

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Wireless Telecommunications Bureau	)	WT Docket No. 17-69
Seeks Comment on the State of Mobile	)	
Wireless Competition	)	

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## EXECUTIVE SUMMARY

The mobile wireless market in the United States continues to flourish and is generating unprecedented benefits for consumers. High consumer demand and competition among providers is driving furious activity to make wireless faster and better. These efforts typify a competitive market. As Chairman Pai recently noted, the U.S. wireless marketplace is “extremely competitive [and] delivering unparalleled value to American consumers.” CTIA therefore urges the Commission to formally recognize that the mobile wireless market is effectively competitive. Indeed, the Commission should not hesitate to meet its Congressional mandate to provide such an assessment, particularly when all of the relevant data provide unequivocal support for a finding of effective competition.

As the Commission recognized in the *Thirteenth Competition Report*, “lower prices, higher quality and greater choice of services” are “the ultimate test of effective competition.” By these metrics and any others, the mobile wireless marketplace is robust and thriving. By way of just a few examples:

- **Adoption.** At the end of 2016, there were 395.9 million wireless subscriber connections. And there are increasingly more wireless connections than people in the country—wireless penetration is at 120.6 percent of the American population. For the first time, wireless-only households exceed more than 50 percent.
- **Usage.** Americans used 13.72 trillion MB in 2016—35 times more mobile data than in 2010—and data usage is projected to increase five-fold from 2016 to 2021. Mobile video traffic accounted for 64 percent of all mobile data traffic in the U.S. in 2016.
- **Pricing.** Prices for wireless telephone services fell 11.4 percent in March 2017 compared to the previous year, and declined seven percent between February 2017 and March 2017 alone.
- **Investment.** Over the past seven years, wireless providers spent more than \$200 billion in network improvements to deliver 4G LTE mobile broadband, and they are expected to invest \$275 billion to build out 5G over the next decade.
- **Deployment.** 4G LTE service is now available to 99.7 percent of Americans and covers more than 71 percent of the total U.S. land area. That connectivity is facilitated by the 308,334 cell sites that are now deployed throughout the country.

- ***App Development.*** The app economy is now worth more than \$143 billion, and consumer spending on mobile applications continues to increase, with mobile app store revenue for the Americas hitting \$14.2 billion in 2016.
- ***Ad spending.*** From May to December 2016, the four nationwide wireless providers spent \$1.5 billion in advertising and digital engagement to promote their networks.

Importantly, consumers are benefiting from this competitive wireless landscape. As analyst Craig Moffett has stated, the “industry’s bruising price war has been a boon to consumers.” These comments demonstrate that the robust wireless marketplace is advantaging consumers. For example:

***Consumers enjoy lower prices.*** Wireless providers have been responding to consumer demands and competitive pressures by offering innovative pricing plans. In late 2016 and 2017, the wireless industry saw all four of the nation’s largest providers roll out unlimited plans. Industry data show that the prices for wireless service are decreasing for consumers, even as consumers use more bandwidth and rely more on wireless connectivity.

***Consumers enjoy enhanced networks.*** To meet consumer demand, wireless providers have been investing billions of dollars in their networks, particularly in spectrum and infrastructure to support broad coverage and increased speeds. The past year brought significant increases in coverage footprints for wireless providers and faster speeds, and recent spectrum purchases promise to support additional network enhancements in the coming years.

***Consumers receive more for their money.*** Wireless providers increasingly are competing not only on price and data plans, but also by offering consumers other high-value features. In addition to unlimited voice, text, and data, consumers now enjoy benefits like free high-definition video and access to unique content offerings.

***Consumer devices offer more functionality than ever before.*** Consumers are also benefiting from the robust innovation driven by competition in the wireless device marketplace. The app economy includes apps that focus on healthcare, transportation, social media, business services, productivity, lifestyle, and communications, just to name a few. In addition to smartphones and tablets, burgeoning Internet of Things devices offer new ways for consumers to connect, work, and improve their quality of life. Manufacturers also continue to release devices offering better cameras and screen resolution, faster processors, and longer battery life.

***Consumers of all incomes and abilities are able to participate in a mobile-first lifestyle.*** Wireless providers, device manufacturers, and app developers are competing to offer systems and devices that are accessible to all Americans. Wireless manufacturers and service providers offer smartphones and tablets at multiple price points to enable access by consumers of all income levels. For consumers who have hearing, vision, speech, dexterity, or cognitive disabilities, Bluetooth hearing aids, high-definition audio, voice commands on artificial intelligence platforms, and video chat are among the various functionalities enabling higher levels of connectivity than previously possible.

***Consumers have choices among service providers.*** Consumers get high-speed wireless connectivity from myriad sources. In addition to the four nationwide providers, there are dozens of regional and local wireless providers and additional competition from mobile virtual network operators. Indeed, nearly all Americans have a choice of at least three providers of wireless voice and 4G LTE. And new entrants are eager to join the wireless market. Cable companies have announced efforts to leverage their Wi-Fi connectivity and build wireless networks, and satellite licensees are using their spectrum holdings to build wireless networks that offer additional options for consumers.

*Consumers benefit from an industry-wide commitment to security and safety.* As consumers come to count on wireless connections throughout their lives, they also depend on wireless connections to protect them in an emergency. Wireless providers are working with public safety agencies and officials to ensure that wireless devices connect to the network during a crisis and that first responders are able to locate callers. Providers also offer features to protect the security of consumer devices and information, including password protection, remote access to devices to disable or locate the device, and encryption for communications on wireless networks. 5G networks will also offer a range of functionality for first responders and healthcare providers, including connected tablets for use in the field.

*Consumers will enjoy even more benefits of wireless connectivity with the advent of 5G.* Analysts predict 5G networks will be up to 100 times faster than 4G networks, connect 100 times the number of devices, and respond five times as quickly. Consumers will benefit from a wide array of new use cases made possible by 5G, including some that are already in progress and some that have not yet been conceived. 5G will enable ultra-fast mobile broadband networks and support the connectedness of devices from tablets to asthma inhalers to self-driving cars.

Finally, the economy also benefits from wireless. To meet consumers' ever-increasing demand for seamless connectivity, wireless providers are investing heavily in infrastructure and innovative technologies and are competing aggressively to offer the widest coverage, fastest speeds, and best plan features. This investment contributes billions of dollars to the economy and directly benefits consumers.

\* \* \* \* \*

Wireless connectivity and mobile devices increasingly are becoming central features of consumers' daily lives, including in their relationships, education, employment, and health. For

all the reasons described herein, the Commission should not hesitate to meet its Congressional mandate to determine that the mobile wireless market is effectively competitive. The Commission can take steps to ensure the continued vibrancy and competitiveness of the wireless market. Making available additional low-, mid-, and high-band spectrum for licensed use is essential to enable continued investment and innovation by wireless providers. Modernizing siting processes will facilitate the deployment of critical wireless broadband infrastructure, including new 5G networks. Taking a fresh look at the regulations affecting mobile wireless providers, including in the Restoring Internet Freedom proceeding, will foster a regulatory framework that permits investment and innovation and would better reflect the competitive dynamic in the mobile wireless industry. And establishing the new Office of Economics and Data will ensure that economic analyses and data-driven assessments support all Commission efforts affecting mobile wireless.



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**COMMENTS OF CTIA**

CTIA<sup>1</sup> respectfully submits these comments in response to the Public Notice released by the Wireless Telecommunications Bureau (“Bureau”) of the Federal Communications Commission (“Commission”) in the above-captioned proceeding.<sup>2</sup> By its Public Notice, the Bureau seeks comment on the state of mobile wireless competition in the U.S. to inform the 20<sup>th</sup> Mobile Competition Report. As detailed herein, competition in the mobile wireless marketplace is robust and growing, benefiting wireless consumers and the American economy. CTIA therefore urges the Commission to find that there is effective competition in the mobile wireless market.

**I. INTRODUCTION.**

The wireless industry exemplifies a competitive market, and consumers are reaping the benefits of that competition as wireless networks become an increasingly vital part of daily life. Wireless providers are competing to offer high-speed connectivity to meet the demands of

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<sup>1</sup> CTIA® (www.ctia.org) represents the U.S. wireless communications industry and the companies throughout the mobile ecosystem that enable Americans to lead a 21<sup>st</sup> century connected life. The association’s members include wireless carriers, device manufacturers, suppliers as well as apps and content companies. CTIA vigorously advocates at all levels of government for policies that foster continued wireless innovation and investment. The association also coordinates the industry’s voluntary best practices, hosts educational events that promote the wireless industry and co-produces the industry’s leading wireless tradeshow. CTIA was founded in 1984 and is based in Washington, D.C.

<sup>2</sup> *Wireless Telecommunications Bureau Seeks Comment on the State of Mobile Wireless Competition*, Public Notice, 32 FCC Rcd 1950 (WTB 2017).

consumer usage, including by investing billions of dollars in their networks year after year. Wireless providers are also offering lower-priced plans, offering more—and often unlimited—data, and offering premium features like access to sought-after mobile video content. Device manufacturers, too, are competing to develop the sleekest, fastest, most durable devices with the best functionality.

All the activity in the wireless market contributes billions of dollars to the economy and tangible benefits to consumers. Consumers of all needs and income levels are accessing wireless networks like never before. The Internet of Things (“IoT”) market, too, offers new and exciting ways for consumers to use wireless networks to enhance their daily lives. The deployment of 5G will present another front for competition in the wireless industry, and providers are jumping into the fray with plans to roll out 5G as early as this year. The U.S. intends to lead the world on 5G as it has led the world on 4G LTE deployment.

The wireless market is also seeing new types of entrants into the marketplace, including the introduction of wireless offerings by cable companies and satellite providers. Consumers will further benefit from the increased choices offered by these new providers. Subscribers are also benefiting from the ongoing commitment in the wireless industry to protection of the consumer experience and consumer data. Subscribers have myriad options to encrypt their communications, protect their interactions with their wireless providers, and stop unwanted calls.

However, there is still more that the Commission can do to foster the vibrancy of the wireless marketplace. In particular, the Commission can make even more low-, mid-, and high-band spectrum available for exclusive, licensed use to promote continued competition in the market. And it can work to modernize siting processes to enable the rapid and efficient deployment of the infrastructure necessary to support improved 4G LTE and 5G networks.

These comments will demonstrate that the U.S. mobile wireless market is and will continue to be a model of innovation and competition. Therefore, CTIA believes the Commission must find the mobile wireless market effectively competitive.

**II. THE COMMISSION CAN AND SHOULD CONCLUDE THAT THE WIRELESS MARKET IS EFFECTIVELY COMPETITIVE.**

The Communications Act requires the Commission annually to review competitive market conditions in the mobile wireless industry and to provide to Congress an analysis of, among other things, “whether or not there is effective competition.”<sup>3</sup> For several years, the Commission—or the Bureau on delegated authority—has declined to reach any conclusion on the competitiveness of the mobile wireless industry, opting instead simply to describe various metrics and trends relating to wireless competition.<sup>4</sup> Respectfully, that approach is not consistent with the statute’s mandate that the Commission “shall” provide its assessment of “whether or not” there is effective competition.<sup>5</sup> Furthermore, avoiding any conclusion on the industry’s competitiveness fails to give Congress an accurate assessment and portrayal of the data amassed in these reports, which continues to confirm that the market is highly competitive and is generating tremendous benefits for consumers. The time has come for the Commission to implement the text of the statute and report to Congress that the mobile wireless industry is characterized by effective competition.

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<sup>3</sup> 47 U.S.C. § 332(c)(1)(C).

<sup>4</sup> See *Implementation of Section 6002(b) of the Omnibus Reconciliation Act of 1993*, Nineteenth Report, 31 FCC Rcd 10534 ¶ 4 and n.11 (2016) (“*Nineteenth Report*”) (acknowledging that the Commission’s recent approach is “in contrast to the *Eighth Report* through the *Thirteenth Report*, which included a specific finding that there was effective competition in the provision of CMRS service. . .”).

<sup>5</sup> 47 U.S.C. § 332(c)(1)(C).

As Chairman Pai noted in recent remarks, the Commission’s policies and findings should be informed by a careful assessment of the relevant data.<sup>6</sup> CTIA’s comments below provide extensive data and other information about the state of the wireless industry. These facts permit no other conclusion than that the mobile wireless industry is effectively competitive, and becoming more competitive with each passing day.

Today’s wireless market reflects vibrant competition along every relevant dimension, including wireless adoption and usage, investment in competitive resources from infrastructure to spectrum, development of new technologies, proliferation of devices, and innovations in services and service plans. Nationwide providers are competing vigorously with one another and with dozens of regional and local wireless providers that give consumers across the country multiple choices for wireless service. Mobile virtual network operators (“MVNOs”) also offer additional competitive options in many markets, and MVNO relationships are creating platforms for rapid new entry into the mobile wireless market.<sup>7</sup> Wireless adoption and usage continue to reach all-time highs; network investment totals billions of dollars annually; speeds and capacity continue to increase rapidly; and wireless providers are perpetually innovating their service plans and data offerings. All of these dynamics reflect a highly competitive market.

Most importantly, the competitive dynamics of the wireless marketplace are generating tremendous benefits for consumers. Consumers today have extensive choices among providers,

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<sup>6</sup> Ajit Pai, Chairman, FCC, Remarks at the Hudson Institute: The Importance of Economic Analysis at the FCC (Apr. 5, 2017), [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0405/DOC-344248A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0405/DOC-344248A1.pdf).

<sup>7</sup> See, Press Release, Comcast, Comcast Introduces XFINITY Mobile: Combining America’s Largest, Most Reliable 4G LTE Network and the Largest Wi-Fi Network (Apr. 6, 2017), <http://corporate.comcast.com/news-information/news-feed/comcast-xfinity-mobile>); Transcript of Charter Communications, Q4 2016 Earnings Call (Feb. 16, 2017), <https://seekingalpha.com/article/4046778-charter-communications-chtr-q4-2016-results-earnings-call-transcript> (CEO Tom Rutledge stating that “we’ve now activated our MVNO agreement ... and we plan to launch a mobile offering in 2018”).

devices, and services, and are enjoying new and evolving uses for mobile connectivity, such as mobile video, wearable devices, virtual reality, and IoT devices. Chairman Pai recently described the U.S. wireless marketplace as “extremely competitive [and] delivering unparalleled value to American consumers.”<sup>8</sup> Based on the facts discussed below, that is an accurate description of the current wireless market, and it is time that the Commission formally reach the same conclusion.

At a minimum, the Commission should reaffirm its prior finding that the core commercial mobile radio service (“CMRS”) market is highly competitive. In the *Thirteenth Competition Report*, the Commission analyzed the mobile wireless market and determined that there was effective competition in the CMRS market, based on an assessment of market structure, provider conduct, consumer behavior, and market performance.<sup>9</sup> After the *Thirteenth Competition Report*, the Commission expanded its analysis to include CMRS as one component of the broader universe of mobile wireless services, including upstream and downstream market segments such as infrastructure and devices. Regardless of how the Commission frames its analysis, however, there is no serious question that the CMRS market is highly competitive, and indeed has grown more competitive in the eight years since the *Thirteenth Competition Report*. In the *Thirteenth Competition Report*, the Commission stated that “lower prices, higher quality

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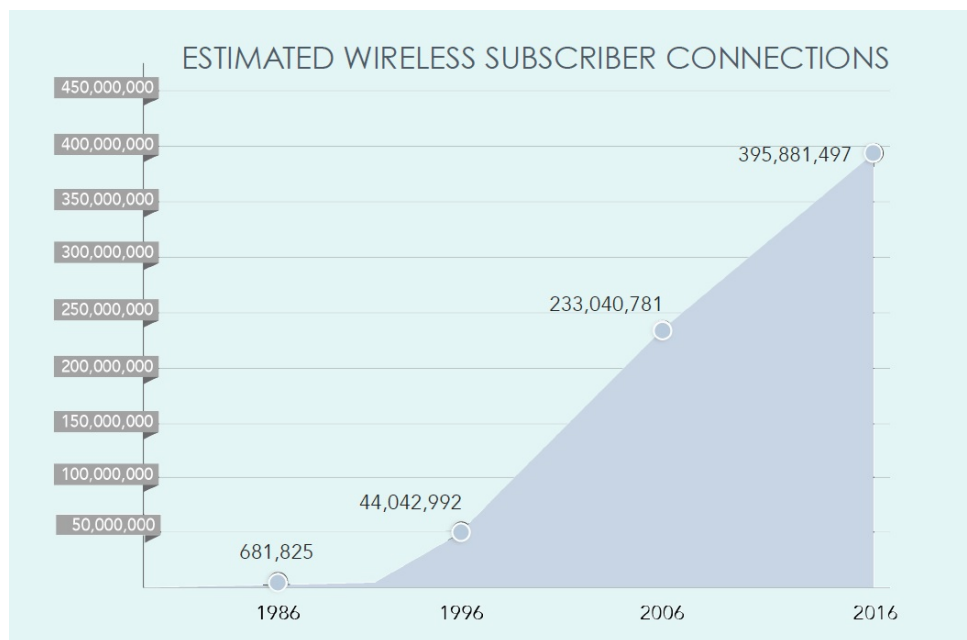
<sup>8</sup> Press Release, CNBC, CNBC Transcript, *FCC Chairman Ajit Pai Speaks with CNBC’s “Squawk on the Street” Today* (Feb. 22, 2017), <http://www.cnbc.com/2017/02/22/cnbc-transcript-fcc-chairman-ajit-pai-speaks-with-cnbc-s-squawk-on-the-street-today.html>; see also *Oversight of the Federal Communications Commission*, 115th Cong., Senate Commerce, Sci., and Transp. Comm. (2017) (statement of Ajit Pai, Chairman, FCC) (wireless industry is “fiercely competitive”); Ajit Pai, Chairman, FCC, Address at the Mobile World Congress, Barcelona, Spain, at 4 (Feb. 28, 2017), [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-343646A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-343646A1.pdf) (“Mobile World Congress Address”) (stating that American wireless consumers are benefiting from “a competitive marketplace”).

<sup>9</sup> *Implementation of Section 6002(b) of the Omnibus Reconciliation Act of 1993*, Thirteenth Report, 24 FCC Rcd 6185 ¶ 1 (2009) (“*Thirteenth Report*”).

and greater choice of services” are “the ultimate test of effective competition.”<sup>10</sup> Since that report, prices for wireless services have steadily decreased, service quality continues to reach new peaks, and consumers have multiple choices of providers, plans, and devices. The Commission should therefore, at a minimum, reaffirm that the core CMRS market is characterized by effective competition.

### III. THE WIRELESS INDUSTRY IS CONTINUING TO GROW.

By nearly every metric, the wireless marketplace shows exceptional development and growth. At the end of 2016, there were almost 396 million wireless connections in the United States, up from 377.9 million wireless connections in 2015.<sup>11</sup>



Source: CTIA Annual Survey.

