June 2, 2016

Mr. Lawrence E. Strickling
Assistant Secretary for Communications and Information
U.S. Department of Commerce
1401 Constitution Avenue, NW
Washington, DC 20230

Re: Internet of Things Request for Comments [Docket No. 160331306-6306-01]

Dear Assistant Secretary Strickling,

BSA | The Software Alliance ("BSA")[1] is thankful for the opportunity to contribute to the NTIA's ambitious study on the Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things.[2] As the leading advocate for the software industry in the United States and around the world, BSA has a keen interest in this study and is hopeful that it will aid in the development of a national strategy for leveraging the full potential of the Internet of Things and its underlying technologies.

As the Notice of Inquiry observes, the "Internet of Things" (or "IoT") is an umbrella term for a broad set of technologies and supporting services that collectively have the potential to transform virtually every facet of modern life. BSA members are on the leading edge of developing these new network-connected technologies that leverage data in ways that are giving rise to what economists from the Massachusetts Institute of Technology have deemed the "Second Machine Age," a period in which software-enabled innovations will be "as important and transformational to society and the economy as the steam engine."[3]

---

[1] BSA's members include: Adobe, ANSYS, Apple, Autodesk, Bentley Systems, CA Technologies, CNC Software -Mastercam, DataStax, Dell, IBM, Intuit, Microsoft, Minitab, Oracle, Salesforce, SAS Institute, Siemens PLM Software, Splunk, Symantec, Tekla, The MathWorks, Trend Micro, and Workday.

[2] National Telecommunications and Information Administration, *The Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things*, 81 Fed. Reg. 19956 (Apr. 6, 2016) [hereinafter IoT RFC].

[3] Erik Brynjolfsson & Andrew McAffee, *The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies* 9 (W. W. Norton & Co. 2014).

Given the broad set of underlying technologies and endless potential use cases that are implicated by the Internet of Things, a one-size-fits-all approach to regulation would be counterproductive. We are therefore pleased by the Department of Commerce's decision to undertake a "holistic, ecosystem-wide" evaluation of the opportunities and risks posed by the Internet of Things, and by its intention to "work with stakeholders to develop industry-driven solutions." Consistent with the Department of Commerce's overall mission, we submit that the focus of this study should be on identifying the "conditions that will enable the private sector to grow the economy, innovate, and create jobs."[4]

As detailed more fully below, the growth of the Internet of Things presents incredible opportunities for all segments of the US economy. In order to realize the full beneficial potential of these data-driven technologies, however, the public must trust the digital devices and services upon which the IoT is built. Establishing such a foundation of trust requires transparency, security, and predictability. For instance, technology providers must ensure that the public understands what data is being collected, how that data will be used, and that it will be secured using the best available technologies. At the same time, Congress must update the legal framework to ensure that consumers around the world can trust in the ability of US technology providers to be good stewards of user data.

In addition, drawing from the Department of Commerce's core competencies, we offer suggestions in these comments for future work streams that would foster IoT innovation and growth:

- To help the US government become an early adopter of IoT, we urge the Department of Commerce to perform an economic study to evaluate how IoT can be leveraged to increase government efficiency, improve the quality of government services, and reduce long-term government spending.

- To eliminate trade barriers that disproportionately impact US technology providers, the Department of Commerce — with other trade agencies in the interagency process — should also engage with US trading partners to promote policies that are conducive to cross-border data flows, encourage the adoption of open, voluntary and consensus-based international standards, secure existing rights and obligations in trade agreements, and leverage those commitments to break down barriers to trade in IoT devices and services.

- To ensure that the US remains an attractive location for IoT-related research and development, the Department of Commerce should help to promote workforce development policies that train the next generation of innovators.

---

[4] IoT RFC at 19958.

Internet of Things and the Data Economy

The "Internet of Things" describes the growing network of "smart" devices that are embedded with Internet-connected sensors and that leverage cloud-based analytics that make the data actionable. Unlike Internet-connected devices that have been around for decades, advances in technology now enable "devices of all kinds — including smartphones, wearables, appliances, medical equipment, and vehicles — to connect with the Internet and each other to create, share and analyze information, all without human intervention."[5] These software-enabled devices use sensors to collect large volumes of data that can be stored and processed in the cloud to increase automation, improve efficiency, bolster performance, and add functionality to product and service offerings.

