Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC 20230

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

COMMENTS OF T-MOBILE USA, INC.

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T-Mobile USA, Inc. ("T-Mobile")[1] submits these comments in response to the National Telecommunications and Information Administration's inquiry regarding the current technological and policy landscape related to the Internet of Things ("IoT").[2] T-Mobile outlines its experience in the IoT marketplace and highlights several actions the federal government can take to accelerate the social and economic benefits a more connected society can offer.

I. INTRODUCTION

IoT, the network of physical objects connected to each other and the Internet, is a large and growing market made up of billions of devices spread across the globe. The IoT market is expected to grow from $655.8 billion in 2014 to $1.7 trillion in 2020.[3] The number of IoT

[1] T-Mobile USA, Inc. is a wholly owned subsidiary of T-Mobile US, Inc., a publicly traded company.

[2] *See* The Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things, 81 Fed. Reg. 19,956 (Apr. 6, 2016) ("*Notice*"). The initial deadline to submit comments was May 23, 2016, but NTIA subsequently extended the comment deadline to June 2, 2016. *See* The Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things, 81 Fed. Reg. 29,254 (May 11, 2016).

[3] Steven Norton, *Internet of Things Market to Reach $1.7 Trillion by 2020: IDC*, WALL ST. J., June 2, 2015, http://on.wsj.com/1BGNar2.

devices is projected to grow from five billion to nearly 25 billion over the same period.[4] In the European Union, the market value of IoT is expected to exceed one trillion euros in 2020.[5]

Connected devices, such as Automatic Teller Machines, have enhanced economic growth since the 1970s.[6] Starting in 2008, the steady progression of connected devices has led to more objects being connected to the Internet than people.[7] Today, the current and expected use cases for IoT are wide and varied. IoT use cases include:

- Human health and fitness – Wearable devices that monitor health and wellness are now commonplace.[8] Ingestible and injectable products likewise have the potential to offer less invasive alternatives to many surgeries with speedier recovery times.[9]

- Home – Applications include smart thermostats with sensors that adapt to users' behavior,[10] appliances that perform chores autonomously[11] and security cameras.[12] IoT

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[4] BI Intelligence, *Here's How the Internet of Things Will Explode by 2020*, Apr. 28, 2016, http://read.bi/1T7miI7.

[5] STEFANI AGUZZI, *ET AL.*, FINAL REPORT: DEFINITION OF A RESEARCH AND INNOVATION POLICY LEVERAGING CLOUD COMPUTING AND IOT COMBINATION 10 (2014), http://bit.ly/1lcPwfV.

[6] *See* Bernard Marr, *17 'Internet of Things' Facts Everyone Should Read*, FORBES, Oct. 27, 2015, http://onforb.es/1sOk3EJ.

[7] *Id.*

[8] *See, e.g.*, Steven Musil, *Ownership of wearable devices has doubled since 2014, study finds*, CNET (May 12, 2016), http://cnet.co/1THwck4 (citing to a survey by PriceWaterhouseCoopers that found that the adoption rate for wearable devices has grown from 21 percent to 49 percent since 2014); *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015–2020 White Paper*, CISCO (Feb. 1, 2016), http://bit.ly/1W26UQo (estimating that by 2020 there will be 601 million wearable devices globally, growing five-fold from 97 million in 2015).

[9] MCKINSEY GLOBAL INSTITUTE, THE INTERNET OF THINGS: MAPPING THE VALUE BEYOND THE HYPE 37 (Jun. 2015), http://bit.ly/213q3VE ("*McKinsey IoT Report*").

[10] *See, e.g.*, Cynthia Dizikes, *Smart Thermostat Program Could Cut Energy Bills*, CHI. TRIB., Oct. 8, 2015, http://trib.in/1jet6Kj.

[11] *See, e.g.*, Tom Howells, *A Guided Tour to the Internet of Things: The Connected Home*, FRAUD & TECH. WIRE, Nov. 11, 2015, http://bit.ly/1TCyGTZ (noting that 18 percent of vacuum sales are robotic vacuums that can be programmed to start at a certain time and use sensors to navigate around the house).