This growth reflects an increase of almost five percent over the prior year, and there are increasingly more wireless connections than people in the country, as the number of active

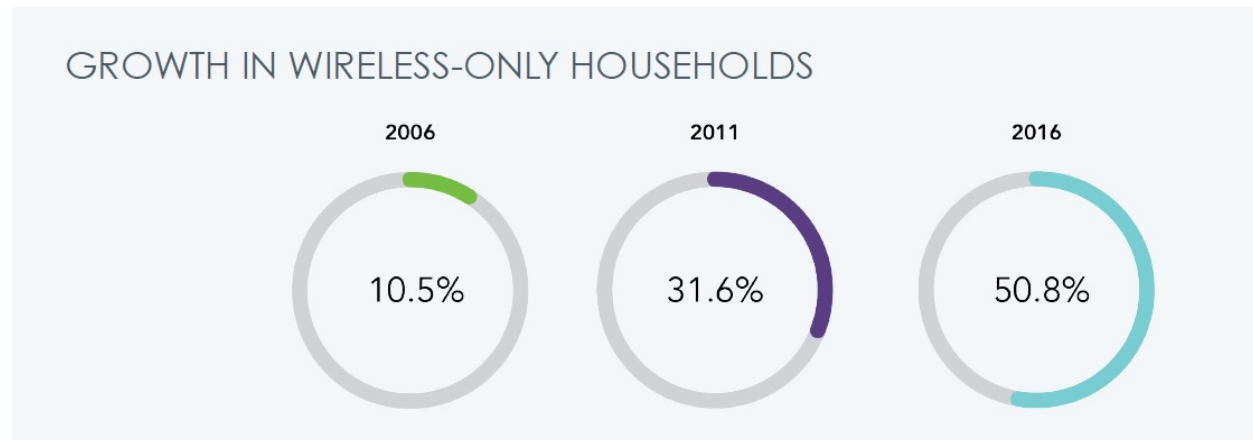
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<sup>10</sup> *Id.* ¶ 187.

<sup>11</sup> CTIA Annual Survey Report, CTIA (2017) (“CTIA Annual Survey”).

revenue-generating wireless devices grew to equal 120.6 percent of the American population.<sup>12</sup>

Indeed, more than 90 percent of all American households have wireless phones, and 50.8 percent are wireless-only as of December 2016.<sup>13</sup>



Source: *Wireless substitution: Early release of estimates from the National Health Interview Survey, July-December 2016*, National Center for Health Statistics, CDC (May 2017).

The number and diversity of networked devices continues to grow apace. According to Cisco, there will be 4.1 billion Internet-connected devices in the United States by 2020, up from 2.3 billion in 2015.<sup>14</sup> In fact, by 2020, each person in the U.S. will have on average 12 networked devices and more than 20 percent of all networked devices will be supported by wireless networks.<sup>15</sup> At year-end 2016, there were almost 396 million CMRS connections.<sup>16</sup> Over the course of 2016, 33.6 million smartphones were added to carriers' networks, as the

<sup>12</sup> CTIA Annual Survey.

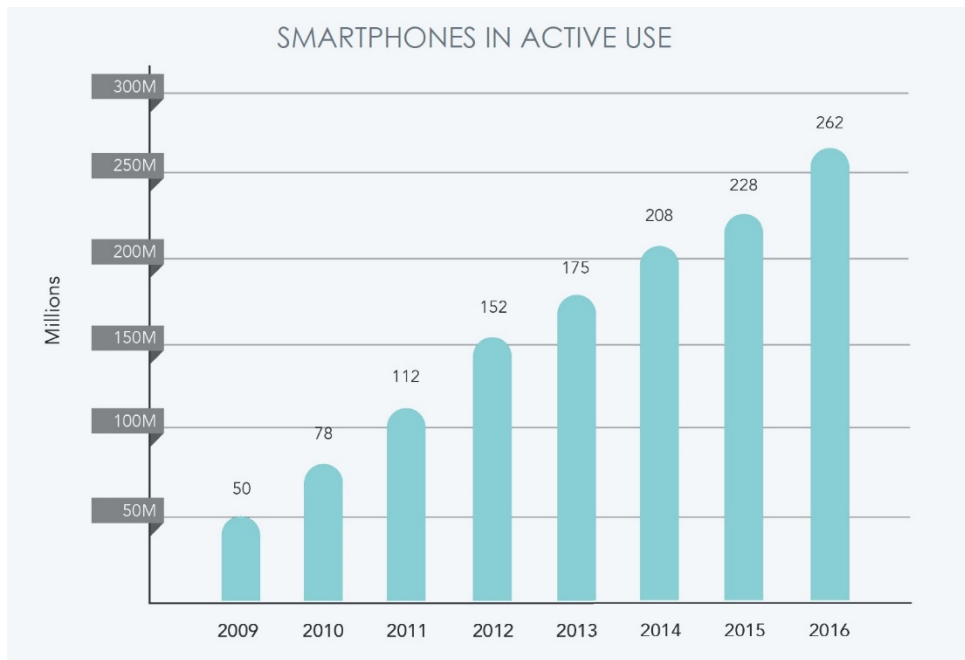
<sup>13</sup> Stephen J. Blumberg and Julian V. Luke, *Wireless substitution: Early release of estimates from the National Health Interview Survey, July-December 2016*, National Center for Health Statistics, CDC (May 2017), <https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201705.pdf>; see also Anick Jesdanun, *More Americans Have Cell Phones Than Landlines for the First Time*, TIME (May 4, 2017), <http://time.com/4766983/cell-phones-landlines-popularity/>.

<sup>14</sup> *VNI Complete Forecast Highlights, United States – 2020 Forecast Highlights*, CISCO (2016), [http://www.cisco.com/c/m/en\\_us/solutions/service-provider/vni-forecast-highlights.html#](http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html#) (click on “North America” and then “United States” and then “Devices”) (“United States 2020 Forecast Highlights”).

<sup>15</sup> *Id.*

<sup>16</sup> CTIA Annual Survey.

number of active smartphones rose from 228.3 million to 261.9 million by year-end.<sup>17</sup> The reported number of tablets, wireless-connected laptops, and wireless broadband modems in use also grew, from 41 to 47.9 million in the space of a year.<sup>18</sup> In total, the 309.8 million smartphones and other data-heavy devices amount to roughly 78 percent of all connections. Indeed, 105.7 million devices were data-only as year-end 2016, up from 85.7 million at year-end 2015.<sup>19</sup>



Source: CTIA Annual Survey.

With the increasing number of connections and devices, U.S. consumers' wireless devices generated even more network traffic than in prior years. Americans used 13.72 trillion MB of data in 2016, 35 times more mobile data than in 2010.<sup>20</sup>

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<sup>17</sup> *Id.*

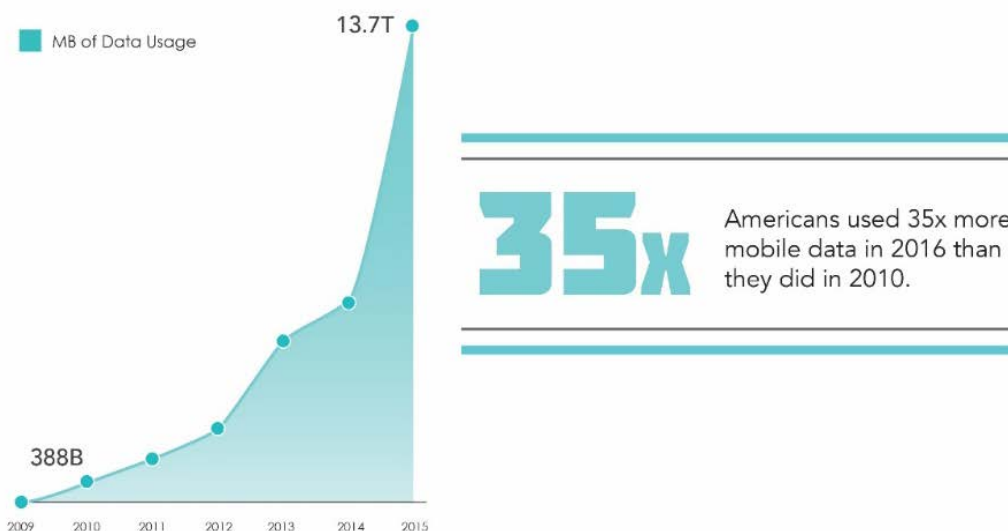
<sup>18</sup> *Id.*

<sup>19</sup> *Id.*

<sup>20</sup> *Id.*



## Reported Annual Wireless Data Usage



Source: CTIA Annual Survey.

Mobile data usage is expected to continue to grow dramatically over the next five years as new network and device technologies respond to consumer demand for higher bandwidth services and faster connectivity. By 2021, Cisco projects mobile data traffic in the U.S. will grow five-fold from 2016—twice as fast as U.S. fixed Internet traffic. Indeed, mobile data traffic is already growing 1.9 times as fast as U.S. fixed Internet traffic.<sup>21</sup>

#### **IV. COMPETITION IN THE WIRELESS MARKETPLACE IS BENEFITING CONSUMERS.**

Vigorous competition and innovation in the wireless market has resulted in transformative products and services that consumers now use as fundamental tools across all aspects of daily life, including health, communications, employment, and entertainment. Consumers are not only benefiting from lower prices and increased plan options, but device

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<sup>21</sup> Cisco VNI Mobile Forecast Highlights, 2016-2021, [http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast\\_highlights\\_mobile/index.html#~Country](http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast_highlights_mobile/index.html#~Country) (click on “United States,” then “2021 Forecast Highlights,” and then “2016 Year in Review”).

improvements and innovations across platforms and technologies as well. In today's competitive marketplace, there are choices for consumers of all different needs, abilities, and incomes.

**a. Consumers Today Are Engaging in a Mobile-First Lifestyle.**

Wireless devices have simply become command central for consumers' daily lives. Nearly all American consumers today own a cellphone of some kind, more than 80 percent of Americans own smartphones,<sup>22</sup> and more than half of Americans own a tablet that can leverage the myriad advantages of wireless connectivity.<sup>23</sup> Forty percent of consumers check their phones within the first five minutes of waking up,<sup>24</sup> and the average U.S. consumer checks his phone nearly 50 times throughout the day.<sup>25</sup> Consumer spending on mobile phones is projected to hit \$400 billion by the end of 2017, marking 4.3 percent growth over 2016.<sup>26</sup> Many consumers are also replacing their basic phones with better-quality, more feature-rich phones.<sup>27</sup> Indeed, wireless service has become an important quality-of-life factor for American consumers. When asked about the factors that influence their decisions about where to live, more Americans ranked reliable wireless service as a "must have" than reasonable home prices or good commuting times.<sup>28</sup>

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<sup>22</sup> Adam Lella, *U.S. Smartphone Penetration Surpassed 80 Percent in 2016*, COMSCORE (Feb. 3, 2017), <https://www.comscore.com/Insights/Blog/US-Smartphone-Penetration-Surpassed-80-Percent-in-2016>.

<sup>23</sup> Ninety-five percent of American consumers own a cell phone of some kind. *Mobile Fact Sheet*, PEW RESEARCH CENTER (Jan. 12, 2017), <http://www.pewinternet.org/fact-sheet/mobile/>.

<sup>24</sup> *2016 Global Mobile Consumer Survey: US Edition*, DELOITTE (2016), <https://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/global-mobile-consumer-survey-us-edition.html> ("2016 Global Mobile Consumer Survey: US Edition").

<sup>25</sup> *Id.*

<sup>26</sup> Diana Goovaerts, *Consumer Spending on Mobile Phones on the Rise*, WIRELESS WEEK (Apr. 12, 2017), <https://www.wirelessweek.com/data-focus/2017/04/consumer-spending-mobile-phones-rise>.

<sup>27</sup> *Id.*

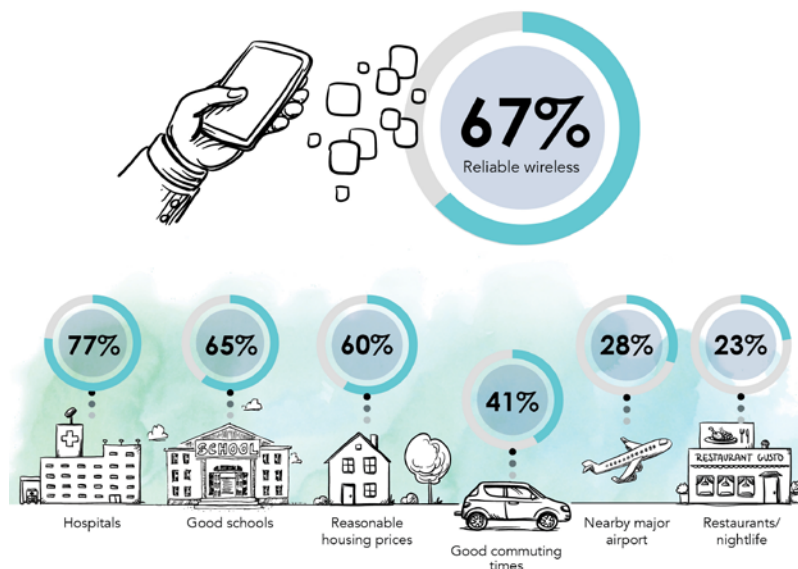
<sup>28</sup> Susie Poppick, *The Surprising Thing Home Buyers Care About More Than Schools*, MONEY (June 2, 2015), <http://time.com/money/3904761/buy-home-good-cell-mobile-reception/>.

Consumers are increasingly relying on wireless connections for a wide range of personal and professional uses, including to access employment opportunities, news, healthcare, home security services, transportation, public safety, entrepreneurship, and education.<sup>29</sup> Over the past three years, consumers also embraced mobile apps, with time spent on mobile apps approaching

## CONSUMERS VALUE WIRELESS

When moving to a new community, Americans believe reliable wireless is more of a must-have than good schools and affordable housing. **Here's how Americans rank the importance of reliable wireless compared to other neighborhood necessities.**

Source: Morning Consult 2017



60 percent of all time consumers spend with digital media.<sup>30</sup> The most popular mobile applications at the end of last year were social media app Facebook and instant messaging app Facebook Messenger, which were accessed by nearly 80 percent and more than 73 percent of smartphone app users, respectively.<sup>31</sup> These were followed by YouTube's mobile video app, accessed by more

<sup>29</sup> *Wireless Connectivity Fuels Industry Growth and Innovation in Energy, Health, Public Safety, and Transportation*, DELOITTE, at 3 (Jan. 2017) (“Wireless Connectivity Fuels Industry Growth and Innovation”); see also Kevin Ryan, *How Wireless Promotes Innovation Across Various Industries*, CTIA BLOG (Jan. 19, 2017), <https://www.ctia.org/industry-data/blog-details/blog-posts/how-wireless-promotes-innovation-across-various-industries>.

<sup>30</sup> The 2016 U.S. Mobile App Report, COMSCORE, at 6 (2016), <https://www.comscore.com/Insights/Presentations-and-Whitepapers/2016/The-2016-US-Mobile-App-Report>.

<sup>31</sup> *Mobile Audience Reach of Leading Smartphone Apps in the United States as of December 2016*, STATISTA, <https://www.statista.com/statistics/281605/reach-of-leading-us-smartphone-apps/>.

than 68 percent of audiences; Google Search, used by nearly 63 percent of smartphone app users; and Google Maps, relied upon by 57 percent of users for transportation and traffic information.<sup>32</sup>

In addition to smartphones,<sup>33</sup> consumers, businesses, and service providers are embracing tablets, wearables, and other IoT devices to support new wireless functionality,<sup>34</sup> which is yet another contributor to the estimated five-fold increase that is expected in mobile data traffic in the next five years.<sup>35</sup>

Analysts estimate that by 2021 there will be 929 million wearable devices globally, a nearly threefold increase from 325 million wearable devices in 2016.<sup>36</sup> Even though it has less than five percent of the world's population, the U.S. already



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**5x** In 2021, Americans are projected to use 5x more mobile data than they did in 2016.

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<sup>32</sup> *Id.*

<sup>33</sup> Even as consumers diversify their wireless device ownership by using wearables and other IoT devices, consumers rely on their wireless-powered smartphone as an information hub for a growing number of daily activities. In fact, Google Cloud—a service used to keep consumers' wireless devices constantly in sync—ranked among the top ten peak period applications. Sandvine, *2016 Global Internet Phenomena: Latin America & North America*, at 4 (June 21, 2016) (“Sandvine 2016 Global Internet Phenomena”), <https://www.sandvine.com/downloads/general/global-internet-phenomena/2016/global-internet-phenomena-report-latin-america-and-north-america.pdf> (accounting for 3.56 percent of peak period aggregate traffic).

<sup>34</sup> See 2016 Global Mobile Consumer Survey: US Edition at 6.

<sup>35</sup> See, *supra*, Section III (citing Cisco VNI Mobile Forecast Highlights, 2016-2021, [http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast\\_highlights\\_mobile/index.html#~Country](http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast_highlights_mobile/index.html#~Country)).

<sup>36</sup> Cisco, Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021 White Paper, CISCO, at 17 (Mar. 28, 2017), <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html> (“Cisco 2017 VNI Update”).

accounts for more than a third of all global wearables, a share that will continue to grow as the number of wearables in the U.S. grows from 117.7 million in 2016 to 358 million in 2021.<sup>37</sup> These devices come in a variety of shapes and forms, including smart watches, smart glasses, heads-up displays, health and fitness trackers, health monitors, wearable scanners and navigation devices, smart clothing, and more. For instance, smart watches tripled their market penetration in 2016, and fitness band ownership nearly doubled.<sup>38</sup> Augmented reality and virtual reality for gaming as well as educational and industrial applications are poised to be major trends in mobile technology.<sup>39</sup> Consumers continue to adopt these capabilities on their smartphones, tablets, and virtual reality headsets.<sup>40</sup> Tablets are a particularly popular device among businesses and service providers. For example, 80 percent of healthcare professionals in the United States use tablets to coordinate and provide patient care.<sup>41</sup>

Many of the fastest growing mobile apps are services that improve daily life, such as hailing cabs, exercising, and dating. For example, the percentage of American adults that have used a dating app on their cellphone has tripled since 2013.<sup>42</sup> The “gig economy,” in which individuals seek and offer specific professional services using technology like apps, is also growing notably, as skilled workers, from local handymen to freelance computer programmers,

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<sup>37</sup> Cisco VNI Mobile Forecast Highlights, 2016-2021, [http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast\\_highlights\\_mobile/index.html#~Country](http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast_highlights_mobile/index.html#~Country) (click on “United States” and then “Network Connections” and “Wearable Devices”).

<sup>38</sup> See 2016 Global Mobile Consumer Survey: US Edition.

<sup>39</sup> Cisco 2017 VNI Report at 16-17.

<sup>40</sup> *Id.* at 23-24. By the end of 2016, eight percent of consumers owned virtual reality headsets. See 2016 Global Mobile Consumer Survey: US Edition at 6.

<sup>41</sup> *2017 Essentials Brief: Mobile*, HIMSS ANALYTICS, <http://www.himssanalytics.org/research/essentials-brief-2017-mobile-study> (available by subscription).

<sup>42</sup> Aaron Smith, *15% of American Adults Have Used Online Dating Sites or Mobile Dating Apps*, PEW RESEARCH CENTER (Feb. 11, 2016), <http://www.pewinternet.org/2016/02/11/15-percent-of-american-adults-have-used-online-dating-sites-or-mobile-dating-apps/>.

use mobile apps and online services to take on project-based work in addition to, or even instead of, traditional employment. Nearly one in ten Americans earned money through an online job platform last year, and more than half of these users described “gig work” as essential or important to their lives.<sup>43</sup>

Many consumers still use their mobile phones for traditional services such as SMS/MMS text messaging (97 percent), voice/video calling (92 percent), Internet access (89 percent), and email access (88 percent).<sup>44</sup> And these carrier-initiated services compete not only with each other, but with over-the-top applications offered by third-parties which offer and deliver similar functionality to millions of consumers. Industries and government agencies are also working to develop consumer mobile engagement strategies using these essential features. For example, Wireless Emergency Alerts (“WEAs”) are the official government communication vehicle for distributing urgent public safety messages, such as Amber Alerts, via mobile, and local governments are beginning to use messaging alert systems that local residents can join for access to public safety information, weather alerts, and other announcements.<sup>45</sup> Businesses are also discovering that SMS/MMS messaging is a very effective marketing tool, with 90 percent of consumers reading the message within minutes of receipt.<sup>46</sup>

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<sup>43</sup> Aaron Smith, *Gig Work, Online Selling and Home Sharing*, PEW RESEARCH CENTER (Nov. 17, 2016), <http://www.pewinternet.org/2016/11/17/gig-work-online-selling-and-home-sharing/>.

