Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC 20230

In the Matter of	)	
	)	
The Benefits, Challenges, and Potential Roles for	)	Docket No. 160331306-6306-01
the Government in Fostering the Advancement of	)	RIN 0660-XC024
the Internet of Things	)	

COMMENTS OF HUAWEI TECHNOLOGIES, INC. (USA) and HUAWEI TECHNOLOGIES, LTD.

Huawei Technologies, Inc. (USA) and Huawei Technologies Co., Ltd. (collectively "Huawei")[1] submit these comments to the National Telecommunications and Information Administration ("NTIA") on the Notice and Request for Comment ("Notice") in the above captioned proceeding.[2] Huawei is a global leader of information and communications technology ("ICT") products and solutions. Continuous innovation based on customer needs drives our more than 170,000 employees globally – including 1,500 employees in the United States – to create maximum value for telecommunications carriers, enterprises and consumers. By leveraging its experience and expertise in the ICT sector, Huawei helps to bridge the digital divide, promote high-quality broadband connectivity for all, strengthen secure and stable network operations, advance the innovative potential of ICTs and assist customers and industries improve efficiencies that drive economic growth.[3]

[1] Huawei Technologies, Inc. (USA), based in Plano, Texas, is a subsidiary of Huawei Technologies Co., Ltd., headquartered in Shenzhen, Guangdong Province, People's Republic of China.

[2] *See The Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things*, Notice and Request for Public Comment, Docket No. 160331306-6306-01, 81 Fed. Reg. 19956 (dated Apr. 6, 2016) (*NTIA Notice*). *See also The Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things*, Notice and Extension of Comment Period, 81 Fed. Reg. 29254 (dated May 11, 2016) (extending the comment deadline to June 2, 2016).

[3] *See* http://www. huawei.com/en/. Huawei maintains a tenacious focus on ICTs, such as networking, cloud computing and Big Data. Alongside its partners and other stakeholders, Huawei aims to be a key contributor to the

Huawei commends NTIA and the U.S. Department of Commerce for undertaking at this early stage an assessment of the technological and policy factors, benefits and challenges, and government's role concerning the development of the "Internet of Things" ("IoT") within the context of Commerce's Digital Economy Agenda.[4] Consistent with the Agenda's focus on "help[ing] businesses and consumers realize the potential of the digital economy to advance growth and opportunity,"[5] Huawei believes that the goal of the IoT is not merely to expand connectivity to the realm of things, but rather, to create value by integrating specific industry knowledge, communication languages and ICTs for consumers, businesses, governments and all of society. From Huawei's perspective as a world-leading supplier of telecommunications network equipment, information technology products and smart devices in more than 170 countries that help connect over one-third of the world's population, the IoT will stimulate more extensive integration of the physical and digital worlds and create enormous growth momentum for the digital economy.

Beyond the positive economic effects expected by the diffusion of the IoT, these technologies could also "make an important contribution to global challenges such as improving public health and quality of life, moderating carbon emissions, and increasing the efficiency of a

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development of an Internet of Things ("IoT") ecosystem and integrate its ICT products and solutions into verticals to drive innovation and industry modernization. Huawei's IoT innovations include, for example: a four-in-one smart home gateway enabling operators to shift their businesses from traditional home broadband to smart home services; an open, shared, and flexible IoT agile platform that consists of software and hardware gateways accessible to customers and partners; a Narrowband IoT ("NB-IoT") solution enabling wireless operators to build ubiquitous cellular networks to connect a massive number of things; a cloud-based IoT connection management platform enabling fast multi-terminal integration and industry-specific app innovation; and a lightweight open source IoT operating system, known as LiteOS, which offers unified, open APIs for the quick development of IoT. *See* Huawei Press Release, "Huawei's Heavy Investment in Five IoT Solutions Leads to Impressive Breakthroughs" (Apr. 12, 2016), available at: http://www.huawei.com/en/news/2016/4/wuda-IoT-jiejue-fangan.

[4] *See* NTIA Notice at 19956-57.

[5] *See* "The Commerce Department's Digital Economy Agenda," available at: https://www.commerce.gov/news/blog/2015/11/commerce-departments-digital-economy-agenda.

range of industries across developed and developing economies."[6] Yet realizing such benefits will also necessitate managing potential challenges presented by the widespread adoption of IoT technologies, as NTIA acknowledges in the Notice.[7] Huawei is committed to collaborating with all stakeholders, including government, to address the challenges and ensure that the economic and social benefits of IoT are not needlessly diminished.