[12] *See, e.g.*, *Snapdragon Smartens Up Next-Gen Sense IoT Security Camera*, QUALCOMM (Mar. 10, 2016), http://bit.ly/20xCdF2.

energy management devices are expected to reduce energy consumption by 20 percent, while automated appliances could reduce the time spent on chores by 17 percent.[13]

- Office – Office IoT devices are used to save energy and promote security. Over the coming years office IoT devices are expected to lead to productivity improvements through activity monitoring and augmented reality.[14]

- Factory – Factory IoT use cases include health and safety sensors, equipment that automatically maintains itself and adjusts based on production and supply chain optimization and automatic quality control.[15] More than one-third of U.S. manufacturers are already using smart sensors to enhance their manufacturing and operating processes.[16]

- Retail – In the retail environment, IoT devices can allow customers to check out automatically as they leave the store, track customers to improve service and reduce shoplifting, monitor and replenish inventory and offer real-time personalized promotions.[17]

- Worksite – The commodities and construction industries have led the way in adopting IoT technologies such as self-driving trucks at large mining sites and robotic equipment on offshore drilling rigs.[18]

- Vehicles – Analysts expect a significant increase in the number of connected automobiles over the next five years. One analyst estimates that by 2020 there will be a quarter of a billion connected vehicles on the road, enabling new in-vehicle services and automated driving capabilities.[19] Autonomous vehicles could vastly reduce the number of

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[13] *McKinsey IoT Report* at 51.

[14] *Id.*; *see also* Press Release, PriceWaterhouseCoopers, Wearable Technology Future is Ripe for Growth – Most Notably among Millennials, Says PwC US (Oct. 21, 2014), http://pwc.to/1ZYeEct (study found that "seventy-seven percent of respondents said an important benefit of wearable technology is its potential to make us more efficient and more productive at work").

[15] *McKinsey IoT Report* at 67.

[16] Bobby Bono & Gardner Carrick, *The Internet of Things has Arrived in America's Factories*, PWC INDUSTRIAL INSIGHTS (Feb. 24, 2015), http://pwc.to/1TxTWIb.

[17] *See, e.g.*, JONATHAN GREGORY, THE INTERNET OF THINGS: REVOLUTIONIZING THE RETAIL INDUSTRY (2015), http://bit.ly/1XSHh83; *McKinsey IoT Report* at 57.

[18] *See, e.g.*, Charles Clark, *Australian Mining Giant Rio Tinto is Using These Huge Self-Driving Trucks to Transport Iron Ore*, BUS. INSIDER, Oct. 19, 2015, http://read.bi/1WN639Y; Clay Dillow, *The Newest Tool for Offshore Exploration: Ocean-Going Drones*, FORTUNE, Jul. 11, 2014, http://for.tn/1wj74VF; *McKinsey IoT Report* at 74.

[19] Press Release, Gartner, Gartner Says By 2020, a Quarter Billion Connected Vehicles Will Enable New In-Vehicle Services and Automated Driving Capabilities (Jan. 26, 2015), http://gtnr.it/15C6LPr.

automobile accidents[20] while reducing fuel use by as much as 15 percent.[21] Other modes of transportation, such as ships, airplanes and railroads, will also become more efficient and experience fewer accidents.[22] Even without considering self-driving technology, IoT has the ability to prevent low-speed collisions, potentially reducing auto insurance premiums by 25 percent.[23] Insurance companies are also beginning to use IoT devices to assess more nuanced fees for coverage based on a driver's mileage and driving behavior.[24] Manufacturers can install IoT devices that automatically diagnose automobile malfunctions and provide maintenance recommendations as well.[25]

- Cities – Cities have many potential uses for IoT devices, such as pollution monitoring, infrastructure management, traffic management and crime monitoring and prevention.[26] Combined, these applications have the potential for a direct annual economic impact of between $930 billion and $1.7 trillion by 2025.[27]