<sup>44</sup> Aaron Smith, *Chapter Three: A “Week in the Life” Analysis of Smartphone Users*, PEW RESEARCH CENTER: INTERNET, SCIENCE & TECH (Apr. 1 2015), <http://www.pewinternet.org/2015/04/01/chapter-three-a-week-in-the-life-analysis-of-smartphone-users/>.

<sup>45</sup> See, e.g., How Wireless Emergency Alerts Help Save Lives, CTIA, <http://www.ctia.org/consumer-tips/how-wireless-emergency-alerts-help-save-lives> (last visited May 1, 2017).

<sup>46</sup> Genia Stevens, *Text Savvy: 6 Reasons Brands Should Start Using SMS Marketing*, BUSINESS.COM (Feb. 22, 2017), <https://www.business.com/articles/6-reasons-brands-should-start-using-sms-marketing/>.

In short, consumers are using their wireless devices every day to communicate with loved ones, stay abreast of important news and public safety events, enjoy a variety of entertainment and social applications and videos, engage in their communities, and more. This mobile-first way of life has revolutionized the way we live, work, and play, and it shows no signs of slowing in the near future.

**b. The Wireless Industry is Competing to Decrease Costs and Increase Choices for Consumers.**

Intense competition among wireless providers led to the rapid release of unlimited data plans in the last year by all four of the nationwide providers, as well as the release or expansion of unlimited data plans by other providers. In February 2017, Sprint began offering five smartphone lines with unlimited data for \$90 per month<sup>47</sup> and U.S. Cellular introduced unlimited data offerings as part of its Total Plans option, with no activation, monthly connection, or phone upgrade fees.<sup>48</sup> U.S. Cellular also offers unlimited data as part of some of its prepaid plans.<sup>49</sup> Verizon announced that same month the release of an unlimited data plan.<sup>50</sup> The “Verizon Unlimited” plan offers an individual option at a cost of \$80 per line or \$45 for each line on a four-line family plan.<sup>51</sup> Also in February 2017, AT&T extended its unlimited plan beyond its

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<sup>47</sup> Tamara Chuang, *Wireless Plan Confusion? Here’s a Breakdown of the New Unlimited Data Plans, Prices*, DENVER POST (Feb. 20, 2017), <http://www.denverpost.com/2017/02/20/wireless-plan-unlimited-data-prices/>.

<sup>48</sup> Press Release, U.S. Cellular, U.S. Cellular Introduces Unlimited Data Offering Among Its New Total Plans With No Hidden Fees (Feb. 24, 2017), <https://www.uscellular.com/about/press-room/2017/USCELLULAR-INTRODUCES-UNLIMITED-DATA-OFFERING-AMONG-ITS-NEW-TOTAL-PLANS-WITH-NO-HIDDEN-FEES.html>.

<sup>49</sup> Press release, U.S. Cellular, U.S. Cellular Brings Unlimited High-Speed Data to its Prepaid Offerings (Apr. 10, 2017), <https://www.uscellular.com/about/press-room/2017/USCELLULAR-BRINGS-UNLIMITED-HIGH-SPEED-DATA-TO-ITS-PREPAID-OFFERINGS.html>.

<sup>50</sup> Chris Welch, *Verizon announces new unlimited data plan*, THE VERGE (Feb. 12, 2017), <http://www.theverge.com/2017/2/12/14592822/verizon-unlimited-data-plan-announced-2017>.

<sup>51</sup> *Id.*

original exclusive release to DirecTV customers. Shortly thereafter, AT&T cut the prices for its unlimited plan, offering an unlimited option for \$60 per month for a single line.<sup>52</sup> Then, in March, T-Mobile increased the amount of data that customers can use at the highest available speeds on its unlimited plan.<sup>53</sup>

Facing strong competition, providers are moving rapidly to position themselves in the marketplace and increase customer satisfaction.<sup>54</sup> According to an analysis from Craig Moffett, the “industry’s bruising price war has been a boon to consumers.”<sup>55</sup> According to Moffett, a drop in wireless bill prices contributed to an overall drop in the consumer price index. Prices for wireless telephone services fell 11.4 percent in March 2017 over the previous March, and declined seven percent between February and March 2017 alone.<sup>56</sup>

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<sup>52</sup> Brian Fung, *AT&T is Cutting the Price of Its Unlimited Data Plans*, WASH. POST (Feb. 23, 2017), [https://www.washingtonpost.com/news/the-switch/wp/2017/02/27/att-reveals-even-more-unlimited-data-plans/?utm\\_term=.b63b6a3d597e](https://www.washingtonpost.com/news/the-switch/wp/2017/02/27/att-reveals-even-more-unlimited-data-plans/?utm_term=.b63b6a3d597e).

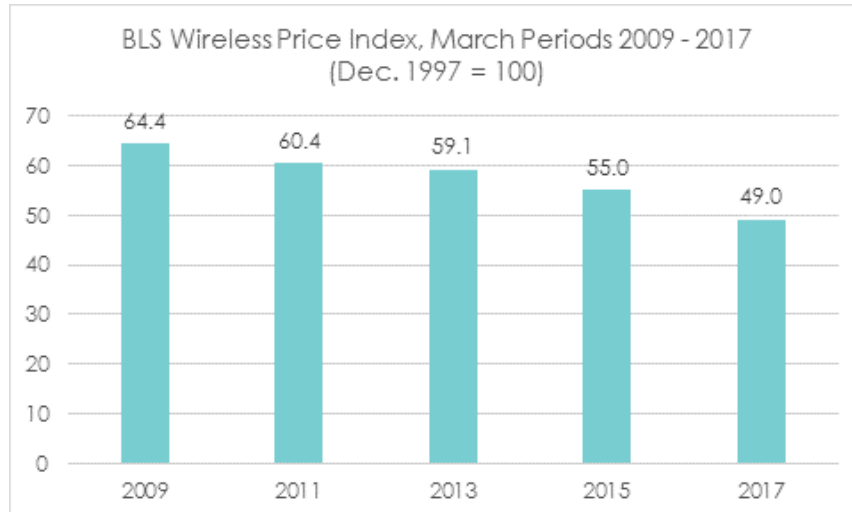
<sup>53</sup> Aaron Pressman, *T-Mobile Just Improved Its Unlimited Data Plan Again*, FORTUNE (Mar. 9, 2017), <http://fortune.com/2017/03/09/how-t-mobile-unlimited-data-plan/>.

<sup>54</sup> Ryan Knutson and Joshua Jamerson, *Verizon Customers Defect as Competition Ramps Up*, WALL ST. J. (Apr. 20, 2017), <https://www.wsj.com/articles/verizon-for-first-time-loses-core-wireless-customers-1492691308>.

<sup>55</sup> *Id.*

<sup>56</sup> *Id.*





Source: BLS Wireless Price Index, Series ID CUUR0000SEED03 (not seasonally adjusted)<sup>57</sup>

This intense competition shows no signs of slowing. In addition to broader availability of, and lower prices for, unlimited data plans, competition among wireless providers has prompted creative thinking to attract and retain customers, including new pricing options that incorporate the costs of taxes and fees.<sup>58</sup> Providers are rushing to offer high-definition video streaming at no additional charge after Verizon introduced this feature.<sup>59</sup> They are also offering high-demand content like HBO as part of the service package for its customers.<sup>60</sup>

On top of high-demand service offerings and lower prices, customers are reaping other benefits from extremely competitive plan terms. Wireless providers continue to offer device

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<sup>57</sup> The Bureau of Labor Statistics (“BLS”) Wireless Price Index shows the effective price of wireless service has fallen 51 percent since it was established in 1997. The above-referenced chart shows declines in two-year intervals since 2009.

<sup>58</sup> See *Why T-Mobile’s All-In Pricing Strategy Could Pay Off*, FORBES (Jan. 12, 2017), <https://www.forbes.com/sites/greatspeculations/2017/01/12/why-t-mobiles-all-in-pricing-strategy-could-pay-off/#785af5255302>.

<sup>59</sup> See Patrick Holland, *Unlimited Data Plans: Verizon, T-Mobile, AT&T and Sprint, Compared*, CNET (Mar. 9, 2017), <https://www.cnet.com/news/how-does-verizon-unlimited-plan-stack-up-against-the-others/>.

<sup>60</sup> See Aaron Pressman, *How to Get Free HBO With AT&T’s Unlimited Mobile Plan*, FORTUNE (Apr. 5, 2017), <http://fortune.com/2017/04/05/hbo-free-att-mobile/>.

promotions, buyout options, and no-contract agreements to attract new customers and retain existing customers. All four of the nation's largest providers cover up to \$650 in fees charged to customers that switch providers. This includes paying off amounts owed on devices and service contracts and covering any early termination fees.<sup>61</sup> Competition has driven the market away from two-year contracts and early termination fees.

**c. Competition is Fostering Innovations for Consumers with a Variety of Needs, Income Levels, and Abilities.**

Competition in the wireless industry is driving innovation in devices and applications. Consumers are looking for, and finding, devices that do more and last longer. The desire to attract all consumers is also resulting in innovation around accessibility and motivating service providers and manufacturers to offer an array of devices at varying price points.

Smartphones and connected devices continue to feature improved device specifications and functionality year after year. In the last year, manufacturers released devices that were faster and more functional, with improved cameras, longer battery life, and faster processors. For example, in April 2017, Samsung released the next generation of its popular Galaxy smartphone: the Galaxy S8, which features a new design, upgraded camera and processor, and iris scanning security functions.<sup>62</sup> Apple released the next generation of the iPhone in September 2016, featuring improvements to the camera, processor, stereo speakers, and display.<sup>63</sup> Meanwhile, HTC announced its new U Ultra model with a new personal assistant program—HTC Sense

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<sup>61</sup> See, e.g., Switch to Verizon and get up to \$650, Verizon, <https://www.verizonwireless.com/promos/switch-and-save/> (last visited Apr. 24, 2017); Switch to Sprint, Sprint, <https://promo.sprint.com/Registration/DisplayLanding?ECID=vanity:joinsprint&LandingPartial=CBOLanding> (last visited Apr. 24, 2017).

<sup>62</sup> Galaxy S8, Samsung, <http://www.samsung.com/global/galaxy/galaxy-s8/> (last visited Apr. 21, 2017).

<sup>63</sup> iPhone 7, Apple, <https://www.apple.com/iphone-7/> (last visited Apr. 21, 2017).

Companion—as well as improved camera functionality and 360-degree immersive audio.<sup>64</sup> LG released its updated smartphone, the G6, with a larger screen, updated display, and new wider-lens camera,<sup>65</sup> while Google similarly released a new version of its flagship smartphone, the Pixel, featuring an improved camera, processor, and battery life, among other features.<sup>66</sup>

Wireless providers offer devices at a variety of price points, ensuring that consumers of all income levels can embrace a mobile-first lifestyle. For example, Apple now offers the iPhone 6S and iPhone SE as mid-level and budget-friendly versions of its flagship iPhone 7.<sup>67</sup> There are also numerous affordable Android smartphones ranging in off-contract price from \$149.99 to \$249.99.<sup>68</sup> In April, U.S. Cellular started offering a basic LG smartphone for \$19.99 when customers sign up for U.S. Cellular’s Simple Connect Plan.<sup>69</sup> The market saturation of smartphones creates additional incentives for providers to compete for customers in new and different ways. For example, providers are looking to other connected devices, like tablets and wearables, for net subscriber additions.<sup>70</sup>

Service, device, and application innovations also enable consumers with disabilities to enjoy the benefits of mobile wireless connectivity. For example, high-definition voice,

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<sup>64</sup> Ultra, HTC, <https://www.htc.com/us/smartphones/htc-u-ultra/> (last visited May 1, 2017).

<sup>65</sup> LG G6, LG, <http://www.lg.com/us/mobile-phones/g6> (last visited May 1, 2017).

<sup>66</sup> Lynn La, *Google Pixel Review*, CNET (updated Feb. 16, 2017), <https://www.cnet.com/products/google-phone/review/>.

<sup>67</sup> iPhone, Apple, <https://www.apple.com/iphone/> (last visited Apr. 21, 2017).

<sup>68</sup> Matt Swider & Cameron Faulkner, *Best cheap phones in the US for 2017*, TECHRADAR (Apr. 13, 2017), <http://www.techradar.com/news/phone-and-communications/mobile-phones/best-cheap-smartphones-payg-mobiles-compared-1314718>.

<sup>69</sup> Alexandra Arici, *Grab the LG K3 2017 for Only \$20 from U.S. Cellular*, ANDROID GUYS (Apr. 27, 2017), <http://www.androidguys.com/2017/04/27/grab-the-lg-k3-2017-for-only-20-from-us-cellular/>.

<sup>70</sup> See e.g., Chaim Gartenberg, *Verizon Announces the Wear24, its Own Android Wear 2.0 Watch*, THE VERGE (Feb. 8, 2017), <http://www.theverge.com/circuitbreaker/2017/2/8/14552536/verizon-wear24-android-wear-2-0-smartwatch-wearable>.

transcription apps, and video chat capabilities are improving access for consumers who are deaf or hard of hearing.<sup>71</sup> Improved voice command and artificial intelligence (“AI”) platforms on mobile and home devices, including Amazon’s Alexa, Apple’s Siri, Google’s Assistant, and Microsoft’s Cortana are also advancing access for the elderly, vision impaired, and mobility impaired.<sup>72</sup> On-going progress on location information technologies, such as mapping and navigation tools, provides new opportunities for blind and low-vision individuals to travel and navigate through their environments.<sup>73</sup> Moreover, nationwide and regional wireless service providers, along with wireless handset manufacturers, are working diligently to roll out real-time text (“RTT”) functionalities to provide a new text communications service for consumers with hearing and speech disabilities.

Increasingly sophisticated connected devices and smartphone platforms also enable third-party app developers to create a wide range of mobile applications tailored to specific disabilities. Apple offers tools to developers to make all apps more accessible to the deaf, blind,

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<sup>71</sup> Tom Avril, *Can’t Hear On Your Cellphone? Here’s Help*, PHILLY.COM (Mar. 3, 2017), <http://www.philly.com/philly/health/Cant-hear-on-your-cell-phone-due-to-hearing-loss-telecoil-hearing-aid.html>.

<sup>72</sup> See, e.g., Allen St. John, *Amazon Echo Voice Commands Offer Big Benefits to Users With Disabilities*, CONSUMER REPORTS (Jan. 20, 2017), <http://www.consumerreports.org/amazon/amazon-echo-voice-commands-offer-big-benefits-to-users-with-disabilities/> (available by subscription); see also The UK Department For International Trade, *Howz Combines IoT Tech and Home Monitoring to Make the Lives of Caregivers a Little Easier*, MASHABLE (Mar. 21, 2017), [http://mashable.com/2017/03/21/howz/?utm\\_cid=mash-com-Tw-tech-link%23sd613jsnlqd#6UG6wI2CeOqw](http://mashable.com/2017/03/21/howz/?utm_cid=mash-com-Tw-tech-link%23sd613jsnlqd#6UG6wI2CeOqw).

<sup>73</sup> See, e.g., John Morris PhD, Mark Sweatman PhD, and Mike Jones PhD, Presentation at 32<sup>nd</sup> CSUN Assistive Technology Conference, *Smartphone Use and Activities by People with Disabilities: User Survey 2016*, Wireless RERC (2017), [http://www.wirelessrerc.org/sites/default/files/publications/wireless\\_technology\\_activities\\_csun\\_2017-02-28.pdf](http://www.wirelessrerc.org/sites/default/files/publications/wireless_technology_activities_csun_2017-02-28.pdf) (noting that 75 percent of individuals with a seeing disability who were polled in a 2015-2016 study used their phone for maps/GPS, compared to 67 percent in a 2012-2013 study).

or physically disabled.<sup>74</sup> One specific smartphone application, developed by Microsoft, allows people with advanced ALS to communicate with their eye movements.<sup>75</sup> Developers are also tailoring apps that give people with disabilities the opportunity to participate in specific activities typically beyond reach. For example, the Smithsonian’s Hirshhorn Museum and Sculpture Garden offered smartphone-enabled virtual reality headsets to people with disabilities so that they could experience the “blockbuster” exhibition “Yayoi Kusama: Infinity Mirrors.”<sup>76</sup>

**d. Content Providers are Developing New Offerings to Meet Consumer Demand for Mobile Video.**

Consumers are embracing mobile video for everything from entertainment and social media to news, remote work, and conferencing. Mobile video consumption is rising at a staggering pace,<sup>77</sup> and live mobile video is projected to grow faster than any other mobile application category.<sup>78</sup> Mobile video traffic accounted for 64 percent of all mobile data traffic in the U.S. in 2016, and is projected to grow 5.4 times from 2016 to 2021, by which time it will account for 76 percent of all mobile data traffic.<sup>79</sup> Mobile video-capable devices and connections in the U.S. are expected to reach 502 million in number by 2021, up 1.6 times from 2016.<sup>80</sup>

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<sup>74</sup> Heather Kelly, *This Deaf-Blind Lawyer Thinks Your App Needs Work*, CNN (July 11, 2016), <http://money.cnn.com/2016/07/11/technology/haben-girma-apple-accessibility/>.

<sup>75</sup> Timothy Revell, *Microsoft App Helps People with ALS Speak Using Just their Eyes*, NEW SCIENTIST (Feb. 17, 2017), <https://www.newscientist.com/article/2121579-microsoft-app-helps-people-with-als-speak-using-just-their-eyes/>.

<sup>76</sup> Casey Lesser, *Yayoi Kusama’s Infinity Rooms Made Accessible to People with Disabilities for First Time*, ARTSY (Feb. 17, 2017), <https://www.artsy.net/article/artsy-editorial-yayoi-kusamas-infinity-rooms-made-accessible-people-disabilities-first-time>.

<sup>77</sup> Cisco 2017 VNI Update at 22.

<sup>78</sup> *Live Mobile Video Growth*, CSI MAGAZINE (Feb. 10, 2017), <http://www.csimagazine.com/csi/Live-mobile-video-growth.php>.

<sup>79</sup> Cisco VNI Mobile Forecast Highlights, 2016-2021, at “United States – Mobile Applications.”

<sup>80</sup> *Id.*

The significant growth in mobile video consumption shows that consumers are increasingly viewing content on their mobile devices. By the end of 2016, average viewing times on mobile devices had grown by four hours a week and more than 200 hours a year since 2012.<sup>81</sup> Meanwhile, fixed-screen viewing declined by 2.5 hours per week.<sup>82</sup> Looking further back, from 2010-2016, fixed-screen content viewing decreased by 14 percent, while mobile video consumption grew by 85 percent.<sup>83</sup>

Live mobile video is projected to grow faster than any other mobile application category as consumers embrace social media apps like Snapchat, Twitter, Instagram, YouTube, and Facebook Live to consume and post live content.<sup>84</sup> YouTube has consistently led live mobile video use, accounting for 19.8 percent of peak downstream traffic in 2015 and 20.9 percent in 2016.<sup>85</sup> Snapchat, which relies on images and videos for messaging, leads third-party messaging services by volume, generating more traffic each day than competing services such as WhatsApp and kik.<sup>86</sup> Instagram, which allows users to share and access images and videos, also experienced strong growth, now accounting for 6.7 percent of downstream peak traffic.<sup>87</sup>

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<sup>81</sup> See Press Release, Ericsson, Mobile Video Viewing Up Over 200 Hours a Year Since 2012 (Nov. 3, 2016), <https://www.ericsson.com/news/2053867> (“Mobile Video Viewing Up Over 200 Hours a Year Since 2012”) (reporting global mobile video trends).