Many predictions about the numbers of "things" that will make up the IoT are all quite large with some variance by source and year. Huawei estimates that by 2025, the number of IoT devices will reach approximately 100 billion nodes, and the number of virtual connections will exceed one trillion, a 100-fold increase over the current number. Indeed, Huawei estimates that sensor deployments will grow to an installation rate of almost two million per hour. In turn, this phenomenon will drive millions of new applications and solutions, a ten-fold increase in comparison to today. While future predictions on the number of connected "things" is not an exact science, Huawei believes the consensus is that the number is extremely large and the majority of Internet traffic in years to come will far exceed the level originated by human users.

In light of the fact that the IoT will be a key disruptive force in our economic lifetimes, Huawei announced IoT as one of its strategic priorities earlier this year. Drawing on its long-term investment in research and development and expertise in ICTs, Huawei is committed to building a robust IoT ecosystem and jointly drive industry innovation with governments, industry and other non-government stakeholders. These comments are offered in that spirit and Huawei welcomes the opportunity to offer its further insights and experiences as policymakers

[6] *See* REGULATION AND THE INTERNET OF THINGS, ITU Draft GSR Discussion Paper, Professor Ian Brown, Oxford Internet Institute, University of Oxford, UK (2015) at 28 (*GSR Discussion Paper*), at 28, available at: *http://www.itu.int/ en/ITU-D/Conferences/ GSR/Pages/GSR2015/GSR15-discussion-paper.aspx.*

[7] *See* NTIA Notice at 19959.

here in the United States and around the world further consider appropriate policy approaches in months and years ahead.

I. GENERAL

The culmination of a 12-month cross-industry initiative to examine the ability of digital infrastructures to keep pace with the demands of a growing digital economy, a 2014 report of the World Economic Forum noted the importance of continued investment and maintenance of digital infrastructure.[8] The report contends that this responsibility falls not only to the owners and operators of digital infrastructure, but also on the "continuing collaboration of its own ecosystem of participants – companies, governments, users and other stakeholders – to keep things moving."[9] As to the particular role of government and the adoption of laws, regulations and policy, the report highlights the need for policy to better reflect the "complex, interconnected value chain" of digital infrastructures.[10] "Today's markets need something other than new regulations," the report concludes, and the concepts of "'[f]orward-looking' and 'light-touch' should be policy-making watchwords in the digital age."[11]

Huawei ascribes to this view and believes that policymakers should resist the temptation to impose regulation on the IoT at this nascent stage. However, government can and should help to accelerate the deployment of IoT technologies through policies that, for example: ensure the

[8] *See* DELIVERING DIGITAL INFRASTRUCTURE: ADVANCING THE DIGITAL ECONOMY, World Economic Forum (April 2014) at 4, available at: http://reports.weforum.org/delivering-digital-infrastructure//. Prepared in collaboration with the Boston Consulting Group, the report notes that the digital economy is growing at more than 10% per year, significantly faster than the economy as a whole. Moreover, in emerging markets, the digital economy is growing even faster, at 12-25% per year. *See id.* at 7.

[9] *See id.* at 4. Specifically, the report recommends that all stakeholders: 1) commit to actions that promote the long-term growth of the digital economy; 2) remove impediments to the expansion of digital infrastructure; and 3) modernize policies to encourage investment and innovation through the Internet ecosystem. *See id.* at 8.

[10] *See id.* at 4.

[11] *See id.* at 26 (recommending that policymakers rethink the scope, approach and level of engagement in making policy related to digital infrastructures).

sufficient availability of appropriate spectrum for IoT needs, including both licensed and unlicensed wireless services;[12] ensure a defined quality of service for the use of licensed spectrum dedicated to IoT; correlate standardization activities relevant to IoT; and define and develop its role as guardian of consumer interest related to IoT. Such policies, Huawei believes, can encourage growth and help create a healthy market environment that enables all stakeholders to embrace IoT technologies.[13]

II. TECHNOLOGY

The key features or components of IoT, from Huawei's perspective, include intelligent sensors, ubiquitous networks, data storage, data sharing and value creation. Although these concepts are not unfamiliar, they present technological challenges both individually and in combination as part of an overall IoT platform as they begin to become integrated into vertical industry business operations. As is commonly known, sensors are a basic device that enables things to be connected and communicate, while ubiquitous networks are the architecture that connects things. Considering that networks are not operating throughout much of the world and the vast majority of things remain unconnected,[14] Huawei's believes it is important to standardize sensor platforms and make them intelligent so that things can connect and communicate in order to, ultimately, generate value. Huawei also submits that different connection scenarios have different requirements; hence network architects, engineers and

[12] *See* Spectrum Frontiers NPRM, *infra*, note 20.