T-Mobile launched its IoT program in 2005 and created a dedicated IoT team in 2008.[28] Today, T-Mobile provides IoT solutions for fleet management, connected cars, utilities, healthcare services and consumer points of sale, among other use cases.[29] Vinli, for example, is a manufacturer of a plug-and-play connected car solution that partnered with T-Mobile to provide the wireless connectivity for its devices.[30] More recently, Twilio partnered with T-Mobile and launched "Twilio Programmable Wireless," a SIM-based solution that expands the

[20] *See, e.g.*, Adrienne Lafrance, *Self-Driving Cars Could Save 300,000 Lives Per Decade in America,* THE ATLANTIC, Sept. 29, 2015, http://theatln.tc/1VpZ3La.

[21] *McKinsey IoT Report* at 91.

[22] *Id.* at 96.

[23] *Id.* at 84.

[24] *Id.* at 83.

[25] *Id.* at 82-84.

[26] *See, e.g.*, Bernard Marr, *How Big Data and the Internet of Things Create Smarter Cities,* FORBES, May 19, 2015, http://onforb.es/1OUXzLD.

[27] *McKinsey IoT Report* at 89.

[28] About Us, T-Mobile Internet of Things, http://bit.ly/22nP4ew (last visited May 20, 2016).

[29] *See* Industries, T-Mobile Internet of Things, http://bit.ly/1OLodRL (last visited May 20, 2016).

[30] Matt Burns, *Connected-Car Startup Vinli Raises $6.5M From Samsung, Cox Automotive, and More,* TECHCRUNCH, June 8, 2015, http://tcrn.ch/1FLrv1B.

availability of mobile wireless broadband connectivity for IoT devices.[31] Twilio Programmable Wireless reduces IOT devices' reliance on Wi-Fi networks and provides ubiquitous, lower-cost broadband connectivity anywhere, increasing device scalability and marketability.

After almost a decade of experience in the IoT market, T-Mobile recently began applying its Un-carrier model of industry disruption to IoT and developed several innovative solutions to customer pain-points. To ease the transition from the large embedded base of 2G connected devices to next-generation technology, for example, T-Mobile launched 2G-M2M, which is a modified version of its 2G network that will maintain 2G service for T-Mobile's IoT customers through 2020.[32] IoT has historically involved low-cost, very long-lived devices, which has tended to require a heavy reliance on last- or prior-generation technology. More recently, however, IoT devices have begun to transition to LTE for additional cost savings, greater reliability and superior performance.[33] T-Mobile's 2G-M2M offering helps simplify this transition. T-Mobile has also launched a nationwide, CAT-1 ready LTE network.[34] CAT-1 LTE is a slimmed-down, more efficient and less costly LTE platform specifically designed to help meet the infrastructure demands IoT will place on LTE networks.[35] T-Mobile has even started a

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[31] *See* Ken Yeung, *Twilio Teams Up with T-Mobile to Help Developers Build Apps that Use Cellular Data*, VentureBeat, May 24, 2016, http://bit.ly/20whNwf.

[32] 2G-M2M, T-Mobile Internet of Things, http://bit.ly/1NJRfX3 (last visited May 20, 2016).

[33] *See, e.g.*, Stephen Lawson, *LTE Can Compete with Upstart IoT Networks, Verizon Says*, COMPUTERWORLD, Oct. 29, 2015, http://bit.ly/1Mxd239 ("Many legacy IoT devices, also called M2M (machine-to-machine), use 2G or 3G networks now. Carriers want to phase those out in the coming years to shift their frequencies over to newer networks."). At the same time, carriers are beginning to re-farm their 2G spectrum assets for additional 4G LTE network capacity. *See* AT&T Inc., Annual Report (Form 10-K), at 2 (Feb. 18, 2016) ("We expect to fully discontinue service on our 2G networks by approximately January 1, 2017.").

[34] 2G-M2M, T-Mobile Internet of Things, http://bit.ly/1NJRfX3 (last visited May 20, 2016).