<sup>82</sup> *Id.*

<sup>83</sup> *Id.*

<sup>84</sup> See *Live Mobile Video Growth*, CSI MAGAZINE (Oct. 2, 2017), <http://www.csimagazine.com/csi/Live-mobile-video-growth.php> (noting that live mobile video will grow 39-fold from 2016-2021).

<sup>85</sup> Sandvine 2016 Global Internet Phenomena at 8, Table 2.

<sup>86</sup> *Id.* WhatsApp is a messaging app for mobile devices that allows users to text, chat, and share media, including voice messages and video, with individuals or groups. See Chandra Steele, *What Is WhatsApp? An Explainer*, PCMAG (Feb. 20, 2014), <http://www.pcmag.com/article2/0,2817,2453710,00.asp>. Kik Messenger is a Canadian-based cross-platform application used for instant messaging on mobile devices. See Michael Guta, *What Is Kik Messenger and How Can You Use it for your Small Business?*, SMALLBIZTRENDS (Mar. 30, 2017), <https://smallbiztrends.com/2017/03/what-is-kik-messenger.html>.

<sup>87</sup> Sandvine 2016 Global Internet Phenomena at 8, Table 2.

Business users are also embracing mobile live video communications as a way to keep employees connected, no matter their location. Not only does this flexibility improve employees' work-life balance, it also generates positive outcomes such as higher employee retention, more efficient training, increased engagement, and higher productivity and performance levels.<sup>88</sup>

**e. Wireless Manufacturers and Service Providers are Competing to Offer Improved Operating Systems.**

Competition for customers is also driving providers and manufacturers to improve their operating systems and the availability of the applications that consumers want. Mobile platforms continue to compete for the lead in market share across multiple devices—including smartphones, voice-controlled home assistants, tablets, PCs, and over-the-top streaming devices. Apple's iOS and Google's Android operating systems continue to compete for the lead in U.S. market share with 55.3 percent and 43.5 percent, respectively, with iOS gaining 6.4 percent on Android between November 2015 and November 2016.<sup>89</sup> Other operating systems, including Microsoft and Blackberry, accounted for 1.1 percent of the market, but are taking steps to remain competitive.<sup>90</sup> Meanwhile, consumer spending on mobile applications increases every year. Mobile app store revenue for the Americas in 2016 was \$14.2 billion and globally revenue was

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<sup>88</sup> Jeff Baskin, *People Have the Power: Transforming Your Organization with Video Enterprise Video Content Solution*, CISCO, at 2-4 (Mar. 28, 2016), <http://www.cisco.com/c/dam/en/us/solutions/collateral/business-video/business-video/c11-736562-00-people-have-power-wp.pdf>.

<sup>89</sup> Press Release, Kantar Worldpanel ComTech, Kantar: 2016's Early Holiday Sales Show Growth for iOS, BUSINESS PRESS, at 24 (Jan. 11, 2017), <http://www.businesspress24.com/pressrelease1479656.html>.

<sup>90</sup> *Id.*; Dan Thorp-Lancaster, *Satya Nadella Hints That Microsoft Is at Work on 'Ultimate Mobile Device,'* WINDOWS CENTRAL (Nov. 22, 2016), <http://www.windowscentral.com/satya-nadella-microsoft-work-ultimate-mobile-device>.

more than \$61.8 billion.<sup>91</sup> Global mobile app store revenue is predicted to top \$139 billion in 2021, with \$35.1 billion earned in the Americas alone.<sup>92</sup>

The open source nature of Google’s Android platform has enabled further competition from Android-based mobile device operating systems.<sup>93</sup> Users of the Android operating system are set to spend more on apps than users of Apple’s iOS App Store for the first time in 2017.<sup>94</sup> And smartphone manufacturers continue to customize operating systems based on the Android platform, adding new features to distinguish their devices. This competitive dynamic is particularly evident in the area of AI assistants, which will become a key differentiator between connected devices as mobile platforms converge with smart home and IoT devices.<sup>95</sup> The Galaxy S8 is the first device equipped with Samsung’s newly announced Bixby AI platform, designed to compete with Google’s Assistant and Apple’s Siri. Meanwhile, Amazon integrated its Alexa AI assistant into its mobile application on iOS and Android to compete with the native AI assistants on those platforms.<sup>96</sup> As noted above, consumers of all incomes, needs, and abilities are benefiting from these innovations and expanded functionalities.

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<sup>91</sup> *App Annie Market Forecast 2016–2021*, APP ANNIE, <http://go.appannie.com/report-app-annie-market-forecast-2017> (last visited Apr. 26, 2017).

<sup>92</sup> *Id.*

<sup>93</sup> Kent Walker, *Android: Choice at Every Turn*, GOOGLE BLOG (Nov. 10, 2016), <https://www.blog.google/topics/google-europe/android-choice-competition-response-europe/> (stating that “more than 24,000 devices from over 1,300 brands run on Android”).

<sup>94</sup> Jeremy C. Owens, *Android Projected to Top Apple in App Revenue for First Time This Year*, MARKETWATCH (Mar. 30, 2017), <http://www.marketwatch.com/story/android-projected-to-top-apple-in-app-revenue-this-year-2017-03-29>.

<sup>95</sup> *See, e.g.*, Sascha Segan, *Can Samsung’s Bixby Smash Alexa?*, PCMAG (Mar. 20, 2017), <http://www.pcmag.com/news/352451/can-samsungs-bixby-smash-alexa>.

<sup>96</sup> *Id.*; *see also* Jacob Kastrenakes, *Amazon Brings Alexa to the iPhone*, THE VERGE (Mar. 16, 2017), <http://www.theverge.com/2017/3/16/14947314/alexa-ios-amazon-app-iphone-siri>.



**V. COMPETITION IN THE WIRELESS MARKETPLACE IS BENEFITING THE ECONOMY.**

The competitive marketplace has driven wireless providers to continue to invest billions annually in the resources (including network infrastructure and spectrum) to improve the coverage, speed, and capacity of their networks, both to meet growing consumer demand for ever-present connectivity and to remain competitive with one another. And next-generation 5G wireless networks will support an even greater variety of devices and functionalities, expanding on the already wide range of functionality offered via the Internet of Things.

**a. The Wireless Industry is Adding Billions of Dollars to Our Economy and Supporting Millions of American Jobs.**

The wireless industry contributes billions of dollars to the U.S. economy annually. As Recon Analytics has explained:

Entire new business segments that utilize high-speed wireless connectivity combined with lightning-fast innovations have led to new transformative companies that spring up seemingly overnight and out of nowhere, generating billions of dollars of value in the process. And the customers get what they want (and even sometimes what they didn't know they wanted).<sup>97</sup>

The dynamic wireless industry is surpassing traditional economic drivers, and is now larger than the computer systems design, legal, publishing (including software), agriculture, petroleum and coal production industries.<sup>98</sup> Moreover, all of these industries also benefit from

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<sup>97</sup> Roger Entner, *The Wireless Industry: Revisiting Spectrum, the Essential Engine of US Growth*, RECON ANALYTICS, at 2 (Apr. 2016), <http://www.ctia.org/docs/default-source/default-document-library/entner-revisiting-spectrum-final.pdf> (“Recon Analytics”).

<sup>98</sup> *Id.*

wireless connectivity. According to a 2015 report, in 2013 the wireless industry generated more than \$400 billion in total U.S. spending.<sup>99</sup>

Purchases of apps and in-app purchases alone are responsible for \$36 billion in annual contribution to the GDP, up from \$10 billion in 2012 and essentially zero ten years ago.<sup>100</sup> The app economy personifies the emergence of new innovative industries that spring up around consistent access to high-speed wireless connections and is now worth more than \$143 billion.<sup>101</sup> Consumers are both driving this economic boon and benefiting from it. Consumers spend hundreds of billions annually on wireless goods and services. Research has shown that spending in the wireless industry ripples across the economy, resulting in a total \$2.32 in economic impact for every \$1 spent in the wireless industry.<sup>102</sup> For example, wireless networks take the money from consumers and spend it to upgrade, improve, and expand their networks, pay for backhaul, and buy network equipment supplies like base stations, antennas, and core network equipment.<sup>103</sup>

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<sup>99</sup> See Coleman Bazelon and Giulia McHenry, *Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy*, THE BRATTLE GROUP, at 2 (May 11, 2015), [http://www.ctia.org/docs/default-source/default-document-library/brattle\\_spectrum\\_051115.pdf](http://www.ctia.org/docs/default-source/default-document-library/brattle_spectrum_051115.pdf).

<sup>100</sup> Recon Analytics at 2.

<sup>101</sup> *State of the App Economy*, ACT The App Association (Apr. 20, 2017), <http://actonline.org/2017/04/20/state-of-the-app-economy-report-outlines-growth-dynamism-of-the-app-ecosystem/>.

<sup>102</sup> See Coleman Bazelon and Giulia McHenry, *Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy*, THE BRATTLE GROUP, at 2 (May 11, 2015), [http://www.ctia.org/docs/default-source/default-document-library/brattle\\_spectrum\\_051115.pdf](http://www.ctia.org/docs/default-source/default-document-library/brattle_spectrum_051115.pdf).

<sup>103</sup> Recon Analytics at 12.

The wireless industry is a tremendous job creator as well. More than 4.6 million jobs rely directly or indirectly on the wireless industry. People work for wireless operators, in device and accessories manufacturing, for professional services organizations or on mobile advertising.



Direct wireless industry jobs accounted for \$1 billion in taxes in 2014.<sup>104</sup> Even using the most conservative job multiplier estimates, the wireless industry indirectly accounts for more than seven million jobs nationwide.<sup>105</sup> For example, more than 100,000 people work as drivers for ride-sharing services like Uber and Lyft, services that would not be possible without wireless connectivity.<sup>106</sup>

The deployment of 5G will grow this economic effect. Wireless providers are expected to invest \$275 billion to build out 5G over the next decade.<sup>107</sup> Beyond the immediate employment benefits during the deployment phase of 5G, both near- and long-term employment gains and GDP benefits on the order of three million jobs and \$500 billion are anticipated.<sup>108</sup>

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<sup>104</sup> *Id.* at 26.

<sup>105</sup> *Id.* at 22.

<sup>106</sup> *Id.* at 7.

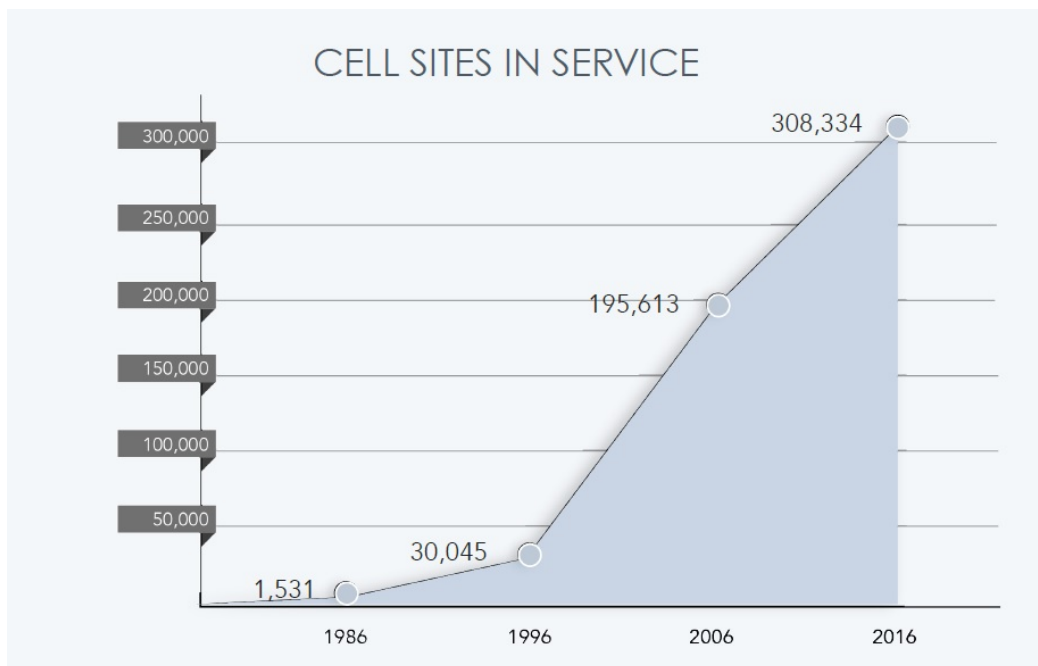
<sup>107</sup> *Smart Cities: How 5G Can Help Municipalities Become Vibrant Smart Cities*, ACCENTURE STRATEGY, at 1 (2017) (“Smart Cities”), attached to Letter from Scott K. Bergmann, CTIA, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 16-421 (filed Jan. 13, 2017).

<sup>108</sup> *Id.*

And the attendant increase in connectivity from 5G may add \$2.7 trillion to the U.S. GDP by 2030.<sup>109</sup>

**b. Wireless Providers Continue to Invest Billions to Improve and Expand Their Networks.**

Over the past seven years, wireless providers spent more than \$200 billion in network improvements to deliver nationwide 4G LTE mobile broadband.<sup>110</sup> Nationwide, regional, and rural providers are each investing millions in network upgrades to meet consumer demand. That includes investments in cell site deployments. The number of cell sites continues to increase, although the growth is being moderated by the retirement of older technologies. At the end of 2016, more than 308,000 sites were in service.<sup>111</sup>



Source: CTIA Annual Survey.

<sup>109</sup> Dr. Michael Mandel, *Long-term U.S. Productivity Growth and Mobile Broadband: The Road Ahead*, PROGRESSIVE POLICY INSTITUTE (Mar. 2016), [http://www.progressivepolicy.org/wp-content/uploads/2016/03/2016.03-Mandel\\_Long-term-US-Productivity-Growth-and-Mobile-Broadband\\_The-Road-Ahead.pdf](http://www.progressivepolicy.org/wp-content/uploads/2016/03/2016.03-Mandel_Long-term-US-Productivity-Growth-and-Mobile-Broadband_The-Road-Ahead.pdf).

<sup>110</sup> See, e.g., Comments of CTIA, WT Docket No. 16-421, at 6 (filed Mar. 8, 2017).

<sup>111</sup> CTIA Annual Wireless Survey.

Collectively, over the past seven years, wireless carriers invested an average of more than \$30 billion annually in next-generation networks and wireless infrastructure.<sup>112</sup> This does not include expenditures on spectrum, or spending on related wireline infrastructure; combining wireless and wireline infrastructure investment adds billions more to the total capex. For example, AT&T spent \$22.9 billion in combined wired and wireless capital expenditures in 2016 after forecasting expenditures of \$22 billion.<sup>113</sup>

In October 2016, AT&T and Verizon were named the nation’s top “Investment Heroes,” leading all non-financial companies in U.S. capital expenditures.<sup>114</sup> AT&T’s network investments totaled nearly \$19 billion in 2015 and Verizon’s network investments totaled over \$16 billion (including wireline and wireless spending).<sup>115</sup> This investment far exceeded the spending of other companies on the list. For example, Exxon Mobil, the third-ranked company, was responsible for less than \$11 billion in capital expenditures in 2015.<sup>116</sup>

Wireless providers have also spent substantial amounts of capital acquiring spectrum at auction. The industry spent nearly \$65 billion on wireless spectrum in the Commission’s last two auctions: the AWS-3 auction and the 600 MHz incentive auction. The incentive auction,

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<sup>112</sup> *Id.*

<sup>113</sup> Sean Buckley, *Telco capex: AT&T’s Spending Remains Steady, While Verizon and Centurylink Adjust Targets*, FIERCETELECOM (Mar. 29, 2017), <http://www.fiercetelecom.com/telecom/telco-capex-att-s-capex-spending-remains-steady-while-verizon-and-centurylink-adjust-to>.

<sup>114</sup> Michelle Di Ionno & Michael Mandel, *Investment Heroes 2016: Fighting Short-termism*, PROGRESSIVE POLICY INSTITUTE 5 (Oct. 2016), [http://www.progressivepolicy.org/wp-content/uploads/2016/10/InvestHeroes\\_2016.pdf](http://www.progressivepolicy.org/wp-content/uploads/2016/10/InvestHeroes_2016.pdf).

<sup>115</sup> Michelle Di Ionno & Michael Mandel, *Investment Heroes 2016: Fighting Short-termism*, PROGRESSIVE POLICY INSTITUTE 5 (Oct. 2016), [http://www.progressivepolicy.org/wp-content/uploads/2016/10/InvestHeroes\\_2016.pdf](http://www.progressivepolicy.org/wp-content/uploads/2016/10/InvestHeroes_2016.pdf).

<sup>116</sup> Michelle Di Ionno & Michael Mandel, *Investment Heroes 2016: Fighting Short-termism*, PROGRESSIVE POLICY INSTITUTE 5 (Oct. 2016), [http://www.progressivepolicy.org/wp-content/uploads/2016/10/InvestHeroes\\_2016.pdf](http://www.progressivepolicy.org/wp-content/uploads/2016/10/InvestHeroes_2016.pdf).

which successfully closed in April 2017, raised nearly \$20 billion in gross revenue, the second highest amount in Commission auction history.<sup>117</sup> In addition, the auction generated approximately \$7.6 billion that will go directly to the U.S. Treasury. T-Mobile was the largest winning bidder in the auction, spending nearly \$8 billion to win 1,525 licenses. Regional and rural providers also bid heavily to acquire licenses. U.S. Cellular, for example, bid nearly \$330 million to win 188 licenses.<sup>118</sup>

Additionally, wireless providers are spending heavily to acquire spectrum in the secondary market. AT&T announced its planned acquisition of Straight Path Communications, with the expectation of using Straight Path's 28 GHz and 39 GHz licenses to support the deployment of 5G services.<sup>119</sup> A competing bid has been made for Straight Path, demonstrating competition to the resources that will underpin the wireless industry's 5G future.<sup>120</sup> AT&T also entered into an agreement to acquire FiberTower in February 2017 for its 24 GHz and 39 GHz spectrum in anticipation of 5G.<sup>121</sup>

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<sup>117</sup> *The Incentive Auction "By the Numbers,"* Fact Sheet (WTB, rel. Apr. 13, 2017), [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0413/DOC-344398A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0413/DOC-344398A1.pdf).

<sup>118</sup> *Incentive Auction Closing and Channel Reassignment Public Notice; Incentive Auction Closes; Reverse Auction and Forward Auction Results Announced; Final Television Band Channel Assignments Announced; Post-Auction Deadlines Announced*, Public Notice, DA 17-314, AU Docket No. 14-252 et al., at App. B (rel. Apr. 13, 2017).

<sup>119</sup> Todd R. Weiss, *AT&T Acquiring Straight Path to Bolster Spectrum Holdings, 5G Strategy*, EWEEK (Apr. 10, 2017), <http://www.eweek.com/mobile/at-t-acquiring-straight-path-to-bolster-spectrum-holdings-5g-strategy>.

<sup>120</sup> See, e.g., *Unnamed Suitor Tops AT&T's Takeover Offer for Straight Path*, FORTUNE (Apr. 25, 2017), <http://fortune.com/2017/04/25/straight-path-takeover-att/>.