[13] *See* GSR Discussion Paper at 28-29 (summarizing the role of regulators in promoting the IoT). The discussion paper concludes that "Regulators can play a role in encouraging the development and adoption of the IoT, while promoting efficient markets and the public interest." *Id.* at 29.

[14] *See* THE STATE OF BROABDAND 2015, The Broadband Commission for Digital Development (2015) (*Broadband Commission Report*), at 8, 25 (finding that while 4.2 billion people or 57% of the world's population are offline, the rate of connected things is five times greater than the number of connected people, with nearly a ten-fold increase in connected devices expected in the next decade), available at: http://www.broadbandcommission.org /publications/ Pages/SOB-2015.aspx.

operations personnel will need to consider the appropriate requirements for various sectors and subsectors of the IoT to progress. For example, super-long battery life may be crucial for smart meters, whereas ultra-low latency is a precondition for video surveillance and unmanned driving.

Most IoT applications today remain siloed in specific industries or inside individual enterprises. These applications have proprietary protocols, standards, and platforms that are incompatible with, and isolated from, each other making information difficult to share, collect, or analyze. To promote IoT within an enterprise, industries must focus on three aspects of IoT networks: device compatibility, service deployment, and collaboration.

- Multiple Protocols: Currently, sensors and terminals from multiple vendors co-exist on IoT networks. Because these endpoints use different communication interfaces and protocols, connecting them to IoT networks remains challenging. To facilitate device access in complicated and diverse network situations, IoT will require open, embedded communications modules or gateway devices that support multiple communications interfaces and protocols.
- Open Networks: Deploying IoT requires new services and applications; however, traditional network devices generally have fixed services and limited functionality. Long development cycles and difficult service adaptation with traditional devices complicates new IoT deployments. A network controller platform can provide a viable solution by easily responding to new service rollouts, on-demand service deployments, and flexible application releases, as needed.
- Industry Collaboration: Stakeholders in the IoT industry chain include terminal chip manufacturers, sensor vendors, gateway equipment providers, network operators, service integrators, service providers, and end customers. These stakeholders cannot compete

aggressively in global markets without extensive collaboration. To advance standardization and development across the IoT industry chain, alliances, open software architectures, and open-source communities are essential to promote partnerships, stakeholder collaborations, and cross-vendor and cross-industry applications.

Government is contributing to the advancement of the IoT technologies in various ways, such as the convening of the Public Working Group on Cyber Physical Systems ("CSP PWG" or "Working Group") formed under the auspices of the National Institute of Standards and Technology ("NIST"), U.S. Department of Commerce.[15] This open public forum has fostered stakeholder discussion to "help define and shape key characteristics of CPS, so as to better manage development and implementation within and across multiple 'smart' application domains, including smart manufacturing, transportation, energy, and healthcare."[16] Released by CSP PWG in May 2016, the "Framework on Cyber-Physical Systems Release 1.0"[17] provides "a comprehensive tool for the analysis and description of CPS" in order to develop a "shared understanding of CSP and its foundational concepts and unique dimensions," and "promote progress through exchanging ideas and integrating research across sectors and to support development of CPS with new functionalities."[18]

The efforts of the CSP PWG represent the important role that government can play in enabling cross-industry collaboration. Huawei commends NIST for convening the Working

[15] *See* Cyber Physical Systems Public Working Group web page, available at: https://pages.nist.gov/cpspwg/.

[16] *See id.*

[17] *See* FRAMEWORK ON CYBER-PHYSICAL SYSTEMS RELEASE 1.0, Cyber Physical Systems Public Working Group (May 2015), at 7, available at: https://pages.nist.gov/cpspwg/.

[18] *See id*. at xiii. Huawei agrees with the CSP PWG that CSPs will be "revolutionary and pervasive – [as] eviden[ced] today in emerging smart cars, intelligent buildings, robots, unmanned vehicles, and medical devices." *See* CSP PWG web page, available at https://pages.nist.gov/cpspwg/.