[35] *See* Sue Marek, *Making LTE Lighter, Cheaper (and Slower) for the Internet of Things*, FIERCEWIRELESS, Mar. 2, 2015, http://bit.ly/1FGDyRW.

financing program to help IoT customers acquire the hardware necessary to transition from 2G to LTE.[36]

The United States can stimulate the growth and expansion of IoT by making more wireless spectrum available more quickly and by taking robust action against the unwarranted concentration of spectrum resources in the hands of just one or two industry participants. Adopting a service- and technology-neutral approach for IoT systems and devices promises to bring additional benefits for businesses and consumers.

II. DISCUSSION

In the *Notice*, NTIA seeks comment on "specific goals or actions that the Department of Commerce, or the U.S. Government in general, might take (on its own or in conjunction with the private sector)" to foster IoT innovation and growth.[37] To accelerate the deployment and adoption of IoT, NTIA and its federal partners should focus on three primary objectives: (1) promoting access to spectrum; (2) avoiding market distortions by adopting privacy and cybersecurity regulations that are consistent across business sectors; and (3) continuing the nation's longstanding policies of technological neutrality. As discussed in greater detail below, making more spectrum available for wireless use and preventing further concentration of existing spectrum resources in the hands of the two largest mobile wireless service providers will promote competition among providers of IoT connectivity and help the IoT ecosystem grow at a faster pace. Adopting a privacy and security regulatory framework that recognizes the nascent IoT marketplace and takes an even-handed approach to service providers operating in different market segments will allow innovative and consumer-friendly offerings to flourish. And

[36] 2G-M2M, T-Mobile Internet of Things, http://bit.ly/1NJRfX3 (last visited May 20, 2016).

[37] *Notice*, 81 Fed. Reg. at 19,958.

following longstanding traditions of technology neutrality will provide the market certainty necessary to power IoT.

A. Making Access to Critical Spectrum Resources Available to Competitive Mobile Wireless Providers is Key to Securing IoT's Future.

Operators that hope to compete in offering IoT services across different types of industrial and consumer vertical market segments will need access to a variety of spectrum bands to offer the network capabilities necessary to compete.[38] NTIA and the FCC can advance the development of IoT through improved spectrum policies that (1) maintain a clear and reasonable timeline for transitioning 600 MHz spectrum to mobile broadband use; (2) protect against further aggregation of critical spectrum resources; and (3) make additional high-band spectrum available for mobile broadband.

While the headlines around 5G have focused on the vast quantities of high-band spectrum necessary to support high-capacity broadband connections, mobile operators also need access to low-band spectrum to offer 5G services.[39] Indeed, the "backbone" of 5G – and one of the fundamental prerequisites for IoT – is a robust coverage layer that can connect devices dispersed

[38] *See 5G Spectrum Recommendations*, 4G AMERICAS at 6 (Aug. 2015), http://bit.ly/1IR6mpb ("While certain applications would require highly robust performance over a long distance (a characteristic of lower frequencies), other applications would need very high throughput over shorter distances (a characteristic of higher frequencies). These aspects could be optimally achieved by service providers having access to a variety of bands to deliver a full 5G service.").

[39] *See Policies Regarding Mobile Spectrum Holdings, et al.*, Report and Order, 29 FCC Rcd 6133, 6163 ¶ 59 (2014) ("*MSH Order*") ("We find that a service provider holding a mix of low- and high-band spectrum licenses would have greater flexibility and would be better able to optimize its network costs for a given quality level, thus promoting the efficient and intensive use of spectrum."); *id.* ¶ 61 ("Providers without access to that mix of spectrum that would allow them flexibility to optimize their networks must incur more costly means of expansion and will be unable to compete as robustly or constrain price increases by providers that do have such access.").