<sup>121</sup> Colin Gibbs, *AT&T Quietly Acquires FiberTower for 24, 39 GHz Spectrum*, FIERCEWIRELESS (Feb. 1, 2017), <http://www.fiercewireless.com/wireless/at-t-quietly-acquires-fibertower-for-24-39-ghz-spectrum>.

**c. Wireless Providers and Manufacturers are Spending Billions in Advertising to Attract New Customers.**

Not surprisingly, wireless providers and manufacturers are aggressively advertising their offerings to consumers. AT&T and Verizon were among the top 10 biggest U.S. advertisers in 2015 across all industries.<sup>122</sup> Although similar numbers for 2016 are yet to be reported, current data suggests that wireless providers continued this trend of increased spending on advertising. According to monthly reports from FierceWireless and iSpot.tv, in just the last eight months of 2016, from May to December, the four largest providers spent \$1.5 billion on advertising and digital engagement.<sup>123</sup>

If this year's Super Bowl ads were any indication, competition among wireless providers to attract new customers and differentiate themselves from their competitors is at an all-time high. During the 2017 Super Bowl, T-Mobile made its biggest buy ever, running four ads, totaling three minutes of commercials.<sup>124</sup> Each 30-second Super Bowl spot was reported to cost \$5 million.<sup>125</sup> T-Mobile's ad buy put it on par with Anheuser-Busch InBev, a perennial Super

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<sup>122</sup> Bradley Johnson, *How Nation's Top 200 Marketers are Honing Digital Strategies*, ADVERTISING AGE (June 27, 2016), <http://adage.com/article/advertising/top-200-u-s-advertisers-spend-smarter/304625/>.

<sup>123</sup> See, e.g., Ben Munson, *The top 5 wireless ads: AT&T maintains lead in TV spending across the mobile industry*, FIERCEWIRELESS (May 2016), <http://www.fiercewireless.com/special-report/top-5-wireless-ads-at-t-maintains-lead-tv-spending-across-mobile-industry>. According to FierceWireless and iSpot.tv, 35 wireless brands spent a total \$1.89 billion in 2015 on advertising. Mike Dano, *The top 10 advertisers in wireless in 2015 From AT&T to Straight Talk*, FIERCEWIRELESS, <http://www.fiercewireless.com/special-report/top-10-advertisers-wireless-2015-from-at-t-to-straight-talk> (last visited May 1, 2017).

<sup>124</sup> Jeanine Poggi, *Why T-Mobile Bought Three Minutes of Ads in Super Bowl LI*, ADVERTISING AGE (Feb. 5, 2017), <http://adage.com/article/special-report-super-bowl/t-mobile-bought-minutes-commercials-super-bowl-li/307842/>.

<sup>125</sup> *Id.*

Bowl big spender.<sup>126</sup> More generally, as a category, wireless providers had a year-over-year television ad spending increase during NFL games/programming of more than 27 percent.<sup>127</sup>

The most recent data already show strong advertising spending in 2016. AT&T reported its total advertising expense in 2016 was \$3.8 billion.<sup>128</sup> T-Mobile reported that its total 2016 advertising spending was \$1.7 billion, up from \$1.6 billion in 2015.<sup>129</sup> Verizon's latest 10-K report indicates it spent more than \$2.7 billion on advertising in 2016.<sup>130</sup> Manufacturers, too, spent tens of millions in 2016 to advertise their devices. From January 1, 2016 through November 30, 2016, Apple spent \$97 million on digital advertising alone, including display, mobile, and video ads in the U.S.<sup>131</sup> Samsung spent \$80.4 million on digital advertising during the same period.<sup>132</sup>

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<sup>126</sup> *Id.*

<sup>127</sup> John Cassillo, *Super Bowl Ad Preview: Verizon Tops Wireless Brands for NFL Ad Spend Leading Up to Big Game*, BROADCASTING AND CABLE (Jan. 31, 2017), <http://www.broadcastingcable.com/news/currency/super-bowl-ad-preview-verizon-tops-wireless-brands-nfl-ad-spend-leading-big-game/162964>.

<sup>128</sup> See AT&T Inc., Annual Report (Form 10-K) at Note 18 (Feb. 17, 2017), <http://phx.corporate-ir.net/phoenix.zhtml?c=113088&p=irol-SECText&TEXT=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9maWxpbnmcueG1sP2lwYWdlPTExNDA4NTM0JkRTRVE9MCZTRVE9MCZTUURFU0M9U0VDVEIPT19FTIRJUkUmc3Vic2lkPTU3>.

<sup>129</sup> See T-Mobile Annual Report (Form 10-K) at 59 (Feb. 14, 2017), <http://investor.t-mobile.com/SEC-Filings>.

<sup>130</sup> See Verizon, Annual Report (Form 10-K) at note 13 (Feb. 21, 2017), [http://verizon.api.edgar-online.com/EFX\\_dll/EdgarPro.dll?FetchFilingConvPDF1?SessionID=cZg1q7v\\_cvMExnm&ID=11871260](http://verizon.api.edgar-online.com/EFX_dll/EdgarPro.dll?FetchFilingConvPDF1?SessionID=cZg1q7v_cvMExnm&ID=11871260).

<sup>131</sup> Lara O'Reilly, *Apple is Spending Far More Than Samsung on Digital Ads*, BUSINESS INSIDER (Dec. 4, 2016), <http://www.businessinsider.com/pathmatics-data-shows-apple-spends-more-than-samsung-on-digital-ads-2016-12>.

<sup>132</sup> *Id.*



**d. Competition is Driving the Growth of the Burgeoning Internet of Things Marketplace.**

In 2016, IoT underwent unprecedented growth.<sup>133</sup> Notwithstanding the billions of Internet-connected devices already in the marketplace, we are only at the dawn of the IoT era. Gartner predicts that there will be 8.4 billion connected devices globally in 2017—up 31 percent from nearly 6.4 billion in 2016—and 20.4 billion IoT devices by 2020.<sup>134</sup>

IoT devices range from consumer-oriented products such as wearables, connected cars, and smart home devices to large interconnected manufacturing systems. While consumer IoT devices are currently driving the IoT application market, representing 63 percent of the overall applications in use in 2017, businesses are expected to spend the most on IoT applications.<sup>135</sup> According to Gartner, based on predicted hardware spending in 2017, the use of connected things among businesses will amount to \$965 billion compared to \$725 billion from consumer applications.<sup>136</sup> By 2020, hardware spending is expected to reach almost \$3 trillion from consumers and businesses combined.<sup>137</sup> Business use cases for connected devices include fleet management,<sup>138</sup> unmanned aviation,<sup>139</sup> and remote inspections and diagnostics.<sup>140</sup>

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<sup>133</sup> See, e.g., Cisco 2017 VNI Update at 1-3, 16-17; Press Release, Gartner Inc., Gartner Says .4 Billion Connected “Things” Will Be in Use in 2017, Up 31 Percent From 2016 (Feb. 7, 2017) (“Gartner IoT Release”), <http://www.gartner.com/newsroom/id/3598917>.

<sup>134</sup> See Gartner IoT Release.

<sup>135</sup> *Id.*

<sup>136</sup> *Id.*

<sup>137</sup> *Id.*

<sup>138</sup> See Satish Ram, *Six Steps to Harnessing IoT to Transform Your Cold Chain Fleet*, MANUFACTURING BUSINESS TECHNOLOGY (Apr. 26, 2017), <http://www.mbtmag.com/article/2017/04/six-steps-harnessing-iot-transform-your-cold-chain-fleet>.

<sup>139</sup> See Scott Allen, *FHSS and the Industrial Internet of Things*, TECHTARGET (Apr. 24, 2017), <http://internetofthingsagenda.techtarget.com/blog/IoT-Agenda/FHSS-and-the-industrial-internet-of-things>.

<sup>140</sup> See Mike Bacidore, *Automotive Parts Supplier Launches IIOT Initiative*, CONTROL DESIGN (Jan. 30, 2017), <http://www.controldesign.com/articles/2017/automotive-parts-supplier-launches-iiot-initiative/>

Wireless providers already market IoT connectivity and offer plans to support this functionality. For example:

- In 2015, Verizon launched an IoT developer program and self-service webpage called ThingSpace. ThingSpace lets developers connect up to three devices for 90 days and select from a range of modules. More than 16,000 developers have used ThingSpace to date.<sup>141</sup>
- In 2016, AT&T introduced IoT data plans meant to help businesses and developers quickly get their products off the ground.<sup>142</sup> In July 2016, AT&T started selling an IoT Starter Kit that includes a SIM card with 300 MB of prepaid data service, an LTE modem, a development board with a variety of sensors, cloud storage, and access to the company's Flow, a web-based development environment for creating IoT apps.<sup>143</sup>
- Earlier this year, T-Mobile began marketing IoT connectivity to companies creating IoT applications, offering data plans styled as "IoT Access Packs."<sup>144</sup>

As competition continues to increase in the IoT space, the market will continue to grow.

A recent report found that while "phones still dominate and that's what generates the bulk of the industry revenue . . . IoT is starting to inch up in material impact."<sup>145</sup> The rapid growth of exciting new IoT use cases and opportunities will fuel this development, creating yet another avenue for the wireless industry to contribute substantially to our nation's economy.

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(highlighting an auto parts supplier that will use new technology to create an IoT production line and "enable remote equipment monitoring and management from a centralized dashboard to promote predictive and proactive maintenance").

<sup>141</sup> See Internet of Things, Verizon, <http://www.verizon.com/about/our-company/internet-things> (last visited Apr. 20, 2017).

<sup>142</sup> IoT Data Plans and SIMs for Effortless Connectivity, AT&T, <https://iotdataplan.att.com/> (last visited Apr. 20, 2017).

<sup>143</sup> AT&T IoT Starter Kit, AT&T, <https://starterkit.att.com/> (last visited Apr. 20, 2017); IoT Starter Kit, AT&T Business, <https://www.business.att.com/enterprise/Service/internet-of-things/iot-platforms-development/starter-kit/> (last visited Apr. 20, 2017).

<sup>144</sup> Press Release, T-Mobile, T-Mobile Delivers Simplicity to the Internet of Things (Jan. 3, 2017), <https://newsroom.t-mobile.com/news-and-blogs/iot-access-packs.htm>.

<sup>145</sup> *US Wireless Market Update 2016*, CHETAN SHARMA CONSULTING, at 8, <http://www.chetansharma.com/publications/us-mobile-market-update-2016/>.

The development of 5G will further expand the use of wireless and IoT devices to support a multitude of diverse industries, including energy, health, public safety, and transportation.<sup>146</sup> 5G is projected to contribute \$500 billion to the U.S. economy and create up to three million new jobs.<sup>147</sup> Local economies will benefit from the power of “smart city” solutions, powered by 5G wireless technologies. For example, wireless-enabled smart grids could generate \$1.8 trillion for the U.S. economy—and save consumers hundreds of dollars per year.<sup>148</sup> 5G-powered smart city solutions could produce \$160 billion in benefits and savings through lowered energy use, reduced traffic congestion and fuel costs, and improved public safety applications.<sup>149</sup> Cities are increasingly implementing data collection programs and using predictive analytics to detect potential public safety or other issues before they occur. For example, cities are turning to sensors to track traffic and air quality, and encouraging citizens to use mobile applications to share data about areas of blight or poor sanitation.<sup>150</sup> Communities across the country that embrace these advances and the benefits they can imbue to their communities can be the first to foster the economic growth that 5G and expanded IoT will enable.

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<sup>146</sup> See generally Wireless Connectivity Fuels Industry Growth and Innovation; see also Kevin Ryan, *How Wireless Promotes Innovation Across Various Industries*, CTIA BLOG (Jan. 19, 2017), <https://www.ctia.org/industry-data/blog-details/blog-posts/how-wireless-promotes-innovation-across-various-industries>.

<sup>147</sup> Jamie Hastings, *How Smart Wireless Policies Will Unlock Smart Cities and Grow Our Country’s Economy*, CTIA BLOG (Jan. 13, 2017), <https://www.ctia.org/industry-data/blog-details/blog-posts/smart-wireless-policies-unlock-smart-cities-grow-economy>; see also Smart Cities at 1.

<sup>148</sup> Wireless Connectivity Fuels Industry Growth and Innovation.

<sup>149</sup> Smart Cities at 1.

<sup>150</sup> Michael Totty, *The Rise of the Smart City*, WALL ST. J. (Apr. 16, 2017), <https://www.wsj.com/articles/the-rise-of-the-smart-city-1492395120> (“The Rise of the Smart City”).

## **VI. COMPETITION IS DRIVING CONTINUED DEPLOYMENT OF NEW AND ADVANCED WIRELESS CONNECTIVITY.**

### **a. Wireless Providers Create Faster and More Robust Networks for the Benefit of Consumers.**

Wireless providers remain focused on improving the quality and expanding the capacity of their networks to meet consumers' growing demand for wireless connectivity and data consumption. As a result of the wireless industry's investment,<sup>151</sup> almost all of the country's population now has access to advanced wireless services. 4G LTE service is now available to 99.7 percent of Americans and covers more than 71 percent of the total U.S. land area.<sup>152</sup> To put this into perspective, far more Americans currently have access to 4G LTE service than had access to mobile data services in 2009, when the Commission last found that the wireless market was effectively competitive. In 2009, mobile broadband service, which was defined to include services in excess of 200 kbps,<sup>153</sup> was available to only 92.3 percent of Americans and covered only 40 percent of the total U.S. land area.<sup>154</sup>

### **b. Wireless Providers Continue to Deploy Advanced Technologies.**

In preparation for 5G, U.S. operators are harnessing multiple technologies and techniques to increase data rates and improve the user experience. LTE-Advanced ("LTE-A") is unleashing the power of high bandwidth and increased data rates, while also providing better connections. LTE-A combines three different technologies: carrier aggregation, which aggregates the bandwidth of multiple LTE providers in the same or different bands to achieve faster speeds;

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<sup>151</sup> See, *supra*, Section V.

<sup>152</sup> *Nineteenth Report* ¶ 39, Chart III.A.2.

<sup>153</sup> See, e.g., *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, Sixth Broadband Deployment Report, 25 FCC Rcd 9556 ¶ 4 (2010).

<sup>154</sup> *Thirteenth Report* ¶ 146, Table 10.

Multiple Input Multiple Output, which increases bandwidth; and relay nodes, which provide better coverage and capacity at the cell edge.<sup>155</sup> T-Mobile, for example, has used these techniques to improve coverage and increase capacity by 35 percent, with even greater gains at the cell edge.<sup>156</sup> Verizon has deployed LTE-A in more than 450 cities, resulting in up to a 50 percent increase in speeds.<sup>157</sup> Bluegrass Cellular also partnered with Verizon to offer LTE-A to its customers in certain areas beginning in November 2016.<sup>158</sup> And Sprint offers two-carrier aggregation in more than 250 markets and three-carrier aggregation, which can reach speeds of up to 300 Mbps, in more than 100 markets.<sup>159</sup>

Voice-over-LTE (“VoLTE”) is improving voice quality and will facilitate the evolution to all-IP wireless networks. VoLTE is a standard IP Multimedia Subsystem (“IMS”)-based implementation of packet-switched voice calls, resulting in numerous benefits for operators and consumers. Voice calls have better quality, and the service uses spectrum more efficiently and eliminates the need for a separate voice network.<sup>160</sup> Great strides have been made in the past

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<sup>155</sup> Steven J. Vaughan-Nichols, *One Gigabit 4G: The Coming of LTE Advanced*, ZDNET (May 9, 2016), <http://www.zdnet.com/article/one-gigabit-4g-the-coming-of-lte-advanced/>.

<sup>156</sup> Diana Goovaerts, *Pushing the Limits of Spectrum Efficiency*, WIRELESS WEEK (Apr. 7, 2017), <https://www.wirelessweek.com/news/2017/04/pushing-limits-spectrum-efficiency>.

<sup>157</sup> Jacob Kastrenakes, *Verizon’s Faster LTE Service Is Now Available in Over 450 Cities*, THE VERGE (Aug. 29, 2017), <http://www.theverge.com/2016/8/29/12693030/verizon-lte-advanced-461-cities-launched-faster-data-speeds>.

<sup>158</sup> Press Release, Bluegrass Cellular, *Bluegrass Cellular Begins Rollout of LTE Advanced* (Nov. 18 2016), <https://bluegrasscellular.com/about/news/bluegrass-cellular-begins-rollout-of-lte-advanced>.

<sup>159</sup> Christian de Looper, *Sprint Switched LTE Advanced On for the iPhone 7, Galaxy S7, and More*, DIGITAL TRENDS (Feb. 3, 2017), <http://www.digitaltrends.com/mobile/sprint-lte-advanced-iphone-7-galaxy-s7/>; Comments of CTIA, WT Docket No. 16-137, at 75-76 (May 31, 2016).

<sup>160</sup> VoLTE, GMSA, <http://www.gsma.com/network2020/technology/volte/> (last visited Apr. 25, 2017).

year, including AT&T and Verizon offering interoperable VoLTE calls for the first time.<sup>161</sup>

Meanwhile, T-Mobile announced that more than half of its voice calls are routed over VoLTE.<sup>162</sup>

Small wireless facilities and heterogeneous networks are helping to add capacity to existing 4G LTE networks and represent an important step toward 5G. 5G will require dense wireless networks, deployment of hundreds of thousands of new small cells, and expanded backhaul and transport facilities to provide needed capacity and coverage. These small cells can be unobtrusively installed on common structures like street lights and utility poles. Providers are focused on rapidly deploying small cells and support the Commission's efforts to expedite wireless siting through its pending wireless infrastructure proceedings.<sup>163</sup> For instance, Sprint's small cell deployment in Manhattan increased download speeds by more than 40 percent and upload speeds by more than 50 percent; the company said it will roll out many more small cells this year.<sup>164</sup> Verizon built more than ten thousand small cells and expects to double that number over the next two years.<sup>165</sup> However, as discussed in more detail in Section X.b. below, wireless providers are facing a variety of barriers to deployment, including fees that are not based on the

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<sup>161</sup> Colin Gibbs, *Verizon, AT&T Offering Interoperable VoLTE to Some Customers*, FIERCEWIRELESS (Jul. 5, 2016), <http://www.fiercewireless.com/wireless/verizon-at-t-offering-interoperable-volte-to-some-customers>.

<sup>162</sup> Colin Gibbs, *Verizon, AT&T Offering Interoperable VoLTE to Some Customers*, FIERCEWIRELESS (Jul. 5, 2016), <http://www.fiercewireless.com/wireless/verizon-at-t-offering-interoperable-volte-to-some-customers>.

<sup>163</sup> *See, e.g.*, Comments of CTIA, WT Docket No. 16-421 (filed Mar. 8, 2017); Reply Comments of CTIA, WT Docket No. 16-421 (filed Apr. 7, 2017); *see also Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, Notice of Proposed Rulemaking and Notice of Inquiry, FCC 17-38, WT Docket No. 17-79 (rel. Apr. 21, 2017); *Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment*, Notice of Proposed Rulemaking, Notice of Inquiry, and Request for Comment, FCC 17-37, WT Docket No. 17-84 (rel. Apr. 21, 2017).

<sup>164</sup> Dr. John Saw, *Celebrating a Year of Network Improvements as We Look Ahead to 2017*, Sprint Newsroom (Dec. 29, 2016), <http://newsroom.sprint.com/blogs/sprint-perspectives/celebrating-a-year-of-network-improvements-as-we-look-ahead-to-2017.htm>.

