected-office/>).

<sup>5</sup>Gartner Says 8.4 Billion Connected “Things” Will Be In Use in 2017, Up 31 Percent From 2016, Gartner, Feb. 7, 2017 (<https://www.gartner.com/newsroom/id/3598917>).

<sup>6</sup>Marr, Bernard, “5 Internet of Things Trends Everyone Should Know About,” *Forbes*, Feb. 4, 2019 (<https://www.forbes.com/sites/bernardmarr/2019/02/04/5-internet-of-things-trends-everyone-should-know-about/#5d1d1cac4b1f>).

<sup>7</sup>Newman, Peter, “IoT Report: How Internet of Things Technology Growth Is Reaching Mainstream Companies and Consumers,” *Business Insider*, Jan. 28, 2019 (<https://www.businessinsider.com/internet-of-things-report>).

<sup>8</sup>Columbus, Louis, “2018 Roundup of Internet of Things Forecasts and Market Estimates,” *Forbes*, Dec. 13, 2018 (<https://www.forbes.com/sites/louiscolombus/2018/12/13/2018-roundup-of-internet-of-things-forecasts-and-market-estimates/#149870eb7d83>).

<sup>9</sup>Menard, Alexandre, “How Can we Recognize the Real Power of the Internet of Things?,” McKinsey & Company, Nov. 2017 (<https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/how-can-we-recognize-the-real-power-of-the-internet-of-things>); see also McKinsey Global Institute, *The Internet of Things: Mapping the Value Beyond the Hype*, McKinsey & Company, June 2015 ([https://www.mckinsey.com/-/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/The%20Internet%20of%20Things%20The%20value%20of%20digitizing%20the%20physical%20world/Unlocking\\_the\\_potential\\_of\\_the\\_Internet\\_of\\_Things\\_Executive\\_summary.ashx](https://www.mckinsey.com/-/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/The%20Internet%20of%20Things%20The%20value%20of%20digitizing%20the%20physical%20world/Unlocking_the_potential_of_the_Internet_of_Things_Executive_summary.ashx)).

<sup>10</sup>Accenture 2017 Internet of Health Things Survey, Accenture Consulting, at 2 (2017) ([https://www.accenture.com/\\_acnmedia/PDF-42/Accenture-Health-2017-Internet-of-Health-Things-Survey.pdf?la=en#zoom=50](https://www.accenture.com/_acnmedia/PDF-42/Accenture-Health-2017-Internet-of-Health-Things-Survey.pdf?la=en#zoom=50)).

2025.<sup>11</sup> Estimates for industrial uses of IoT, known as Industrial IoT (IIoT), suggest the addition of \$14.2 trillion to the global economy by 2030.<sup>12</sup>

Estimates of the impact of IoT on the U.S. economy vary, but experts project the impact to be substantial. For instance, Accenture estimates the U.S. economy will gain \$6.1 trillion in cumulative GDP by 2030 from IIoT and, with additional measures such as infrastructure improvements, IIoT may be worth as much as \$7.1 trillion to the U.S. economy.<sup>13</sup>

Some have argued that, to fully realize the potential of IoT, countries should craft a national strategy to promote IoT development and adoption, which the United States has not done.<sup>14</sup> Establishing such a national strategy to encourage the development of IoT has the support of a diverse set of business and industry stakeholders, including The App Association, the U.S. Chamber of Commerce, CTIA, the Competitive Carriers Association, the Computing Research Association, the Consumer Technology Association, Intel, the Information Technology Industry Council, the Information Technology and Innovation Foundation, Security Industry Association, the Semiconductor Industry Association, the Telecommunications Industry Association, and VMware.

#### SUMMARY OF PROVISIONS

If enacted, S. 1611, the Developing Innovation and Growing the Internet of Things Act, or the DIGIT Act, would do the following:

- Help create a national strategy for IoT.
- Require the Secretary of Commerce (Secretary) to convene a working group of Federal agencies, advised by a steering committee of nongovernmental stakeholders established within the Department of Commerce (DOC), to provide recommendations to Congress on how to plan and encourage the growth of IoT.
- Direct the Federal Communications Commission (FCC), in consultation with DOC's National Telecommunications and Information Administration (NTIA), to issue a report (after seeking public comment) on the spectrum needs required to support IoT.