Group, bringing together private sector stakeholders and recognizing that "the future promise of CPS will require interoperability between elements and systems, supported by new reference architectures and common definitions and lexicons."[19]

III. INFRASTRUCTURE

The most important prerequisite for the IoT is, from Huawei's perspective, connectivity.[20] In order for the potential of IoT to be realized, connectivity must become so ubiquitous and widespread that by 2025, sensors deployed and connected to a network at a rate of almost two million per hour or just over 47 million per day will bring tangible results across all industries and communities. Connectivity links computing devices, sensors, and effectors at the edge to compute and storage facilities usually housed in a data-center at the core. This includes the edge devices, the network connectivity infrastructure, the datacenter core, and the transformation enablers as represented by cloud services and Big Data analytics to enable IoT.

A specific, essential infrastructure need is the deployment of next-generation wireless technology—5G—the next frontier of innovation for the mobile industry, to support IoT technologies and traffic. Huawei believes that 5G is not just a technology upgrade to existing network technologies, nor a mere innovation. Rather, it combines existing wireless technologies with revolutionary capabilities. While earlier generations of wireless technologies primarily facilitate communications, 5G will support the infrastructure for next-generation mobile communications that will transform the digital world as the basis for the IoT. That is, compared to previous generations of wireless technology, 5G will feature a 1,000-fold increase in mobile

[19] *See id.*

[20] *See* Broadband Commission Report, at 25 (stating that "[t]he need for investments to build networks capable of handling all the expected future traffic will be significant, and should be taken into account in any public policy initiative").

traffic per unit area; an increase in the transmission speed per user by 10 to 100 times, supporting a peak transmission speed of 10 Gbit/s or 100 times faster than 4G; and decreased latency by a factor of five. 5G wireless technologies will also be able to support an increase in the number of connected devices by 10 to 100 times, amounting to at least 100 billion devices.

Huawei believes that the evolution to 5G mobile technologies and services is dependent on three factors: 1) a demonstration of the commercial value of 5G to potential users by accelerating technological innovation that creates new applications and delivers new experiences; 2) open cooperation and cross-industry collaboration that create new technical standards, application scenarios and business model leveraging 5G mobile technologies; and 3) forward-looking policies on spectrum allocations by government.[21]

NTIA and the Federal Communications Commission ("FCC") play key roles in managing spectrum allocations and, through a joint initiative, are working to make available a total of 500 MHz of Federal and non-Federal spectrum available for commercial mobile and fixed wireless broadband.[22] Although still in process, these efforts will help facilitate the introduction of 5G services and will, Huawei submits, significantly contribute to the growth and adoption of the IoT. Huawei commends NTIA and FCC for their efforts in this regard, including FCC's current

[21] *See* Huawei comments to the FCC, *In the Matter of the Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et al.,* GN Docket No. 14-177, FCC 15-138 (rel. Oct. 2015) at 3-4. Huawei is playing a leading role in defining and promoting 5G around the world and has been actively contributing to the development of the 5G ecosystem as a leading member of METIS (Mobile and wireless communications Enablers for the Twenty-Twenty Information Society) and 5G-PPP (5G Infrastructure Public- Private Partnership), both in the European Union; the 5G Innovation Centre (5GIC) with the University of Surrey in the United Kingdom; IMT-2020 in China; NYU WIRELESS in the United States; and the Fifth Generation Mobile Communications Promotion Forum (5GMF) in Japan. Huawei has also established partnerships with over 20 universities on joint research and published more than 190 academic papers on 5G. *See* http://www.huawei.com/minisite/5g /en/.

[22] *See* NTIA webpage: https://www.ntia.doc.gov/category/500-mhz-initiative. As of July 2015, five years into the ten-year initiative, NTIA reported that it and the FCC were making "steady progress" and, to date, had repurposed 245 MHz of spectrum toward the 500 MHz goal. *Id.*

proceeding on the identification of spectrum bands above 24 GHz for 5G mobile radio services,[23] and urges the agencies to expeditiously continue their efforts to attain the 500 MHz goal.

IV. ECONOMY

Huawei believes that the IoT will bring important efficiencies and better ways to do business that will provide huge economic benefits. Productivity and cost savings are just a couple of ways at evaluating the economic value of IoT by companies. The decline in the cost of building and running the future ICT platform will create an environment for substantial innovation, thus positively impacting opportunities for growth in the digital economy. Huawei expects to see the cost of IoT sensors continue to drop in half every ten years, and the cost of computer processing to improve by seventy-fold in the same time period.