<sup>165</sup> Comments of Verizon, WT Docket No. 16-421, at 1-2 (filed Mar. 8, 2017).

actual, direct costs to localities for managing the public rights of way; barriers to access, in particular to municipally-owned poles and rights of way; and delays in reviews and approvals of siting applications. CTIA looks forward to working with the Commission to address these concerns and ensure that the agency's siting policies are updated to recognize the distinct needs of the vast, dense networks of smaller facilities that will be needed to support 4G LTE and 5G technologies.

Network functions virtualization (“NFV”), software defined networking (“SDN”), and advances in 4G machine-type communications are also helping pave the way to 5G. Wireless providers are very active in taking advantage of these new technologies. For example, AT&T developed products such as the Integrated Cloud and Network on Demand to automate network services and infrastructure running in the cloud.<sup>166</sup> In addition to offering cloud services, Verizon has also been working on NFV and SDN in the context of its 5G plans.<sup>167</sup> Sprint has also been very active, working with the Linux Foundation to promote the adoption of open source SDN and NFV solutions.<sup>168</sup> Recently, Sprint and Deutsche Telekom joined AT&T and Verizon in the Central Office Re-architected as a Datacenter (“CORD”) Project, which is working to create an “open source delivery platform that combines SDN, NFV and cloud technologies.”<sup>169</sup>

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<sup>166</sup> Dan Meyer, *AT&T and Verizon NFV and SDN Moves Seen as Industry-leading*, RCR WIRELESS NEWS (June 9, 2016), <http://www.rcrwireless.com/20160609/network-function-virtualization-nfv/att-verizon-nfv-sdn-moves-seen-industry-leading-tag2>.

<sup>167</sup> *Id.*

<sup>168</sup> *Id.*

<sup>169</sup> Monica Allevan, *Sprint Joins CORD Project Focused on SDN, NFV, Cloud*, FIERCEWIRELESS (Apr. 3, 2017), <http://www.fiercewireless.com/wireless/sprint-joins-cord-project-focused-sdn-nfv-cloud>.

Finally, the wireless industry is developing LTE technologies for deployment in unlicensed bands. LTE-Unlicensed (“LTE-U”) is a technology that allows wireless providers to offer faster speeds and greater network capacity without additional licensed spectrum holdings. It combines unlicensed spectrum and enhanced 4G LTE so that consumers enjoy improved coverage, speed, mobility, and security.<sup>170</sup> T-Mobile will start deploying LTE-U technology this spring to approach the speeds of gigabit LTE.<sup>171</sup> Verizon is testing LTE-U at six sites,<sup>172</sup> and AT&T requested authorization to conduct testing as well.<sup>173</sup> The first consumer device to support LTE-U, Samsung’s Galaxy S8, hit the market in April 2017.<sup>174</sup> CTIA supports the Commission’s recent authorization of the first LTE-U devices<sup>175</sup> and the wireless industry is moving quickly to make these innovative new offerings available to consumers.

## **VII. COMPETITION IS EXPANDING TO NEW LOCATIONS AND TYPES OF COMPETITORS.**

In addition to competing to offer the fastest speeds, most advanced networks, and most innovative devices, wireless providers are competing on geography. Wireless providers are

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<sup>170</sup> *Fostering 21st Century Wireless Connectivity: Key Spectrum & Infrastructure Issues for Policymakers*, CTIA, at 5 (Jan. 2017), <http://www.ctia.org/docs/default-source/default-document-library/ctia-white-paper-infrastructure.pdf>.

<sup>171</sup> John Eggerton, *FCC Approves LTE-U Devices*, MULTICHANNEL NEWS (Feb. 22, 2017), <http://www.multichannel.com/news/fcc/fcc-approves-lte-u-devices/411063>.

<sup>172</sup> Kelly Hill, *Verizon Asks for Extended LTE-U Testing Permission*, RCR WIRELESS NEWS (Apr. 18, 2017), <http://www.rcrwireless.com/20170418/test-and-measurement/20170418test-and-measurementverizon-asks-for-extended-lte-u-testing-permission-tag6>.

<sup>173</sup> Monica Alevan, *AT&T Wants to Put LTE-U, LAA Through Coexistence Paces*, FIERCEWIRELESS (Aug. 29, 2016), <http://www.fiercewireless.com/tech/at-t-wants-to-put-lte-u-laa-through-coexistence-paces>.

<sup>174</sup> *Id.*

<sup>175</sup> See Julius Knapp, *OET Authorizes First LTE-U Devices*, FCC BLOG (Feb. 22, 2017), <https://www.fcc.gov/news-events/blog/2017/02/22/oet-authorizes-first-lte-u-devices>; Press Release, FCC, Chairman Pai Statement on Commission Authorization of First LTE-U Devices (Feb. 22, 2017), [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-343598A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-343598A1.pdf).



increasingly competing with each other, with rural and regional providers, and with new entrants to offer the most comprehensive nationwide coverage. Even as this competitive environment is helping to close the digital divide across the country, a robust and efficient federal Mobility Fund is necessary to support deployment of mobile wireless broadband services in unserved rural areas.

**a. Providers are Competing to Offer Services in Rural Areas.**

Wireless providers are improving the scope and speed of their coverage in rural areas. Most Americans have access to 4G LTE service from at least one provider, and at least 80 percent of rural areas have LTE service from three or more providers.<sup>176</sup> And mobile wireless service providers are investing unprecedented resources to deploy 4G LTE service to the most rural and remote parts of our country. T-Mobile, for example, has grown its LTE network to cover 314 million people, and aims to cover 320 million people by the end of 2017.<sup>177</sup> Regional carriers, too, such as East Kentucky Network, are investing in their networks to provide higher-speed wireless broadband services to the customers in their service areas.<sup>178</sup>

Further, AT&T's contract with FirstNet will give it a layer of low-band spectrum throughout rural America that it will be able to use to enhance rural coverage. And portions of the recently auctioned 600 MHz band spectrum could become available for mobile use as early as this year, with the remainder being deployed in by 2020. This spectrum is extremely well suited to providing service in rural areas. For example, T-Mobile asserts that its access to low-

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<sup>176</sup> *Nineteenth Report* at Chart III.A.5.

<sup>177</sup> Martha DeGrasse, *T-Mobile US posts double digit growth*, RCR WIRELESS NEWS (Feb. 15, 2017), <http://www.rcrwireless.com/20170215/carriers/t-mobile-us-posts-double-digit-growth-tag4>.

<sup>178</sup> *See, e.g.*, Press Release, Ciena, East Kentucky Network Turns to Ciena for Next-Generation Communications Network (Feb. 1, 2017), <http://www.ciena.com/about/newsroom/press-releases/East-Kentucky-Network-Turns-to-Ciena-for-Next-Generation-Communications-Network.html>.

band spectrum as a result of the recent 600 MHz auction will enable it to provide coverage to the entire United States and Puerto Rico.<sup>179</sup> Regional carriers already offering services in rural areas also won 600 MHz licenses, including Bluegrass Cellular and East Kentucky Network, which the carriers can use to augment their networks.<sup>180</sup> As noted above, the Commission can help accelerate competition in rural areas through an efficient and seamless repacking of 600 MHz spectrum licenses, and by identifying additional low-band spectrum for auction.

Implementing a robust and efficient Mobility Fund will also enable wireless providers to serve rural and high-cost areas where consumers lack access to critical mobile wireless broadband services. Moreover, Mobility Fund support can accelerate investment and planning by providing advanced detailed guidance about the reverse auction, deployment, service obligations, compliance processes, and other aspects of *Mobility Fund II*. Although mobile wireless providers continue to invest and deploy to rural areas, comprehensive universal service support remains necessary to meet the shared goal of closing the digital divide in rural areas.

**b. New Entrants and Mobile Satellite Service Providers Are Poised to Provide Additional Competition in the CMRS Market.**

Multiple entrants are joining the competitive fray in the wireless industry, creating new competitive pressures for existing wireless providers.

*Cable Companies.* Cable companies are seeking to enter the CMRS market by leveraging their extensive Wi-Fi networks and the ubiquity of Wi-Fi-capable devices to offer services using hybrid cellular/Wi-Fi networks. One such new entrant is Comcast, which recently announced its Xfinity Mobile wireless service using Comcast's own network of 16 million Wi-Fi

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<sup>179</sup> Press Release, T-Mobile, T-Mobile's Spectrum Haul is a Game Changer for Wireless Consumers (Apr. 13, 2017), <http://t-mo.co/2o909RQ>.

<sup>180</sup> See *Incentive Auction Closing and Channel Reassignment Public Notice, et al.*, Public Notice, DA 17-314, AU Docket No. 14-252 *et al.*, at Appendix B (rel. Apr. 13, 2017).

hotspots supplemented by an MVNO arrangement providing access to Verizon's 4G network.<sup>181</sup> Comcast was also a winning bidder for \$1.7 billion worth of licenses in the Commission's recent 600 MHz incentive auction.<sup>182</sup>

Charter Communications, which recently acquired Time Warner Cable, also announced plans to launch wireless services by mid-2017 as an MVNO using Verizon's network, while the company looks to construct its own facilities.<sup>183</sup> According to Charter CEO Tom Rutledge, Charter intends to eventually extend its own network, including densification via small cells.<sup>184</sup> Like Comcast, Charter intends to bundle wireless service with its other suite of services.<sup>185</sup>

*DISH Network Corporation.* DISH Network Corporation ("DISH"), a direct broadcast satellite television provider, is well-positioned to become a major player in the mobile wireless market. In recent years, DISH has been very active in acquiring significant amounts of spectrum suitable for offering terrestrial mobile services. As detailed below, in aggregate, DISH now has available approximately 94.4 megahertz of spectrum nationwide under 3 GHz, which is comparable to the spectrum holdings of existing nationwide providers. It could use these

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<sup>181</sup> See Press Release, Comcast, Comcast Introduces Xfinity Mobile: Combining America's Largest, Most Reliable 4G LTE Network and the Largest Wi-Fi Network (Apr. 6, 2017), <http://corporate.comcast.com/news-information/news-feed/comcast-xfinity-mobile>.

<sup>182</sup> See Press Release, Comcast, Comcast Corporation Statement on FCC Broadcast Incentive Auction Results (Apr. 13, 2017), <http://corporate.comcast.com/news-information/news-feed/comcast-corporation-statement-on-fcc-broadcast-incentive-auction-results>.

<sup>183</sup> See Diana Goovaerts, *Charter Also Eyeing Wireless Service Via Verizon MVNO Deal*, WIRELESS WEEK (Sept. 22, 2016), <https://www.wirelessweek.com/news/2016/09/charter-also-eyeing-wireless-service-verizon-mvno-deal>.

<sup>184</sup> *Id.*

<sup>185</sup> *Id.*

spectrum holdings either to deploy a new, nationwide terrestrial mobile broadband network or to supplement networks of existing providers.<sup>186</sup>

In March 2017, DISH announced that it intends to use spectrum assets to deploy within three years a state-of-the-art, 5G-capable network focusing on IoT.<sup>187</sup> In support of this effort, the company issued in the fourth quarter of 2016 a “Request for Information” to facilitate the technology and infrastructure selection process.<sup>188</sup> DISH stated that, in the near term, it will work with infrastructure, device, and services vendors to select suitable equipment, product roadmaps, and service offerings for the deployment of 5G services on its licensed spectrum.<sup>189</sup>

*MSS.* Although the MSS market has traditionally involved satellite-based voice and narrowband data services, a number of MSS providers have taken steps to provide terrestrial broadband services using their licensed satellite spectrum. Other satellite providers, through their next-generation satellites, have either expanded existing broadband service capabilities or expect to do so soon. All of these factors support the conclusion that the Commission should consider mobile satellite providers as potential competitors to terrestrial-based mobile providers.

*Globalstar, Inc.* Globalstar, Inc. (“Globalstar”) is an MSS operator that has proposed to operate a new terrestrial service using its satellite spectrum. In December 2016, the Commission granted Globalstar the authority to use an 11.5 megahertz portion of its MSS spectrum in the

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<sup>186</sup> See, e.g., Greg Avery, *Dish Network Again Bids Billions in FCC Spectrum Auction*, DENVER BUSINESS JOURNAL (April 13, 2017), <http://www.bizjournals.com/denver/news/2017/04/13/dish-network-again-bids-billions-in-fcc-spectrum.html>.

<sup>187</sup> See DBSD Services Limited, Gamma Acquisition LLC, and Manifest Wireless LLC, Consolidated Interim Construction Notification for AWS-4 and Lower 700 MHz E Block Licenses, File Nos. 0007690885 et al. (filed Mar. 7, 2017) (“DISH Interim Construction Notification”); see also Mike Farrell, *Ergen: DISH Is Ready for 5G*, MULTICHANNEL NEWS (Feb. 22, 2017), <http://www.multichannel.com/news/satellite/ergen-dish-ready-5g/411065>.

<sup>188</sup> See DISH Interim Construction Notification at 6.

<sup>189</sup> See *id.* at 7.

S-band frequencies (2483.5-2495 MHz) for a terrestrial low-powered service.<sup>190</sup> Because the frequencies enjoy interference protection, have favorable technical characteristics, and could be globally harmonized, Globalstar believes that its spectrum is uniquely situated to help wireless providers meet capacity demands through small cell LTE network deployments.<sup>191</sup> If Globalstar is able to successfully deploy a network using its spectrum, there could be even more competitive entry in the wireless market from mobile service providers seeking to use hybrid cellular/small cell networks.

*Ligado Networks LLC.* Ligado Networks LLC (“Ligado”), formerly LightSquared Subsidiary LLC, is another MSS operator that could offer terrestrial or a hybrid terrestrial/MSS service. Ligado requested Commission approval for its revised plans to deploy a satellite/terrestrial network using 40 megahertz of mid-band frequencies for the provision of 5G services.<sup>192</sup> Ligado was granted authority in 2004 to deploy a hybrid service in the 1.5 GHz and 1.6 GHz bands<sup>193</sup> and submitted license modification applications to its authorized operations in December 2015.<sup>194</sup> In April 2016, the Commission issued public notices requesting comments on the license modification applications.<sup>195</sup> If Ligado’s plan is approved, its spectrum holdings

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<sup>190</sup> See generally *Terrestrial Use of the 2473.5-2495 MHz Band for Low-Power Mobile Broadband Networks, et al.*, Report and Order, 31 FCC Rcd 13801 (2016). Globalstar stated that it ultimately plans to deploy a more traditional LTE wireless broadband system across 19 megahertz of its licensed MSS spectrum in the Big LEO band. That proposal is not addressed in the FCC’s order. See *id.* ¶ 3.

<sup>191</sup> See *Globalstar Overview*, GLOBALSTAR, at 22 (2017), <http://www.globalstar.com/en/ir/docs/GlobalstarOverviewPresentation.pdf>.

<sup>192</sup> See Dan Meyer, *Ligado Files 5G Plans with FCC, Promises Fair Play with GPS*, RCR WIRELESS NEWS (May 24, 2016), <http://www.rcrwireless.com/20160524/carriers/ligado-files-5g-plans-fcc-promises-fair-play-gps-tag2>.

<sup>193</sup> See generally *Mobile Satellite Ventures Subsidiary LLC, Application for Minor Modification of Space Station License for AMSC-1, et al.*, Order and Authorization, 19 FCC Rcd 22144 (2004).

<sup>194</sup> See Applications of Ligado Networks Subsidiary LLC, Narrative, IBFS File Nos. SAT-MOD-20151231-00090, SAT-MOD-20151231-00091, and SES-MOD-20151231-00981 (filed Dec. 31, 2015).

<sup>195</sup> See, e.g., *Comment Sought on Ligado’s Modification Applications*, Public Notice, 31 FCC Rcd 3802 (2016); *Comment Sought to Update the Record on Ligado’s Request That the Commission Initiate a*

could be used to introduce additional facilities-based competition in the terrestrial mobile wireless market. The record for this proceeding is now complete and ready for Commission decision.

*Other Satellite Providers.* Historically, MSS operators have served niche markets or remote areas where terrestrial networks were limited or unavailable. Recent advances in satellite and antenna technology, however, have allowed for the introduction of more sophisticated devices and faster broadband services at lower costs. For example, Iridium Communications, Inc. (“Iridium”), another MSS provider, successfully deployed its first ten Iridium NEXT satellites, which are designed to provide high-speed broadband connectivity globally.<sup>196</sup> And the company expects to complete deployment of the remaining 60 satellites of its constellation in the next fifteen months.<sup>197</sup>

Additionally, a number of new satellite companies have proposed to deploy innovative low-Earth orbit satellite constellations providing a wide range of communication services, including voice and broadband, for users worldwide.<sup>198</sup>

These various endeavors demonstrate that entry into the mobile wireless marketplace is occurring and will continue to occur, and further support the conclusion that the wireless market is competitive.

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*Rulemaking to Allocate the 1675-1680 MHz Band For Terrestrial Mobile Use Shared With Federal Use*, Public Notice, 31 FCC Rcd 3813 (2016).

<sup>196</sup> See *Success! The First Ten Iridium NEXT Satellites Have Arrived in Low-Earth Orbit*, IRIDIUM EVERYWHERE BLOG (Jan. 14, 2017), <http://blog.iridium.com/2017/01/14/success-the-first-ten-iridium-next-satellites-have-arrived-in-low-earth-orbit/>.

<sup>197</sup> See *id.*

<sup>198</sup> See, e.g., See Press Release, OneWeb, OneWeb Satellites Breaks Ground on the World’s First State-Of-The-Art High-Volume Satellite Manufacturing Facility (Mar. 16, 2017), <http://oneweb.world/press-releases/2017/oneweb-satellites-breaks-ground-on-the-worlds-first-state-of-the-art-high-volume-satellite-manufacturing-facility>.

## **VIII. COMPETITION IS DRIVING A NATIONAL AND INTERNATIONAL RACE FOR 5G LEADERSHIP.**

The global rollout of 5G presents another front for competition in the wireless marketplace. Wireless providers in the U.S. are aggressively investing to deploy 5G networks first and with the fastest speeds and lowest latency. As a result of this investment, the U.S. is set to compete with the rest of the world in the deployment of 5G. Competition around 5G will bring the benefits of 5G networks to consumers sooner and at a higher quality. And global competition will provide the U.S. with an opportunity for continued leadership in the wireless space.

### **a. 5G Promises Myriad Use Cases and Economic Benefits.**

5G represents the future of wireless. Compared to today's 4G LTE networks, which typically operate on 5, 10, or 20 megahertz carriers in spectrum bands below 3 GHz, tomorrow's 5G networks will operate on over 200+ megahertz carriers in a mix of low-, medium- and high-band spectrum reaching into the millimeter wave bands.<sup>199</sup> Forecasts for 5G networks suggest that they could be up to 100 times faster than 4G networks, connect 100 times the number of devices, and respond five times as quickly, transforming businesses and the consumer mobile wireless experience.<sup>200</sup> 5G will create ultra-fast mobile broadband zones in high-traffic areas like sports arenas, concert venues, airports, and other public venues and will deliver better quality, lower-cost fixed wireless broadband service to homes that today are either un-served or underserved.<sup>201</sup>

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<sup>199</sup> See Thomas K. Sawanobori & Paul V. Anuszkiewicz, *High Band Spectrum: The Key to Unlocking the Next Generation of Wireless*, CTIA, at 5 (June 13, 2016), <http://www.ctia.org/docs/default-source/default-document-library/5g-high-band-white-paper.pdf>.

<sup>200</sup> *Id.*

<sup>201</sup> See *id.* at 4.