The promise of the Internet of Things lies in the data it receives and produces and in the technologies that transform that raw data into actionable intelligence. Economists estimate that companies investing in technologies to make better use of data will benefit from a "data dividend" of $1.6 trillion in the next four years alone and that data-enabled efficiency gains could add almost $15 trillion to global GDP by 2030.[6] Unsurprisingly, 90 percent of today's business leaders cite data as a key resource and fundamental business differentiator, on par with basic resources like land, labor, and capital.[7]

Companies in every segment of the economy are therefore quickly developing IoT strategies to improve their processes for gathering, storing, securing, analyzing and acting upon data. Consumers now have access to a range of IoT products that provide unique insights to improve their daily lives. For instance, both Apple and Microsoft have launched wearable devices with sensors that measure biometric data and provide unprecedented insights to help consumers optimize their workouts and live more healthfully.[8] A variety of "smart home" devices now enable consumers to automate daily tasks and reduce their energy consumption. And, new automobiles are equipped with more than 10 million lines of software code to control sensors that generate up to 25 gigabytes of data per hour that can be processed to enable safety and crash avoidance systems, reduce congestion, and route traffic more efficiently.[9]

---

[5] Deloitte, *The Internet of Things Ecosystem: Unlocking the Business Value of Connected Devices* 5 (2014), at http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Technology-Media-Telecommunications/gx-tmt-Iotecosystem.pdf

[6] BSA | The Software Alliance, *What's the Big Deal With Data?* 3 (2015), at http://data.bsa.org/wp-content/uploads/2015/12/bsadatastudy_en.pdf

[7] Economist Intelligence Unit, *The Deciding Factor: Big Data & Decision Making*, Cap Gemini, 2012, *available at* https://www.capgemini.com/resources/the-deciding-factor-big-data-decision-making.

[8] *See* https://www.microsoft.com/Microsoft-Band/en-us; http://www.apple.com/watch/

[9] BSA, *What's the Big Deal With Big Data?*, p. 15

By 2020, analysts predict that there will be more than 50 billion IoT devices relied upon by consumers, governments and businesses.[10] While consumer-facing IoT devices have understandably drawn much of the attention, commercial and industrial sector applications are likely to account for upwards of 70 percent of the data-added value enabled by the Internet of Things.[11] For instance, during transcontinental flights, the sensors on a commercial aircraft's engines, flaps and landing gear can generate half a terabyte of data that is used to improve flight performance, reduce turbulence, and identify possible engine defects before they impact mission critical systems.[12] Telematic sensors in tens of thousands of delivery vehicles track engine performance, improve routing, and reduce fuel consumption and overall emissions.[13] And, cities are using sensors embedded in critical infrastructure to improve the efficiency of their resource management, public health, and transportation systems. Experts forecast that these types of IoT smart city initiatives will have an economic impact of up to $1.6 trillion per year by 2025.[14]

Consumer Trust and the Data Economy

Data innovation is not only transforming how we interact with the world around us, it is also fueling a powerful new job-creation engine and potent job-force multiplier. In fact, Gartner estimated that upwards of 4.4 million IT jobs globally would be created to support data innovation by 2015 alone.[15] More importantly, for every data-related IT job created, another three jobs are estimated to be created for people outside of IT.[16]

Fully capitalizing on the promise of the new data economy, however, requires a foundation of trust. Enterprises, governments and consumers will take advantage of the convenience and efficiencies of the Internet of Things only to the extent that they can trust the underlying technologies that are making use of their data. They will want to ensure that their data is kept both private and secure.

---

[10] *See* Valerio, Pablo, *Internet of Things: 50 Billion Is Only the Beginning*, EE Times, Feb. 28, 2014, http://www.eetimes.com/document.asp?doc_id=1321229

[11] *See*, McKinsey Global Institute, *The Internet of Things: Mapping the Value Beyond the Hype*, at i (June 2015).

[12] BSA, *What's the Big Deal With Big Data?*, p. 8.

[13] *Id.*

[14] McKinsey Global Institute, *The Internet of Things: Mapping the Value Beyond the Hype*, at 5 (June 2015).

[15] Gartner, *Gartner Says Big Data Creates Big Jobs: 4.4 Million IT Jobs Globally to Support Big Data by 2015*.

[16] *Id.*

Of course, the balance of this trust equation will vary significantly depending on the particular nature of the IoT application in question. For instance, unlike certain consumer-facing devices, enterprise and industrial uses of IoT for things like predictive maintenance of equipment, automation of HVAC and lighting control systems, and transportation fleet management involve little, if any, personal information and therefore present fewer privacy risks. At the same time, IoT technologies that do not involve the collection of personal information, may nonetheless present heightened security concerns. The point is that the range of policy considerations implicated by the Internet of Things will inherently vary based on the risk profile of individual use cases.

While each use case presents unique considerations, the following principles should serve as touchstones as industry and government work together to foster a foundation of trust to encourage continued IoT innovation:

- **Transparency:** Transparency is critical to the trust equation. Companies that provide or use IoT systems must ensure that the public understands the type and volume of data that an IoT device is collecting and how that data will be used. Transparency regarding the collection of personally identifiable information is particularly critical for purposes of establishing user consent. The ideal method for providing users with notice will vary based on the manner in which the public interacts with a particular IoT technology. While on-screen disclosures may be possible in some instances, use of QR Codes, online notices, or other methods reasonably designed to provide notice will also serve an important role building trust.