over wide areas and in hard-to-service locations that lack local area network connectivity.[40] Mid-band and high-band spectrum cannot cost-effectively offer the types of wide-area and in-building coverage necessary to support these types of offerings.[41] The FCC's 600 MHz incentive auction is the last foreseeable opportunity for wireless carriers to acquire low-band spectrum through an auction process. The 600 MHz spectrum being auctioned propagates across wide areas and readily penetrates inside buildings. Licensing 600 MHz spectrum will increase carriers' capacity to support more IoT devices and push the benefits of IoT into new areas. Wireless carriers are expected to spend billions of dollars to acquire 600 MHz licenses and will need access to this low-band spectrum as soon as reasonably possible.[42]

The FCC has established a 39-month transition deadline for the 600 MHz band, based on existing and reasonably anticipated broadcast industry resources available to assist with repacking work.[43] Delaying the transition date would rob wireless broadband service providers

[40] Having a path to licensed low-power, wide-area spectrum is important to manage drones and other IoT products. These IoT devices and services are becoming rapidly commercialized using proprietary or non-licensed networking standards, which pose greater security and network management risks.

[41] *See, e.g.*, *MSH Order* at 6164 ¶ 60.

[42] *See* GREENHILL & CO., LLC, INCENTIVE AUCTION OPPORTUNITIES FOR BROADCASTERS 2 (Oct. 2014) (citing estimates that forward auction proceeds could approach $45 billion); KAGAN MEDIA APPRAISALS, CAN THE FCC ATTRACT A FULL HOUSE FOR THE 2016 BROADCAST INCENTIVE AUCTION? 8 (Feb. 11, 2015) ("Our analysis assumes the receipts from all bidders in the 600 MHz auction could well be in the $60 billion-$80 billion range, depending on how many megahertz are being sold once the final stage of the auction is reached.").

[43] *See generally* T-MOBILE ET AL., ON TIME AND ON BUDGET: COMPLETING THE 600 MHZ INCENTIVE AUCTION REPACKING PROCESS WITHIN THE FCC'S 39-MONTH RELOCATION DEADLINE AND THE BUDGET ESTABLISHED BY CONGRESS (Feb. 17, 2016), *attached to Ex Parte* Letter from Steve Sharkey, Vice President, Government Affairs Technology and Engineering Policy, T-Mobile USA, Inc. to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-268 and AU Docket No. 14-252 (filed Feb. 17, 2016); T-MOBILE ET AL., ON TIME, ON BUDGET: A RESPONSE TO DTC'S MARCH 2016 PRESENTATION ON THE STATE OF BROADCASTER RELOCATION RESOURCES (May 11, 2016), *attached to Ex Parte* Letter from Trey Hanbury, Counsel to T-Mobile USA., Inc. to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-268 and AU Docket No. 14-252 (filed May 11, 2016).

and consumers of the benefits of having access to this spectrum.[44] While exceptional circumstances may merit waiver of the 600 MHz transition deadline on a case-by-case basis, the FCC must press forward with granting timely access to the 600 MHz broadband spectrum so the newly available capacity can power innovation and investment in IoT connectivity.

At the same time, the potential for excessive concentration of spectrum licenses threatens to hinder the development of IoT and diminish the benefits of robust competition in IoT. Today, two dominant providers hold licenses for more than two-thirds of below-1-GHz spectrum that is suitable and available for commercial mobile wireless service.[45] In its *Mobile Spectrum Holdings Report and Order*, the Commission acknowledged the danger of excessive concentration of low-band spectrum and established rules to address that risk.[46] The FCC adopted an "enhanced factor" standard of review for acquisitions that exceed one-third of the suitable and available low-band spectrum to "protect against the risk [of] further concentration of spectrum, particularly low-band spectrum, [which] would have significant effects on competition in the marketplace in the foreseeable future."[47] The FCC must use its heightened standard of review for low-band spectrum aggregation to avert the reduced investment, higher prices, less consumer choice, slower economic growth and diminished innovation that excessive low-band spectrum concentration can create.