#### LEGISLATIVE HISTORY

S. 1611 was introduced on May 22, 2019, by Senator Fischer (for herself and Senators Booker, Gardner, and Schatz) and was referred to the Committee on Commerce, Science, and Transportation of the Senate. On July 10, 2019, the Committee met in open Executive Session and, by voice vote, ordered S. 1611 reported favorably with amendments. Senator Lee offered two amendments—one

<sup>11</sup>O'Sullivan, Andrea; Thierer, Adam, "Projecting the Growth and Economic Impact of the Internet of Things," Mercatus Center Policy Briefing, Jun. 15, 2015, at p. 7 (<https://www.mercatus.org/system/files/IoT-EP-v3.pdf>).

<sup>12</sup>Winning With the Industrial Internet of Things, Accenture, 2015, pp. 2–3 ([https://www.accenture.com/t20150523T023647\\_w/us-en/acnmedia/Accenture/Conversion-Assets/DocCom/Documents/Global/PDF/Dualpub\\_11/Accenture-Industrial-Internet-of-Things-Positioning-Paper-Report-20pdf](https://www.accenture.com/t20150523T023647_w/us-en/acnmedia/Accenture/Conversion-Assets/DocCom/Documents/Global/PDF/Dualpub_11/Accenture-Industrial-Internet-of-Things-Positioning-Paper-Report-20pdf) (Accenture Report)).

<sup>13</sup>Accenture Report at 3.

<sup>14</sup>See, e.g., "Technology Industry Leaders Release National Strategy to Maximize U.S. Economic and Societal Benefits from the Internet of Things, Information Technology Industry Council, Oct. 3, 2017 (<https://www.itic.org/news-events/news-releases/technology-industry-leaders-release-national-strategy-to-maximize-u-s-economic-and-societal-benefits-from-the-internet-of-things>).

amendment that would limit the compensation paid to private sector representatives on the steering committee created by the bill, and the second amendment that would terminate the DIGIT Act steering committee once it has filed its report with the working group.

S. 1611 is substantially similar to S. 88, a bill introduced in the 115th Congress on January 10, 2017, by Senator Fischer (for herself and Senators Booker, Gardner, and Schatz), and which was referred to the Committee on Commerce, Science, and Transportation of the Senate. On January 24, 2017, the Committee met in open Executive Session and, by voice vote, ordered that bill reported favorably without amendment. On August 3, 2017, that bill passed the Senate with an amendment, by voice vote, and on August 11, 2017, that bill was referred to the Subcommittee on Communications and Technology of the Committee on Energy and Commerce of the House of Representatives.

S. 1611 also is substantially similar to S. 2607, a bill introduced in the 114th Congress on March 1, 2016, by Senator Fischer (for herself and Senators Ayotte, Booker, and Schatz), and which was referred to the Committee on Commerce, Science, and Transportation of the Senate. On April 27, 2016, the Committee met in open Executive Session and, by voice vote, ordered S. 2607 reported favorably with an amendment (in the nature of a substitute). On September 27, 2016, Senator Thune reported that bill favorably with an amendment (in the nature of a substitute), and it was placed on the Senate Legislative Calendar.

On February 11, 2015, the Committee on Commerce, Science, and Transportation, as the Senate Committee with primary and general jurisdiction over Internet and IoT matters, held the first-ever congressional hearing examining the economic and policy implications of IoT. The Committee received testimony from a panel of five private sector witnesses.<sup>15</sup>

#### ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

<sup>15</sup> See, “The Connected World: Examining the Internet of Things,” Committee on Commerce, Science, and Transportation of the Senate, Feb. 11, 2015, webcast (<https://www.commerce.senate.gov/public/index.cfm/hearings?ID=D3E33BDE-30FD-4899-B30D-906B47E117CA>), and published hearing (<https://www.govinfo.gov/content/pkg/CHRG-114shrg99818/pdf/CHRG-114shrg99818.pdf>).