The biggest change IoT will bring to society, from Huawei's perspective, is the massive increase in contact all industries will have with customers. Huawei believes that IoT-related devices and solutions will have the potential to redefine various industries; the most active IoT developments, however, will be clustered around the manufacturing, transportation, e-commerce, healthcare, Smart Cities, and utilities. Huawei forecasts that about 55 percent of IoT use cases will come from business-facing initiatives (e.g., smart manufacturing, smart city, smart utilities, etc.) representing heavy investment to obtain productivity gains, asset management and competitive advantage. The remaining 45 percent of use cases will involve customer-facing scenarios, such as smart homes and smart lifestyles that improve the quality of life and sustainability.

[23] *See In the Matter of the Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, GN Docket No. 14-177, Notice of Proposed Rulemaking, FCC 15-138 (rel. Oct. 23, 2015) (*Spectrum Frontiers NPRM*).

To help describe a potential economic outcome that could happen, Huawei looked at several industrial and public sector use cases to determine the effects that one-percent of expense savings would have if a supply chain, manufacturing process, or workflow became IoT-enabled.[24] While the range of expense savings varied by industry use case, the range was a savings of $350 million to $1.2 billion.[25] The results show that IoT brings efficiencies and better ways to do business that, simply stated, provide huge economic benefits making it hard to argue against forgoing development and adoption of an IoT strategy.

While secure and reliable IoT connections will be configured using standard gateway products for data transmission over broadband networks, cloud platforms will provide single logical points for data collection and management, operation of Big Data analytics, and production of correlated data services to the end-users. Indeed, the transfer of data between business, consumers and governments is the digital lifeblood that will fuel new businesses, services, efficiencies and overall economic growth.

Huawei believes that governments have a major part in the adoption of IoT technologies and the growth of the digital economy. That is, governments are uniquely positioned to ensure

[24] *See* GLOBAL CONNECTIVITY INDEX 2015: BENCHMARKING DIGITAL ECONOMY TRANSFORMATION, Huawei Technologies (April 2015), at 12. Huawei's Global Connectivity Index ("GCI") is an ICT assessment framework that measures, analyzes, combines, and forecasts multiple connectivity dynamics on the impact of a country's digital economy and the value generated for its industry transformation toward digital economy. The GCI 2015 white paper emphasized that the Internet of Things will have great economic impact on businesses that adopt these technologies. After examining and analyzing several industrial and public sector use cases of IoT, the Huawei explored what 1% of expense savings would look like if a supply chain, a manufacturing process, or workflow became IoT-enabled. Huawei concluded that IoT brings efficiencies and better ways to do business that simply provide huge economic benefits and make for a difficult business case to not adopt an IoT strategy. *See id.* For the 2016 GCI, *see* http://www.huawei.com/minisite/gci/en/index.html.

[25] *See id*. The white paper indicates that government should ensure the right conditions are in place to encourage adoption of IoT technologies and growth of the digital economy by encouraging the buildout of high-speed, high-bandwidth networks. *Id.*

that the right economic conditions are in place and ensure that public policy encourages the continued investment and deployment of high-speed, high-bandwidth networks.

V. POLICY

Although leveraging data from connected devices and sensors can generate value, it also raises a range of policy challenges, including data ownership, security protections and privacy rights, among others.[26] Huawei believes the recommendations made in the January 2015 Federal Trade Commission Staff Report remain valid today. The report takes note of the fact that because there is "great potential for innovation" in development of the IoT, the adoption of legislation "at this stage would be premature."[27] The report further states that "the development of self-regulatory programs designed for particular industries would be helpful as a means to encourage the adoption of privacy- and security-sensitive practices."[28]

Huawei acknowledges that the IoT poses many challenges in data protection, given the anticipated myriad of uses of personal data, many of which will be collected passively via systems and sensors invisible to the human eye. In the emerging IoT environment, the individual will often be unaware of the data collection taking place or may be completely absent from the transaction being processed. This poses extra challenges in satisfying basic data protection principles, such as "notice and choice" as well as "purpose specification and use limitation."[29] This might result in proposals to relax the requirements of data collection and/or give more

[26] *See* "THE INTERNET OF THINGS: AN OVERVIEW. UNDERSTANDING THE ISSUES AND CHALLENGES OF A MORE CONNECTED WORLD," The Internet Society (Oct. 2015) (addressing the key policy challenges that could hinder development and realization of the benefits associated with the IoT).

[27] *See* INTERNET OF THINGS: PRIVACY AND SECURITY IN A CONNECTED WORLD, Federal Trade Commission Staff Report (Jan. 2015), at 49.