Access to high-band, centimeter-wave spectrum above 3 GHz and millimeter-wave spectrum above 30 GHz promises to be just as important as access to low-band spectrum to

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[44] COLEMAN BAZELON & GIULIA MCHENRY, STAYING ON TRACK: REALIZING THE BENEFITS FROM THE FCC'S INCENTIVE AUCTION WITHOUT DELAY 13 (Feb. 20, 2015), *reproduced in* Comments of LocusPoint Networks, LLC, AU Docket No. 14-252 (filed Feb. 20, 2015).

[45] *MSH Order*, 29 FCC Rcd at 6196 ¶ 153.

[46] *See id.* 6135 ¶ 4.

[47] *Id.* ¶ 5.

advance the deployment of 5G services. High-band spectrum will offer greater capacity through improved spectrum availability and frequency reuse than possible with low-band spectrum; moreover, high-band spectrum will allow carriers to offer the high throughput, low latency and high reliability that are the hallmarks of 5G service.[48] At the last International Telecommunication Union World Radiocommunication Conference ("WRC"), the U.S. and other stakeholders identified 11 bands of spectrum above 6 GHz that the next WRC will study for expanded mobile broadband capacity.[49] The number of bands above 6 GHz the next WRC allocates for mobile broadband service will directly affect IoT device production and service costs. If more high-band spectrum is globally harmonized for mobile broadband service, then IoT device manufacturers can leverage greater economies of scope and scale. Similarly, a larger number of bands designated for mobile broadband service will create increased international roaming options which should reduce overall service costs. There are several bands of higher frequency spectrum that could be allocated for mobile broadband, including 23.15-23.6 GHz; 24.25-27.5 GHz; 28.35-29.5 GHz; 31-31.3 GHz; 31.8-33.4 GHz; 40-40.5 GHz; 40.5-42.5 GHz; 42.5-43.5 GHz; 45.5-47 GHz; 47.2-50.2 GHz; 50.4-52.6 GHz; 57-64 GHz; 71-76 GHz; and 81-86 GHz.[50] NTIA can foster the advancement of IoT by advocating that these additional spectrum bands are allocated for commercial 5G use and identifying additional high-band spectrum the U.S. can make available for 5G through either relocation or sharing.

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[48] *See, e.g.*, Yoni Heisler, *5G Speeds Will Be Even Faster Than We Thought; Will Debut at 2018 Winter Olympics*, BGR, June 19, 2015, http://bit.ly/1QJkoCk (noting that 5G networks will "'have a capacity to provide more than 100 megabits-per-second average data transmission to over one million Internet of Things devices within 1 square kilometer.'").

[49] *See* World Radiocommunication Conference 2015 (WRC-15), Presentation to the FCC Open Meeting 6 (Dec. 17, 2015).

[50] *See* Comments of T-Mobile USA, Inc., GN Docket No. 14-177, at 6 (filed Jan. 27, 2016).

The FCC must also act. The two dominant wireless carriers are moving swiftly to secure their access to high-band spectrum resources and, if left unchecked, could replicate their dominance of low-band spectrum in the high-band frequency rage. Verizon, for example, has already moved to acquire access to substantial quantities of 5G-capable spectrum in the 27.5 GHz and 31.3 GHz range.[51]

NTIA and the FCC have an opportunity to prevent the excessive concentration of high-band spectrum before it starts. NTIA, as the Executive Branch agency with primary responsibility for advising the President on telecommunications policy issues, can work to ensure that additional high-band spectrum becomes globally harmonized for mobile broadband service and accessible to all mobile broadband service providers, not just the two dominant carriers. The FCC should simultaneously adopt a policy of applying additional regulatory scrutiny for any proposed transaction that would result in a carrier holding more than one-third of 5G-capable spectrum in a band or more than one-third of all high-band spectrum used or useful for 5G services. Adopting a spectrum-screen for high-band spectrum holdings would help promote competition for IoT services by preventing the two dominant providers from exercising undue influence over the delivery and pricing of 5G services.