<b>S. 1611, Developing Innovation and Growing the Internet of Things Act</b>			
As ordered reported by the Senate Committee on Commerce, Science, and Transportation on July 10, 2019			
By Fiscal Year, Millions of Dollars	2019	2019-2024	2019-2029
Direct Spending (Outlays)	0	0	0
Revenues	0	0	0
Deficit Effect	0	0	0
Spending Subject to Appropriation (Outlays)	0	7	not estimated
Statutory pay-as-you-go procedures apply?	No	<b>Mandate Effects</b>	
Increases on-budget deficits in any of the four consecutive 10-year periods beginning in 2030?	No	Contains intergovernmental mandate?	No
		Contains private-sector mandate?	No

S. 1611 would require the Department of Commerce (DOC) to convene a federal interagency working group to report to the Congress on the Internet of things (IoT).<sup>1</sup> The group would be required to identify laws and regulations that inhibit or promote IoT deployment, examine current and future federal IoT use, and recommend federal IoT security measures. The working group would consult with academic stakeholders and with those in the public, private, and nonprofit sectors.

S. 1611 also would establish a steering committee within DOC to advise the working group on IoT issues. Topics of study would include the economic effects of IoT and the availability of electromagnetic spectrum to meet users' demands. The committee would submit its findings to the working group, which would report them to the Congress.

Finally, under S. 1611 the Federal Communications Commission (FCC), in consultation with the National Telecommunications and Information Administration, would seek public comments on current and future spectrum needs to ensure adequate IoT connectivity and to report those findings to the Congress.

Using information from the affected agencies, CBO estimates that implementing S. 1611 would cost \$7 million over the 2020–2021 period for DOC to hire about 22 employees, to convene the working group, and to issue the mandated reports. Such spending would be subject to appropriation of the estimated amounts.

CBO also expects that participating in the working group and completing the spectrum report would cost the FCC less than \$500,000. The FCC is authorized to collect fees sufficient to offset the costs of its regulatory activities each year; therefore, CBO estimates that the net cost of those activities would be negligible, assuming appropriation actions consistent with that authority.

The CBO staff contact for this estimate is David Hughes. The estimate was reviewed by Theresa Gullo, Assistant Director for Budget Analysis.

<sup>1</sup>The IoT consists of devices connected one another and to a network for exchanging data without human interaction. See Suzy E. Park, *Internet of Things (IoT): An Introduction*, In Focus Report 11239 (Congressional Research Service, June 4, 2019), <https://go.usa.gov/xVcdR>.

## REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported:

## NUMBER OF PERSONS COVERED

The bill does not authorize any new regulations and would not subject any individuals or businesses to new regulations.

## ECONOMIC IMPACT

The bill would not have an adverse economic impact on the Nation.

## PRIVACY

The bill would not have any adverse impact on the personal privacy of individuals.

## PAPERWORK

S. 1611, as reported, would require three reports from the Federal Government. The first report would be submitted by the steering committee to the working group within 1 year after the date of the bill's enactment. The second report would be submitted by the working group to Congress no later than 18 months after the date of enactment. The third report would require the FCC to submit to the appropriate committees of Congress, no later than 1 year after enactment, a report (after seeking public comment) on the current, as of the date of enactment, and future spectrum needs of IoT.

## CONGRESSIONALLY DIRECTED SPENDING

In compliance with paragraph 4(b) of rule XLIV of the Standing Rules of the Senate, the Committee provides that no provisions contained in the bill, as reported, meet the definition of congressionally directed spending items under the rule.

## SECTION-BY-SECTION ANALYSIS

*Section 1. Short title*

This section would provide that the legislation may be cited as the "Developing Innovation and Growing the Internet of Things Act" or the "DIGIT Act."