The high speed and low latency promised by 5G will improve the responsiveness of wireless networks and devices, creating new use cases that will create widespread benefits beyond the telecommunications sector. For example, 5G will benefit the health care industry and emergency response. As Commission Clyburn has noted, broadband-enabled health solutions are a “game changer” that “can dramatically improve patient outcomes, create efficiencies and improve our bottom lines by reducing health care costs.”<sup>202</sup> High-speed wireless connections will drive innovations in telemedicine, patient monitoring, and data collection, which could create \$305 billion in annual health system savings from decreased costs and mortality due to chronic illnesses.<sup>203</sup> High-speed connections also benefit consumers by providing them with more information, enabling better choices, and giving them better and more efficient access to care. For example, a coalition of public, private, and philanthropic organizations in Louisville, Kentucky recently provided more than 1,000 GPS-equipped inhalers to asthma sufferers in an effort to map areas in the city where air quality is poor.<sup>204</sup> The inhalers not only provided patients and their doctors with better data about their asthma, but also helped the city take responsive action in areas with high air impurities (such as planting a green belt to improve the air quality).<sup>205</sup>

5G will also improve public safety by saving lives and reducing crime. For example, emergency response vehicles can be equipped with a 5G wireless connection to support display monitors, which receive multiple inputs simultaneously and enable responders to make better

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<sup>202</sup> Remarks of FCC Commissioner Mignon Clyburn, 2016 California Telehealth Network Annual Summit, San Diego, California (Apr. 18, 2016), [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-338901A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-338901A1.pdf).

<sup>203</sup> Wireless Connectivity Fuels Industry Growth and Innovation.

<sup>204</sup> See The Rise of the Smart City.

<sup>205</sup> *Id.*



informed decisions.<sup>206</sup> Even a 60-second improvement in emergency response time translates to a reduction of eight percent in mortality.<sup>207</sup>

Moreover, advanced wireless connectivity is poised to improve transportation and travel safety. For instance, wireless powered self-driving cars could reduce emissions by 40-90 percent, travel times by nearly 40 percent, and delays by 20 percent.<sup>208</sup> If self-driving vehicles are widely adopted, this innovation could generate \$447 billion per year in savings and, more importantly, save 21,700 lives.<sup>209</sup>

In addition to improving Americans' health and well being, 5G networks will have a multiplier effect that ripples across other key sectors of the U.S. economy. Expanded smart grid adoption, a technology powered through wireless connectivity, could create \$1.8 trillion in additive revenue to the U.S. economy between 2013 and 2020, according to the Electric Power Research Institute.<sup>210</sup> The agriculture industry is already using wireless technology to monitor market conditions, weather, and crops.<sup>211</sup> As just one example, farmers can use wireless technology to prevent over- and under-watering of their crops, particularly during periods of drought.<sup>212</sup>

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<sup>206</sup> Wireless Connectivity Fuels Industry Growth and Innovation at 9.

<sup>207</sup> *Id.* at 9-10.

<sup>208</sup> *Id.* at 11.

<sup>209</sup> *Id.*

<sup>210</sup> *Id.*

<sup>211</sup> David L. Sunding, Martha Rogers & Coleman D. Bazelon, *The Farmer And The Data: How Wireless Technology Is Transforming Water Use In Agriculture*, MONDAQ (Apr. 27, 2016), <http://www.mondaq.com/unitedstates/x/487024/Telecommunications+Mobile+Cable+Communications/The+Farmer+And+The+Data+How+Wireless+Technology+Is+Transforming+Water+Use+In+Agriculture>.

<sup>212</sup> *Id.*

Among the most significant social and economic benefits of 5G will be the creation of “smart cities” and deployment of IoT devices. As the *Wall Street Journal* recently reported:

In just the past few years, mayors and other officials in cities across the country have begun to draw on the reams of data at their disposal—about income, burglaries, traffic, fires, illnesses, parking citations and more—to tackle many of the problems of urban life. Whether it’s making it easier for residents to find parking places, or guiding health inspectors to high-risk restaurants or giving smoke alarms to households that are most likely to suffer fatal fires, big-data technologies are beginning to transform the way cities work.<sup>213</sup>

Municipalities can create jobs, increase government efficiency, and raise revenues by adopting smart-city technologies. For example, municipalities that deploy low-cost 5G sensors to provide real-time parking information can increase parking revenue by 27 percent when paired with smart metering systems—both of which rely on advanced wireless connectivity.<sup>214</sup> Several of the characteristics of 5G networks—higher data-throughput, adaptive response time, low-power connectivity, and the ability to communicate with millions of devices—are essential ingredients to successful smart cities and IoT deployments.<sup>215</sup>

**b. The Wireless Industry is Competing for Leadership in 5G Both in the U.S. and Abroad.**

The United States is a global leader in 4G LTE deployment, having “blanketed the country with more than \$200 billion in network spending to deliver 4G LTE mobile broadband nationwide” over the past seven years.<sup>216</sup> But the U.S. wireless industry is not content to rest on

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<sup>213</sup> See *The Rise of the Smart City*.

<sup>214</sup> See *Smart Cities* at 9.

<sup>215</sup> See *id.* at 6.

<sup>216</sup> *Exploring the Value of Spectrum to the U.S. Economy*, 115th Cong., Sumcomm. on Comm., Tech., Innovation, and the Internet of the Senate Commerce, Sci., and Transp. Comm. (Mar. 2, 2017), Testimony of Scott Bergmann, Vice President, Regulatory Affairs, CTIA, <https://www.commerce.senate.gov/public/cache/files/cfc5dd82-18fe-4fc1-9577-c2eab817b502/09BA67F7E766D1F434AD88224306FD25.scott-bergmann-testimony.pdf> (“Bergmann Testimony”) (*citing* Press Release, CTIA, Americans’ Data Usage More than Doubled in 2015 (May 23,

its laurels. U.S. providers are focused on leading the world in 5G, too. Already, all four nationwide providers have plans to conduct 5G trials. AT&T announced it will launch its first “5G Evolution Markets” in Austin, Texas and Indianapolis, Indiana in the coming months to work towards deploying mobile data network connectivity with theoretical peak speeds of 400 Mbps or higher.<sup>217</sup> Verizon, meanwhile, intends to offer pre-commercial, 5G fixed wireless services in 11 markets in the first half of this year.<sup>218</sup> T-Mobile tested 5G mobile speeds of 1.8 Gbps and fixed speeds of 12 Gbps with latency of less than two milliseconds.<sup>219</sup> And Sprint demonstrated a 5G network deployment in June 2016 that “delivered claimed download speeds in excess of 2 Gbps and ‘low millisecond latency’” in Santa Clara, California.<sup>220</sup> U.S. Cellular and Ericsson also completed joint testing of 5G in Madison, Wisconsin, at the end of 2016, achieving peak speeds of 9 Gbps overall and 1.5 Gbps at a distance of one mile.<sup>221</sup> Non-wireless companies are conducting 5G trials as well. Charter, for example, is experimenting with fixed wireless service using 28 GHz band spectrum in Orlando, Florida.<sup>222</sup>

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2016), <http://www.ctia.org/industry-data/press-releases-details/press-releases/americans-data-usage-more-than-doubled-in-2015>).

<sup>217</sup> See Monica Allevan, *AT&T to Showcase 5G in Austin, Indianapolis this Year*, FIERCEWIRELESS (Feb. 1, 2017), <http://www.fiercewireless.com/wireless/at-t-to-showcase-5g-austin-indianapolis-year>.

<sup>218</sup> See Monica Allevan, *Verizon to Begin 5G pilot in 1H 2017 in Atlanta, Denver, Seattle and More*, FIERCEWIRELESS (Feb. 22, 2017), <http://www.fiercewireless.com/tech/verizon-to-begin-5g-pilot-1h-2017-atlanta-denver-seattle-and-more>.

<sup>219</sup> See Mike Dano, *T-Mobile boasts of 979 Mbps tests on LTE network, mobile 5G tests reaching 1.8 Gbps*, FIERCEWIRELESS (Dec. 29, 2016), <http://www.fiercewireless.com/wireless/t-mobile-boasts-979-mbps-tests-lte-network-mobile-5g-tests-reaching-1-8-gbps>.

<sup>220</sup> See Dan Meyer, *Spring 5G demoed at Copa America tournament*, RCR WIRELESS (June 3, 2016), <http://www.rcrwireless.com/20160603/carriers/sprint-5g-demoed-copa-america-tournament-tag2>.

<sup>221</sup> See Diana Goovaerts, *U.S. Cellular Hits 9 Gbps in 5G Trials with Ericsson at 15 GHz*, WIRELESS WEEK (Dec. 16, 2016), <https://www.wirelessweek.com/news/2016/12/us-cellular-hits-9-gbps-5g-trials-ericsson-15-ghz>.

<sup>222</sup> See Karl Bode, *Charter Conducting 28 GHz Band 5G Wireless Trials in Florida*, DSLREPORTS (Apr. 10, 2017), <http://www.dslreports.com/shownews/Charter-Conducting-28-GHz-Band-5G-Wireless-Trials-in-Florida-139325>.

However, the U.S. is competing against other countries to win the race to 5G. Indeed, 15 carriers in 11 countries are already deploying 4G LTE Advanced Pro, or “Gigabit LTE” networks, that will serve as the precursor to 5G networks.<sup>223</sup> Several governments around the world are making direct financial investments to promote 5G deployments. South Korea, for example, has committed \$1.5 billion to its “5G Creative Mobile Strategy,”<sup>224</sup> and expects to launch a 5G trial network for the Winter Olympic Games in 2018.<sup>225</sup> The European Commission has similarly committed 700 million Euros (\$759 million) of public funds to support 5G activities as part of its Horizon 2020 Programme.<sup>226</sup>

In addition to direct investment, other countries are forming partnerships and making additional spectrum available for next-generation services. The European Union released “5G for Europe: An Action Plan” this past September that calls for making provisional spectrum bands available for 5G ahead of the 2019 World Radiocommunication Conference.<sup>227</sup> The EU also entered into an agreement with Brazil to develop 5G, along with similar key cooperation initiatives with South Korea, Japan, and China.<sup>228</sup> The Chinese government has an ongoing 5G

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<sup>223</sup> See Posting of Anshel Sag to Forbes #NewTech, <https://www.forbes.com/sites/moorinsights/2017/04/11/getting-a-taste-of-5g-experiences-with-gigabit-lte/#2c9137e5379f> (Apr. 11, 2017, 11:00 EST).

<sup>224</sup> See Tammy Parker, *China, South Korea Commit to 5G Leadership, While Japan and U.S. Rely On Private Efforts*, FIERCEWIRELESS (June 8, 2014), <http://www.fiercewireless.com/tech/china-south-korea-commit-to-5g-leadership-while-japan-and-u-s-rely-private-efforts>.

<sup>225</sup> See Daniel Fuller, *2018 Winter Olympics To Have 5G Thanks To Samsung And KT*, ANDROID HEADLINES (Oct. 28, 2016), <https://www.androidheadlines.com/2016/10/2018-winter-olympics-to-have-5g-thanks-to-samsung-and-kt.html>.

<sup>226</sup> See Jorge Valero, *Europe Hopes to Make 5G Networks a Reality by 2018*, EURACTIV (Feb. 19, 2016), <https://www.euractiv.com/section/digital/news/european-industry-to-bring-5g-network-by-2018/>.

<sup>227</sup> See *5G for Europe Action Plan*, EUROPEAN COMMISSION (Mar. 3, 2017), <https://ec.europa.eu/digital-single-market/en/5g-europe-action-plan>.

<sup>228</sup> See European Commission Press Release IP/16/382, *EU and Brazil Work Together on 5G Mobile Technology*, European Commission (Feb. 23, 2016), [http://europa.eu/rapid/press-release\\_IP-16-382\\_en.htm](http://europa.eu/rapid/press-release_IP-16-382_en.htm).

technology trial in the 3400-3600 MHz band,<sup>229</sup> and has set ambitious goals for domestic 5G as part of its “Made in China” 2025 project.<sup>230</sup> Japan’s NTT Docomo has its own 5G trial network plans in the lead-up to the 2020 Summer Olympics.<sup>231</sup> In other words, the race is on both domestically and internationally for 5G leadership, and companies across the globe are competing to come out on top.

**c. Action is Needed for the United States to Maintain its Global Lead in the Race to 5G.**

America’s wireless industry is working cooperatively with the new administration, Congress, and federal agencies to speed the arrival of 5G. These entities can promote the U.S.’s global leadership in mobile services and technologies by taking immediate action to facilitate access to spectrum and modernize siting policies.

Access to additional spectrum, particularly licensed spectrum, is critical to continuing the cycle of innovation and investment that has produced the 5G trials to date and spurred initial smart city and IoT deployments. CTIA applauds the Commission’s rapid work in advancing its rulemaking proceeding to allocate millimeter wave band spectrum for flexible use.<sup>232</sup> CTIA encourages the agency to move forward with similar speed in allocating the spectrum identified in the *Further Notice* for licensed, terrestrial mobile use. It takes 13 years on average to allocate

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<sup>229</sup> See *5G Spectrum in Europe*, GLOBAL MOBILE SUPPLIERS ASSOCIATION (Dec. 23, 2016), <http://www.slideshare.net/soksitha/5g-spectrum-in-europe>.

<sup>230</sup> See Lilian Rogers, *What’s at Stake in China’s 5G Push?*, APCO FORUM (Dec. 14, 2016), <http://apcoworldwide.com/blog/detail/apcoforum/2016/12/14/whats-at-stake-in-chinas-5g-push>.

<sup>231</sup> See Joseph Waring, *Docomo’s 2020 5G Launch ‘Not Just for Olympics’*, MOBILE WORLD LIVE (Oct. 7, 2015), <https://www.mobileworldlive.com/featured-content/homebanner/docomos-2020-5g-launch-not-just-for-olympics/>.

<sup>232</sup> *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8280 (2016) (Statement of Commissioner Ajit Pai, Approving in Part and Concurring in Part) (“In less than two years, [the FCC] pushed this proceeding from a *Notice of Inquiry* to an *Order*, and this country from virtually no high-band, mobile spectrum to over 10 GHz of it. In the regulatory context, that is moving at the speed of light.”).

spectrum for wireless use,<sup>233</sup> and acting immediately to begin that process to identify and allocate millimeter-wave spectrum for 5G service will promote the global leadership of the U.S. in the years to come.

Similarly, infrastructure siting policies will play a vital role in determining the success or failure of 5G. As discussed in more detail in Section X.b. below, common sense reforms that account for the reduced size of 5G infrastructure and its minimal impact on rights-of-way (“ROWS”) will allow this technology to flourish. CTIA looks forward to working with the Commission on such modernization efforts in the recently opened proceedings and through engagement with the Broadband Deployment Advisory Committee.

#### **IX. COMPETITION IS PROMPTING THE WIRELESS INDUSTRY TO FURTHER PROTECT THE CONSUMER EXPERIENCE.**

As U.S. consumers conduct more of their life and business across wireless networks, they are increasingly aware of the need to safeguard their information. Wireless providers and device manufacturers are competing to offer the most secure networks and devices, and to provide consumers with the best tools to protect themselves and their information. Wireless providers are also joining forces to protect consumers from unwanted scam phone calls, and are working with the public safety community to maximize the utility of wireless devices for communications during an emergency.

##### **a. The Wireless Industry Remains Committed to Protecting Consumer Data.**

Wireless providers have strong incentives to safeguard their customers’ personal information and have long provided such protections in their privacy policies and network practices. The competitive marketplace for mobile broadband services ensures that providers

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<sup>233</sup> Bergmann Testimony at 11.

will continue to maintain effective privacy and data practices to meet their customers' expectations. Indeed, consumers' satisfaction regarding their mobile providers' privacy and security protections is steadily increasing. A recent survey found that in 2016, 72 percent of respondents rated their provider as trustworthy, compared to 69 percent in 2015 and 63 percent in 2014.<sup>234</sup>

Numerous wireless providers recently reaffirmed their commitment to strong consumer data protections by voluntarily agreeing to a set of privacy principles that emphasize transparency, consumer choice, data security, and notification.<sup>235</sup> These policies reaffirm the wireless industry's longstanding, pro-consumer privacy practices and ensure that wireless privacy policies will continue to reflect consumers' expectations and demands.

**b. The Wireless Industry Continues to Deploy New Technologies and Tools to Improve Device Theft Deterrence.**

Wireless providers continue to provide consumers with state-of-the-art tools to protect their mobile devices and personal information. In July 2015, CTIA, along with several wireless providers and manufacturers, created the "Smartphone Anti-Theft Voluntary Commitment," by which companies agreed to offer certain protections to consumers in the event of loss or theft.<sup>236</sup> These protections include the ability to remotely wipe smartphones and render the devices inoperable. Wireless providers have also developed a variety of tools and security features to

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<sup>234</sup> Preston Gralla, *The Votes Are In: Which Mobile Data Provider Is Best?*, COMPUTERWORLD (Dec. 21, 2016), <http://www.computerworld.com/article/3150992/wireless-carriers/the-votes-are-in-which-mobile-data-provider-is-best.html>.

<sup>235</sup> Press Release, CTIA, Protecting Consumer Privacy Online: Internet Companies Reaffirm Consumer Privacy Principles as FCC Reviews Flawed Wheeler Era Broadband Rules (Jan. 27, 2017), <http://www.ctia.org/docs/default-source/default-document-library/final---protecting-consumer-privacy-online.pdf>

<sup>236</sup> Smartphone Anti-Theft Voluntary Commitment, CTIA, <http://www.ctia.org/initiatives/voluntary-guidelines/smartphone-anti-theft-voluntary-commitment> (last visited Apr. 21, 2017).

assist customers in securing their devices and information. Many providers have recently deployed multi-factor authentication to protect access to sensitive user information. For example:

- AT&T offers a feature referred to as “extra security.” Once activated, this feature gives the customer a security passcode, and any future interaction with AT&T, whether online, via phone, or in a retail store requires a consumer to provide his or her passcode.<sup>237</sup>
- T-Mobile allows its customers to establish a customer care password on their accounts. Once established, customers are required to provide this password when contacting T-Mobile by phone.<sup>238</sup>
- Verizon allows its customers to set an account PIN. This PIN provides additional security for telephone transactions and certain other transactions.<sup>239</sup>
- Sprint requires customers to set a PIN and security questions when they establish service with Sprint. Customers must use the PIN or answer the security question when calling or visiting a Sprint retail store and to register an account online.<sup>240</sup>

**c. The Wireless Industry Joined Forces to Stop Unwanted Calls.**

The wireless industry is also actively working to stop unwanted robocalls. Since August 2016, 33 Strike Force representatives, including from numerous wireless provider companies, have participated in an industry-led Robocall Strike Force that is working to secure caller ID systems to stop spoofing, develop technologies that would block unwanted and illegal calls at the point of origin, educate consumers on existing tools, and provide guidance for regulators trying

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<sup>237</sup> See Add or Remove Extra Security, AT&T, <https://www.att.com/esupport/article.html#!/wireless/KM1051397> (last visited Apr. 26, 2017).

<sup>238</sup> See About T-Mobile, T-Mobile, <https://www.t-mobile.com/company/privacy-resources/account-security/password-security.html> (last visited Apr. 21, 2017).

<sup>239</sup> See Account Pin FAQs, Verizon, <https://www.verizonwireless.com/support/account-pin-faqs/> (last visited Apr. 26, 2017).