B. IoT Privacy and Security Regulations Should Not Impede the Development of Consumer-Friendly Offerings.

NTIA and its federal partners should avoid adopting overly burdensome and potentially duplicative or conflicting cybersecurity and privacy IoT regulations. The FCC recently proposed stringent broadband privacy rules that would apply only to Internet service providers ("ISPs")

[51] *See generally Applications Filed for the Transfer of Control of XO Communications, LLC to Verizon Communications Inc.*, Public Notice, WC Docket No. 16-70, DA 16-393 (rel. Apr. 12, 2016); Petition to Deny of Dish Network Corporation, WC Docket No. 16-70 (filed May 3, 2016).

and not extend to edge providers that have access to the same information and operate in the same Internet ecosystem.[52] Under the FCC's proposed rules, mobile broadband providers may prove less able to compete with edge providers, leading to upward pricing pressure and reducing the potential for innovation in the sector. For consumers, these market distortions could mean having to forgo new or competing products and services that ISPs otherwise would have brought to market. Sector-specific regulation is the wrong approach for IoT.

Both IoT and the 5G networks over which IoT will operate are nascent technologies that will open the doors to developed (and yet-to-be developed) applications and systems. NTIA and other federal agencies should only adopt cybersecurity and privacy regulations based on clear evidence of actual harm after balancing the need for regulation against the deterrent effects regulation will have on innovation and investment. Wireless carriers have strong incentives to safeguard their customers' personal information. If a wireless carrier misuses a consumer's data or does not devote the resources needed to develop and maintain meaningful privacy and security programs, customers can switch to another provider. Moreover, the FTC's flexible, technology-neutral and harm-based approach to consumer privacy provides a unified regime for all online actors. The FTC's rules adequately protect consumers by aggressively enforcing rules that are focused on consumer harm. If other federal agencies were to adopt competing rules, then regulatory uncertainty could impair innovation. The same can be said for cybersecurity

[52] *See Protecting the Privacy of Customers of Broadband and Other Telecommunications Services*, Notice of Proposed Rulemaking, 31 FCC Rcd 2500, 2546 ¶ 132 (2016) ("We recognize that edge providers, who may have access to some similar customer [proprietary information], are not subject to the same regulatory framework, and that this regulatory disparity could have competitive ripple effects."). Just last week, Federal Trade Commission ("FTC") staff informed the Commission that "the FCC's proposed rules, if implemented, would impose a number of specific requirements on the provision of BIAS services that would not generally apply to other services that collect and use significant amounts of consumer data. This outcome is not optimal." *See* Comments of the Staff of the Bureau of Consumer Protection of the Federal Trade Commission, WC Docket No. 16-106, at 8 (filed May 27, 2016), *available at* http://1.usa.gov/1TVttYH.

regulations. As CTIA notes, "prescriptive security regulations for 5G are premature given that there is much still unknown about 5G deployments and attendant security challenges."[53] Moreover, "[s]ecurity-related regulations are doubly premature in light of the emerging use cases for 5G, the Internet of Things, and machine-to-machine, the development of which could be distorted by regulation."[54] Divergent privacy regimes that regulate data based on who holds it rather than the data's sensitivity threaten to create the kind of market-distorting regulatory inconsistency and consumer confusion that will hamper IoT deployment and adoption.

C. Technology Neutrality Will Provide the Capacity Necessary to Meet the Exploding Demand for IoT Device Connectivity.

LTE-U is a set of protocols that aggregate licensed and unlicensed spectrum for LTE access, enhancing user experience.[55] In testing conducted by Qualcomm, LTE-U provided double the service capacity and range compared to Wi-Fi networks alone.[56] But some operators have urged the FCC to adopt rules that prevent wireless carriers from deploying LTE-U and similar technologies.[57] Government agencies should refrain from adopting practices or rules that discriminate against next-generation unlicensed services such as LTE-U.

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[53] *See Ex Parte* Letter from Thomas K. Sawanobori, Chief Technology Officer, CTIA – The Wireless Association® to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177, *et al*., at 4 (filed May 23, 2016).

[54] *Id.* at 4-5.

[55] *See* LTE Advanced in Unlicensed Spectrum | Qualcomm, http://bit.ly/1EwAhUD (last visited May 23, 2016).