*Section 2. Findings; sense of Congress*

This section would set out findings and express the sense of Congress that IoT policies should do the following:

- Promote solutions with respect to IoT that are secure, scalable, interoperable, industry-driven, and standards-based.
- Maximize the development and deployment of IoT to benefit all stakeholders, including businesses, governments, and consumers.

### *Section 3. Definitions*

This section would establish definitions for terms used throughout the bill.

### *Section 4. Federal working group*

This section would require the Secretary of Commerce to convene a working group of Federal entities to study and make recommendations on various IoT matters. It also would establish a steering committee within the DOC comprised of a wide range of stakeholders outside the Federal Government to make recommendations to the working group.

The Secretary would have discretion in forming the Federal working group, but would be required to consider seeking representation from the Department of Commerce (including NTIA, the National Institute of Standards and Technology, and the National Oceanic and Atmospheric Administration) and the following departments and agencies: the Departments of Transportation, Homeland Security, and Energy; the Office of Management and Budget; the National Science Foundation; the FCC; the Federal Trade Commission; the Office of Science and Technology Policy; and the Federal Energy Regulatory Commission.

The section would require the working group to do the following:

- Identify any Federal regulations, statutes, grant practices, budgetary or jurisdictional challenges, and other sector-specific policies that are inhibiting or could inhibit the development of IoT;
- Consider policies or programs that encourage and improve coordination among Federal agencies with jurisdiction over IoT;
- Consider any findings or recommendations made by the steering committee and, where appropriate, act to implement those recommendations; and
- Examine how Federal agencies use and can benefit from IoT, including preparedness to adopt IoT and any additional security measures that Federal agencies may need to take (ensuring that such security measures are properly coordinated among Federal entities).

The working group would be required to consult with various nongovernmental stakeholders, including, among others, the steering committee and subject matter experts representing a variety of industry and civil society stakeholders (including small business and rural stakeholders).

The steering committee, which also would be appointed by the Secretary of Commerce, would advise the working group on the following:

- Potential regulatory, statutory, grant, programmatic, budgetary, jurisdictional, and sector-specific challenges to the development of IoT;
- Situations in which the use of IoT is likely to deliver significant and scalable economic and societal benefits;
- Spectrum availability to support IoT;
- Policies, programs, and multi-stakeholder activities relating to privacy, security, or coordination among Federal agencies with jurisdiction over IoT;
- The use of IoT by small businesses; and
- International proceedings affecting IoT.

The steering committee, within 1 year of the bill's enactment, would be required to submit its findings and recommendations to the working group.

The section would further provide that the steering committee would be required to set its own agenda in carrying out its duties, but that the working group could suggest topics or items for committee consideration. It also would state that the steering committee's report must be the result of the independent judgment of the committee. The steering committee would terminate upon the filing of its report, and members of the working group would receive no compensation for their service.

The working group would be required to submit its findings and recommendations to Congress, along with the steering committee's findings and recommendations, no later than 18 months after the bill's enactment. The report would be required to include the working group's recommendations for action or reasons for inaction on the steering committee's recommendations, along with an accounting of the progress made by Federal agencies in implementing recommendations from both the steering committee and the working group. A copy of the report would be required to be provided to several named Congressional committees.

*Section 5. Assessing spectrum needs*

This section would require the FCC, in consultation with NTIA, to issue a notice of inquiry seeking public comment on the current and future spectrum needs of IoT. Specifically, the inquiry would seek comment on the following:

- The adequacy of available spectrum or planned allocations for wireless services that could support IoT;
- If adequate spectrum is not available for IoT, how to ensure that it is made available;
- What regulatory barriers exist to providing any needed spectrum; and
- The role of licensed and unlicensed spectrum in the growth of IoT.

This section would further provide that, within 1 year of the bill's enactment, the FCC be required to submit to various named congressional committees a report summarizing the comments submitted in response to the notice of inquiry.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, the Committee states that the bill as reported would make no change to existing law.