[28] *See id.*

[29] *See id.* at v, vi and 45.

emphasis to ensuring accountability of data users/controllers. Such approaches, however, would mean taking a paternalistic action where the burden of privacy protection is shifted away from individuals and toward data controllers.

Reducing an individual's control over their personal data has always led to great privacy abuses, Huawei observes, and cannot work as a solution for better privacy protection. Addressing the new challenges in IoT should not mean moving away from a user-centric approach where the individual—the data subject—ultimately determines the fate of his or her personal data. Huawei believes that the ability of individuals to exercise meaningful control over their personal data should be protected and enforced through the application of privacy-by-design, which proactively embeds privacy into information technologies, business practices and network infrastructure.[30] The de-identification, pseudonymization and anonymization are vitally important tools to protect privacy, reducing the risk that personal information is used for unauthorized or malicious purposes. This should be done in a way that the risk of re-identification is minimized without compromising the level of data quality that is appropriate for secondary uses. Emphasis should also be given to technical innovation in privacy and transparency-enhancing technologies to enable individuals to manage and control their personal data more intuitively and effectively than is currently possible.

As to security protections, Huawei recognizes that cyber attack surfaces will change with the introduction of IoT. Perimeter defenses will no longer be sufficient given that IoT inflection points will be scattered throughout the physical environment. Given this dynamic, Huawei

[30] *See* PROTECTING CONSUMER PRIVACY IN AN ERA OF RAPID CHANGE: RECOMMENDATIONS FOR BUSINESS AND POLICY MAKERS, Federal Trade Commission (March 2012) (recommending that privacy be built into every stage of product development).

believes it will be difficult to continue to defend against attacks in various environments or virtual enclaves.

IoT has the potential to be perhaps the most significant driver of a new security debate from Huawei's perspective. The maturation of cloud computing and software defined networks will mean that most enterprises will own little, if any, infrastructure and will pay for access and services as they use and consume. Dramatically increased product interoperability will likely reduce costs as many products are commoditized. IoT, 5G and artificial intelligence will undoubtedly enable technology that provides tremendous opportunities and efficiencies for organizations and individuals in real time. These technology trends will not only change the attack surface, but they will make securing the physical and logical layers more challenging.

The FCC's Technological Advisory Counsel (TAC) and its Cybersecurity Working Group have made important contributions to the security debate relative to IoT. The Working Group's Technical Considerations White Paper released in December 2015 provides useful information on the security challenges associated with IoT consumer products.[31] Continued efforts by the TAC Working Group will lend further support to securing the IoT, including its current focus on security principles that should be built into ecosystems and the standards development process to support IoT architectures that use 5G technology.[32]

[31] *See* TECHNICAL CONSIDERATIONS WHITE PAPER: RELEASE 1.1, Federal Communications Commission, Technological Advisory Council, Cybersecurity Working Group, Applying Security to Consumer IoT Devices Subcommittee (Dec. 4, 2015), available at: https://www.fcc.gov/general/technological-advisory-council.

[32] *See* Meeting Presentations, Technological Advisor Council, Federal Communications Commission (March 9, 2016), available at: https://www.fcc.gov/general/technological-advisory-council. Huawei also commends the Technological Advisory Council's IoT Working Group Position Statements on Safe Harbor, Privacy, IoT End of Life, and Coexistence in Unlicensed Bands (Etiquette) (Sept. 2014), available at: https://www.fcc.gov/oet/tac/2014#block-menu-block-4.

VI. CONCLUSION

The conditions are ripe for unleashing the full potential of the IoT. A smart planet is emerging as a result of sensors embedded in everyday objects that transparently connect consumers via cloud technologies. Computer intelligence combined with far-reaching connectivity is improving the way factories work, farmers bring crops to market, and cities provide services to its citizens. Each person is, and will inevitably become, transparently immersed in always-connected support across industries and in homes, vehicles and entertainment platforms.

In order to realize the tremendous opportunities and potential of the IoT, Huawei believes that stakeholders must collectively develop and unify cross-industry standards, contain costs and promote cooperation among different stakeholder groups. Stakeholder cooperation is the most effective way to ensure that the policy challenges that will arise from IoT, including privacy and security protections, are not compromised. These factors will help drive growth in the U.S. market and growth throughout the global digital economy. Huawei is committed to continuing its participation in stakeholder initiatives to address standards, applications and policy challenges related to IoT. Huawei again appreciates the opportunity to offer its views to NTIA and the Commerce Department on this important initiative.

Respectfully submitted,

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