[56] *See* QUALCOMM, Background on LTE-Unlicensed 8, *attached to Ex Parte* Letter from Patrick Welsh, Executive Director, Public Policy and Law, Verizon, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 15-105 (filed Oct. 2, 2015).

[57] *See, e.g.*, Comments of Cablevision Systems Corp., ET Docket No. 15-105 (filed June 11, 2015); Reply Comments of National Cable & Telecommunications Association, ET Docket No. 15-105 (filed June 26, 2015).

LTE-U is based on 3GPP's current standards of Release 10/11/12 of LTE and complies with the Commission's Part 15 rules that govern access to unlicensed bands. LTE-U protocols allow LTE-U to share spectrum fairly with Wi-Fi and other unlicensed users, and in many cases LTE-U is a better neighbor to Wi-Fi than Wi-Fi is to itself.[58] LTE-U protocols dynamically avoid Wi-Fi through spectrum-sensing capabilities that seek out unoccupied channels within a Wi-Fi band.[59] When the service cannot find an unoccupied channel within the band, LTE-U uses an adaptive duty cycle that allows it to take turns with other unlicensed users without degrading performance.[60] LTE-U is designed to maximize efficiency of unlicensed spectrum and deliver more throughput to consumers while at the same time helping to ease the well-documented mobile broadband spectrum crunch.[61] Extensive testing not typically required of unlicensed devices demonstrates LTE-U can coexist with other unlicensed devices, such as Wi-Fi, without causing harmful interference.[62] Policies and procedures that deny new technologies the same access to unlicensed bands that others have enjoyed frustrate competition and deny consumers the benefits of the "permissionless innovation" that the unlicensed bands are designed to allow.

T-Mobile has no incentive to disrupt unlicensed operations because T-Mobile's business model depends in large measure on the successful operation of services in the unlicensed bands. To improve customer satisfaction, T-Mobile employs unlicensed innovations such as Wi-Fi calling and a Wi-Fi "Personal CellSpot," which is a device that enables customers to put the

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[58] *See Ex Parte* Letter from Member Companies of the LTE-U Forum and T-Mobile to Julius P. Knapp, Chief, Office of Engineering and Technology, FCC, ET Docket No. 15-105, at 1-2 (filed Sept. 9, 2015).

[59] *See id.* at 1-2.

[60] *See id.* at 2.

[61] *Id.* at 1.

[62] *See* Comments of T-Mobile USA, Inc., ET Docket No. 15-105, at 2 (filed June 11, 2015).

capabilities of a personal T-Mobile tower in their home.[63] T-Mobile also uses unlicensed spectrum to support carrier offload and backhaul services for its network.[64] Wi-Fi will remain a critical component of T-Mobile's network for the foreseeable future, and the Commission should not prevent T-Mobile and other carriers from deploying new and innovative uses of unlicensed spectrum to support wireless broadband services for consumers.

Continuing the technology neutral policies of the last several decades that helped to write the unlicensed spectrum success story will permit new technologies, such as IoT, to use spectrum resources to their greatest potential.

III. CONCLUSION

As the number of IoT devices grows from five billion to more than 25 billion over the next four years, the Internet of Things promises to inject hundreds of billions of dollars into the global economy and create new levels of efficiency and convenience for businesses and consumers alike. Increasing access to low-, mid- and high-band spectrum would accelerate IoT device connectivity and allow carriers to offer more competitive pricing and service. Meanwhile, common-sense regulations in the presence of market failure will help promote the types of robust competition that advances the public interest in investment and innovation. But the FCC and other federal agencies should avoid adopting sector- or technology-specific rules that could lead to market distortions that confuse the public and limit competition. Federal agencies should likewise avoid the use of unwarranted technical preconditions before new devices can access the nation's unlicensed spectrum. Taken together, these actions would

[63] *See id.* at 4-5.

[64] *Id.* at 3.

promote market entry, enhance competition and promote consumer choice for IoT products and services.

Respectfully submitted,

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