- **Security:** Companies that provide or use IoT systems must also ensure that they are securing data and operation of their devices using the best available technologies. Security and privacy protections should be commensurate with the sensitivity of the data being collected and the device's potential risk profile. And companies must have the flexibility to continue to develop and implement new security technologies as they evolve. For example, encryption is an important tool for securing personally identifiable data in transit and at rest, and for maintaining authentication credentials to prevent bad actors from using IoT endpoints as gateways for broader network access.[17] Government proposals that would restrict the use of encryption or curtail companies' freedom to design more secure systems would undermine confidence in new and evolving technologies.

- **Privacy:** The legal framework for law enforcement access to data also plays a critical role in the trust equation. The law that enables such access in the United States — the Electronic Communications Privacy Act (ECPA) — was adopted in the 1980s, and its rules no longer reflect today's technological reality. As consumers generate new kinds of data with new devices and innovations like cloud computing challenge render political borders more permeable, ECPA's framework becomes increasingly unworkable. Consumers, technology providers, and law enforcement lack sufficient

---

[17] *See* BSA | The Software Alliance, *Encryption: Security Our Data, Security Our Lives* (2016), *available at* http://encryption.bsa.org/.

clarity and predictability about the regulations and laws that govern law enforcement requests for data. This has, unfortunately, created a misperception about the ability of US technology providers to serve as good stewards of user data. Existing laws that are based on outdated conceptions of technology must be updated to reflect today's realities. BSA therefore supports efforts to update ECPA, including legislation to require a warrant for access to digital communications and steps to create a framework for cross-border law enforcement requests for data.

- **Regulatory Humility:** Because the Internet of Things encompasses a broad range of technologies, business models, and use cases, governments must resist the temptation to pursue a one-size-fits-all approach to regulation. In most cases, existing legal regimes have proven sufficiently flexible in addressing new issues raised by emerging devices[18] and online services[19] without the need to tailor new legislation that may produce unintended consequences or add new burdens.

Commerce Department Initiatives to Promote IoT Innovation

Consistent with the objectives of this study, leadership from the Commerce Department on the following initiatives could have a meaningful impact on IoT innovation and growth:

- **Encouraging US Government Adoption of IoT:** As noted above, adoption of IoT could result in an economic impact of up to $1.6 trillion per year. The Commerce Department should undertake a study to determine how IoT technologies can be used by federal, state, and local governments to increase government efficiency, improve the quality of government services, and reduce long-term government spending. Commerce should explore whether public-private partnerships can be leveraged to help finance long-term capital intensive infrastructure projects.

- **Engaging with US Trading Partners to Eliminate Trade Barriers:** The Commerce Department — in conjunction with the other trade agencies in the interagency process — should continue to engage bilaterally and multilaterally to promote policies that are consistent with a free and open global Internet. Barriers to cross-border data flows, including requirements for data to be stored in local facilities, undermine the enormous efficiencies of scale and economic benefits that accrue from data innovation. It is our hope that the Commerce Department and its partner agencies will continue to promote global norms surrounding the free flow of data. They should likewise continue to encourage the adoption of open, voluntary, consensus-based standards, and should push back when trading partners attempt to introduce country-specific standards. It is important to ensure that IoT policies do not inadvertently undermine the hard fought gains secured in trade agreements, including existing

---

[18] *See* Comments of BSA | The Software Alliance to the Copyright Office, Software-Enabled Consumer Products Study (Feb. 17, 2016) available at http://1.usa.gov/24jiutu; Comments of Microsoft Corporation to the Copyright Office Software-Enabled Consumer Products Study (Feb. 17 2016), available at http://1.usa.gov/283VDHc.

[19] *See* Comments of BSA | The Software Alliance to the Copyright Office Section 512 Study (Apr. 1, 2016) available at http://1.usa.gov/1XQnISS; Comments of Microsoft Corporation to the Copyright Office Section 512 Study (Apr. 1, 2016), available at http://1.usa.gov/1O66J81.

rights and obligations on non-discrimination, transparency and due process, customs and other goods-related disciplines, intellectual property rights, and services. These commitments can be leveraged to eliminate barriers to trade in IoT devices, including tariffs and nontariff measures, and as well as barriers to cross-border trade in IoT services.

- **Promoting Workforce Development:** The Commerce Department should help develop a national strategy for ensuring that US workers have the skills necessary to thrive in the new data economy. A consistent flow of skilled computer science graduates will ensure continued American innovation. While the United States still manufactures goods, innovation will be the force behind the US economy, and to maintain this force, we will have to increase access to STEM fields like computer science. Today, more than 600,000 computing jobs go unfilled, and US universities only graduate about 43,000 computer science graduates each year. While a number of states have already worked to boost their computer science education programs, a federally focused strategy is necessary to amplify and accelerate these efforts and to close the skills gap, meet growing demand for computing jobs, and boost the US ability to compete and innovate.

* * * * *

Thank you again for the opportunity to share our views on these important issues.

Sincerely,

Christian Troncoso
Director, Policy