<sup>240</sup> See Your Account PIN and security question answer, Sprint, [https://shop2.sprint.com/en/legal/PIN\\_intro\\_popup.shtml](https://shop2.sprint.com/en/legal/PIN_intro_popup.shtml) (last visited Apr. 21, 2017).



to accelerate deployment of new technologies.<sup>241</sup> In April 2017, the Strike Force issued a progress report on its efforts in the areas of (1) authentication, (2) empowering consumer choice, (3) detection, assessment, traceback and mitigation, and (4) regulatory support.<sup>242</sup>

Industry participants and Strike Force members are also taking steps to help customers avoid unwanted calls and improve and expand mitigation tools to combat illegal robocalling.

For example:

- AT&T Call Protect is a free, network-based app that provides automatic fraud blocking and warnings of suspected spam calls through the provider's myAT&T offering. The service also lets users block calls from specific numbers for up to 30 days at a time.<sup>243</sup> In addition, AT&T blocked its billionth unwanted robocall in cases where its business contracts allow it to block impermissible traffic using a new program that detects violators through network data analysis.<sup>244</sup>
- Sprint's Premium Caller ID allows customers to see the caller's name on their incoming screen when the caller is not already in their contacts list. Sprint also identifies incoming calls that may be robocallers, potential spammers, or potential fraud.<sup>245</sup>
- T-Mobile's Scam ID and Scam Block safeguards customers from scam calls by identifying calls that are coming from known scammers and allowing customers to choose to automatically block these calls.<sup>246</sup>
- Verizon has been trialing a service that scores all incoming calls to its Caller Name ID customers, identifying potential spam and calling-out the level of risk with a "risk meter." The service is powered by Cequint, a wholly owned subsidiary of

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<sup>241</sup> See, e.g., FCC, ROBOCALL STRIKE FORCE, ROBOCALL STRIKE FORCE REPORT (Oct. 26, 2016), <https://transition.fcc.gov/cgb/Robocall-Strike-Force-Final-Report.pdf>.

<sup>242</sup> See, e.g., INDUSTRY ROBOCALL STRIKE FORCE REPORT (Apr. 28, 2017), <https://www.fcc.gov/file/12311/download>.

<sup>243</sup> Press Release, AT&T, AT&T Unveils AT&T Call Protect to Help Customers Manage Unwanted Calls (Dec. 20, 2016), [http://about.att.com/story/att\\_call\\_protect.html](http://about.att.com/story/att_call_protect.html).

<sup>244</sup> Press Release, AT&T, More Than One Billion Robocalls Blocked (Apr. 13, 2017), [http://about.att.com/story/more\\_than\\_one\\_billion\\_robocalls\\_blocked.html](http://about.att.com/story/more_than_one_billion_robocalls_blocked.html).

<sup>245</sup> Kathleen Dunleavy, *Sprint Provides Protection from Unwanted Robocalls with Availability of Premium Caller ID – Find out How it Works!*, SPRINT NEWSROOM (Nov. 30, 2016), <http://newsroom.sprint.com/blogs/devices-apps-and-services/sprint-provides-protection-from-unwanted-robocalls-with-availability-of-premium-caller-id-find-out-how-it-works.htm>.

<sup>246</sup> See Call Protection, T-Mobile, <https://explore.t-mobile.com/callprotection> (last visited Apr. 21, 2017).

Transaction Network Services (“TNS”), and is currently available on Android and Apple devices.<sup>247</sup> Verizon expects a broader product launch later in 2017.

- Apple introduced CallKit for iOS 10 and higher. API developers can create a call directory app extension to identify and block incoming callers by their phone number. This opens up the iPhone ecosystem to an important call control capability, for devices running iOS 10 and higher, across all service provider networks.<sup>248</sup>
- Google has introduced spam protection functionality on the Google Phone application for Pixel, Nexus, and Android One devices, which warns users about potential spam callers and provides users with the choice to block and report these numbers.<sup>249</sup> The user interface and reporting aspects of Google Phone spam protection have also been made openly available at no cost to third parties via the Android Open Source Project.<sup>250</sup> In addition, there are plans to provide platform APIs in upcoming builds of Android that would offer new forms of spam solution support for carriers and manufacturers.

**d. The Wireless Industry is Collaborating with the Public Safety Community.**

Every year, more people turn to their mobile device to reach 9-1-1. In 2016, nearly 240 million 9-1-1 calls were placed, roughly 70 percent of which were wireless.<sup>251</sup> Over the past year, wireless providers continued to make communities safer with reliable, innovative technologies, including text-to-911, and 9-1-1 location accuracy. Since the Commission’s 2015 *Fourth 9-1-1 Location Accuracy Order*, CTIA has led the wireless industry and public safety representatives in a collaborative, on-going effort to meet the Commission’s new wireless 9-1-1 location accuracy requirements.<sup>252</sup> Wireless providers have deployed new technologies, such as

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<sup>247</sup> See Verizon Caller Name ID, Verizon, <https://www.verizonwireless.com/solutions-and-services/caller-name-id/> (last visited May 1, 2017).

<sup>248</sup> See CallKit, API Reference, Apple, <https://developer.apple.com/reference/callkit> (last visited May 1, 2017).

<sup>249</sup> See Use Caller ID & Spam Protection, Pixel Phone Help, Google, <https://support.google.com/pixelphone/answer/3459196> (last visited May 1, 2017).

<sup>250</sup> See Android Source, <https://source.android.com/> (last visited May 1, 2017).

<sup>251</sup> Matthew Gerst, *Getting 9-1-1 Location Accuracy Right for Public Safety and Consumers*, CTIA BLOG (Feb. 3, 2017), <https://www.ctia.org/industry-data/blog-details/blog-posts/9-1-1-location-accuracy-public-safety-and-consumers>.

<sup>252</sup> *Wireless E911 Location Accuracy Requirements*, Fourth Report and Order, 30 FCC Rcd 1259 (2015).

device-based hybrid solutions, and invested in new capabilities, like the National Emergency Address Database (“NEAD”), that enhance wireless 9-1-1 location accuracy, especially indoors.<sup>253</sup> Last year, NEAD announced a major step toward helping first responders locate wireless 9-1-1 callers more accurately indoors by selecting West’s Safety Services to develop and operate the NEAD Platform. With a NEAD operator in place, the wireless industry remains on schedule to enhance indoor 9-1-1 location accuracy by harnessing commercial technologies.<sup>254</sup>

Wireless providers continue to support Text-to-911 services while also working with device manufacturers to support the deployment of RTT. Since 2015, all U.S. wireless providers support text-to-911 services.<sup>255</sup> Text-to-911 has already helped save lives across the United States.<sup>256</sup> As deaf, hard of hearing, and speech-impaired consumers increasingly adopt

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<sup>253</sup> Matt Gerst, *Recognizing the 9-1-1 Community and How Wireless Supports 9-1-1 During National 9-1-1 Education Month*, CTIA BLOG (Apr. 18, 2017), <https://www.ctia.org/industry-data/blog-details/blog-posts/wireless-supports-911-community-national-education-month>.

<sup>254</sup> Press Release, PR Newswire, *Wireless Industry Announces Latest Step Toward Enhancing Mobile 911 Location Services* (Oct. 4, 2016), <http://www.prnewswire.com/news-releases/wireless-industry-announces-latest-step-toward-enhancing-mobile-911-location-services-300338841.html>.

<sup>255</sup> Press Release, CTIA, *Wireless Industry Announces Latest Step Toward Enhancing Mobile 911 Location Services* (Oct. 4, 2016), <http://www.ctia.org/policy/policy-position-details/policy-subtopic-details/911-Public-Safety/text-to-911>.

<sup>256</sup> Lisa Marquez, *Injured Mt. Baldy Hiker Rescued Using ‘Text-to-911’*, DAILY BULLETIN (Jan. 23, 2016), <http://www.dailybulletin.com/general-news/20160123/injured-mt-baldy-hiker-rescued-using-text-to-911>; Tony Shin, *Text to 911 Helps Deaf Woman in Distress*, NBC LOS ANGELES (Dec. 30, 2015), <http://www.nbclosangeles.com/news/local/Deaf-Woman-Uses-Text-to-911-to-Get-Help-363855561.html>; *Text-to-911 Used For Aid In Dangerous Traffic Stop*, VAILDAILY, (Jan. 8, 2016), <http://www.vaildaily.com/news/text-to-911-used-for-aid-in-dangerous-traffic-stop/>; Kylee Wierks, *Indiana Woman Texts 911 To Report Kidnapping While Held At Gunpoint*, FOX59 (Apr. 14, 2016), <http://fox59.com/2016/04/14/indiana-woman-texts-911-to-report-kidnapping-while-held-at-gunpoint/>; *Father Charged with DUI After Kids Text 911 for Help*, 6ABC ACTION NEWS, (Apr. 15, 2016), <http://6abc.com/family/father-charged-with-dui-after-kids-text-911-for-help/1292680/>.

innovative wireless services, including Text-To-911, the wireless industry will continue to support the transition toward advanced solutions like RTT.<sup>257</sup>

The wireless industry has also worked diligently to develop, deploy, and enhance WEA capability, enabling alert originators and wireless subscribers to communicate and receive alerts, respectively, in a timely and accurate manner. Wireless providers that voluntarily support the WEA system have continued to work with alert originators and public safety entities to advance and enhance the existing system through standards efforts led by the Alliance for Telecommunications Industry Solutions and participation in the Commission's Communications Security, Reliability and Interoperability Council. These efforts have directly led to recommendations adopted in 2016 by the Commission to improve the functioning of the WEA.

**X. THE COMMISSION SHOULD FOSTER FURTHER GROWTH AND COMPETITION IN THE MARKET.**

The Commission should take additional action to enhance competition in the wireless industry, principally by allocating additional spectrum for licensed uses and promoting policies that enable rapid infrastructure deployment.

**a. The Commission Can Promote Competition Among Wireless Providers By Allocating Additional Low-, Mid-, and High- Band Spectrum for Exclusive Licensed Use.**

Licensed spectrum is the lifeblood of wireless services, and increasing its availability drives greater competition among mobile operators. As the *Nineteenth Mobile Competition Report* noted, "increasing consumer demand for mobile broadband is increasing service providers' need for spectrum at an unprecedented rate and this is projected to grow further."<sup>258</sup> Giving operators "the opportunity to access both low-band spectrum that can provide coverage

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<sup>257</sup> See Reply Comments of CTIA, PS Docket Nos. 15-91, 15-94 (filed Jan. 9, 2017).

<sup>258</sup> *Nineteenth Report* ¶ 49.

and in-building penetration, as well as higher band spectrum that can provide the increased throughput for mobile broadband applications” promotes competition.<sup>259</sup> Access to new sources of spectrum facilitates new entrants into the wireless market and allows existing providers to expand and improve their coverage to better compete with one another.

Low-band spectrum continues to serve as the cornerstone of effective 4G LTE coverage and the bedrock of any nationwide wireless network deployment. The Commission should pursue all available opportunities to allocate low-band spectrum for licensed wireless communications. The propagation characteristics of low-band spectrum allow operators to offer coverage that travels long distances, penetrates walls to provide indoor connectivity, and reaches urban canyons.<sup>260</sup>

Although the recent successful 600 MHz incentive auction is on track to deliver 70 megahertz of low-band spectrum available for wireless use, the Commission can do more during the post-auction process to maximize the advantages for consumers. As Chairman Pai has recognized, it is “now imperative that we move forward with equal zeal to ensure a successful post-auction transition, including a smooth and efficient repacking process.”<sup>261</sup> Maintaining the 39-month transition timeline will ensure that 600 MHz spectrum is in the hands of mobile operators—and consumers—as quickly as possible. Any delay in accessing 600 MHz spectrum will result in significant opportunity costs.<sup>262</sup> One study estimates the annual loss of consumer

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<sup>259</sup> *Id.* ¶ 51.

<sup>260</sup> *Id.* ¶ 50.

<sup>261</sup> FCC Press Release, Statement of Chairman Ajit Pai On the Completion of the Incentive Auction and the Start of the Post-Transition Period (Apr. 13, 2017), [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0413/DOC-344399A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0413/DOC-344399A1.pdf).

<sup>262</sup> See, e.g., Coleman Bazelon & Giulia McHenry, *Staying on Track: Realizing the Benefits from the FCC's Incentive Auction Without Delay*, THE BRATTLE GROUP (Feb. 20, 2015), reproduced in Comments of LocusPoint Networks, LLC, AU Docket 14-252 (filed Feb. 20, 2015).

surplus associated with even a one-year delay will approximate the total revenue from the auction.<sup>263</sup> By contrast, tower-related efforts and broadcaster repacking can be accomplished in a timely and cost-effective manner.<sup>264</sup>

Beyond the incentive auction, the Commission should work with the National Telecommunications and Information Administration (“NTIA”) and Congress to identify additional low- and mid-band spectrum for exclusive, licensed use, including spectrum currently held by federal agencies. By some accounts, 60 to 70 percent of all spectrum between 225 MHz and 3.7 GHz is allocated at least in part to federal agencies.<sup>265</sup> One idea that warrants serious consideration is Commissioner O’Rielly’s proposal to establish “an annual cost to government agencies based on their allocated frequencies, which would impact their annual budgets,” and would “force agencies to reconsider their spectrum holdings because they would only want to pay for what is actually needed to accomplish their mission, thereby freeing spectrum for commercial uses.”<sup>266</sup> Legislative efforts, such as the MOBILE NOW Act, can also promote spectrum clearing and encourage more efficient use of the spectrum bands.<sup>267</sup>

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<sup>263</sup> *Id.* at 9.

<sup>264</sup> See T-Mobile USA, Inc., Broadcast Tower Technologies, Inc. and Hammett & Edison, Inc., 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, AU Docket No. 14-252 (filed Feb. 17, 2016).*

<sup>265</sup> See President’s Council of Advisors on Science and Technology (PCAST), *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, at 8 (July 20, 2012), [https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast\\_spectrum\\_report\\_final\\_july\\_20\\_2012.pdf](https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf).

<sup>266</sup> Commissioner Michael O’Rielly, *Enacting More “Sticks”: Spectrum Fees for Government Users*, FCC Blog (Sept. 8, 2015), <https://www.fcc.gov/news-events/blog/2015/09/08/enacting-more-sticks-spectrum-fees-government-users>.

<sup>267</sup> Press Release, John Thune, Thune Reintroduces MOBILE NOW Act on First Day of 115<sup>th</sup> Congress (Jan. 3, 2017), <https://www.thune.senate.gov/public/index.cfm/2017/1/thune-reintroduces-mobile-now-act-on-first-day-of-115th-congress>.

Additionally, mid-band spectrum provides the coverage and capacity needed to help facilitate the transition to 5G. Today, the 3.5 GHz band is the only mid-band spectrum targeted for 5G use in the United States. CTIA therefore urges the Commission to evaluate other mid-band opportunities for licensed, wireless use. The Commission should also ensure that the policies in place for the 3.5 GHz band reflect a workable three-tier sharing framework that provides the certainty needed for wireless providers to invest and deploy to the benefit of consumers.

Allocating additional high-band spectrum for exclusive, licensed use is also becoming increasingly necessary for wireless providers, especially as they start preparing for 5G services. CTIA supports the Commission's release of high-band spectrum for licensed, exclusive use in the first phase of the *Spectrum Frontiers* proceeding, and urges the Commission to act quickly to make the bands identified in the Further Notice available for flexible, licensed use. In particular, the Commission should allocate the 37-37.6 GHz band for licensed use, with licenses conditioned on coordination with federal parties, and expeditiously open up the 24 GHz, 29 GHz, 31 GHz, 32 GHz, 40-42 GHz, 42 GHz, 47 GHz, and 50 GHz bands.

**b. Modernizing Siting Processes Will Enable the Competitive Roll-Out of Infrastructure to Support Improved 4G LTE and Next-Generation 5G Networks.**

The pace of infrastructure deployment provides concrete evidence of intensifying competition among mobile operators to provide 5G wireless services. As Commissioner O'Rielly has recognized, "there is little dispute" that 5G technology will require "expansive buildout efforts by providers" including both traditional towers and networks comprised of hundreds of thousands of small cell antennas and miles of fiber.<sup>268</sup> Wireless providers are racing

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<sup>268</sup> Remarks of Michael O'Rielly, Commissioner, FCC, *The 5G Triangle*, at 2 (May 25, 2016), [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2016/db0525/DOC-339558A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0525/DOC-339558A1.pdf); *see also*

to install small cell antennas across the country. The Commission estimates that 100,000 to 150,000 small cells will be constructed by the end of 2018, and these numbers will reach 455,000 by 2020 and 800,000 by 2026.<sup>269</sup> According to another study, approximately 300,000 pizza box-sized small cells will be needed in next three to four years.<sup>270</sup> Novel technologies allow these small cell antennas to be installed on a variety of structures, enabling the extension of wireless networks from common fixtures like street lights and utility poles.<sup>271</sup>

Deploying dense small cell networks cannot occur expeditiously, however, unless regulations keep pace with technology. Unfortunately, wireless providers often face an obstacle course of reviews from local, state, and tribal governments. Barriers to infrastructure deployment relating to costs, access, and delays inhibit competition by slowing the deployment of small cells and other facilities necessary to provide competitive service.

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Remarks of FCC Commissioner Ajit Pai, Remarks at the Brandery: A Digital Empowerment Agenda Cincinnati, OH, at 2 (Sept. 13, 2016), [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-341210A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-341210A1.pdf) (“Future 5G technologies will require ‘densification’ of wireless networks. That means providers are going to deploy hundreds of thousands of new antennas and cell sites, and they are going to deploy many more miles of fiber to carry all of this traffic.”); Statement of FCC Commissioner Mignon Clyburn, Senate Committee on Commerce, Science, and Transportation, Oversight of the Federal Communications Commission (Mar. 8, 2017), [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0308/DOC-343813A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0308/DOC-343813A1.pdf) (“In order to reap the benefits of 5G services, however, we need to not only have adequate spectrum, but the necessary infrastructure, such as small cells and distributed antenna systems (DAS), to deploy that spectrum.”).

<sup>269</sup> See *Comment Sought on Streamlining Deployment of Small Cell Infrastructure by Improving Wireless Facilities Siting Policies; Mobilitie, LLC Petition for Declaratory Ruling*, Public Notice, 31 FCC Rcd 13360, 13363-64 (WTB 2016).

<sup>270</sup> See *Ex Parte* Notice of Brian Josef, Assistant Vice President, Regulatory Affairs, CTIA to Marlene H. Dortch, Secretary, FCC, at Attachment at 5 (Apr. 13, 2017), <https://ecfsapi.fcc.gov/file/1041397808761/170413%20CTIA%20Ex%20Parte.pdf>; see also Bergmann Testimony.

<sup>271</sup> *Id.*



CTIA is encouraged by the FCC’s recent proposals aimed at reducing regulatory barriers to wireless broadband infrastructure.<sup>272</sup> As CTIA recently noted, “although some localities are modernizing their policies to account for the evolution of wireless technology, others are imposing increased barriers that either directly or indirectly prohibit access and create delays to deployment, despite the clear national interest in the U.S. being a leader in 5G.”<sup>273</sup>

CTIA therefore urges the Commission to ensure that localities issue permits for wireless facilities within reasonable timeframes, and provide “deemed granted” remedies in instances when localities fail to act on a permit application within the time limit prescribed. Preventing municipalities from enforcing unreasonable requirements or anti-competitive policies that act as *de facto* denials of infrastructure siting applications will also promote deployment. Moreover, while localities have a legitimate interest in recovering reasonable fees that offset the costs of processing permits and managing ROWs, municipalities’ fee schedules should also reflect the minimal impact of small cell review. Finally, the wireless industry would benefit from modernization and clarification of the historic preservation and environmental review processes for small cells and other 5G infrastructure. The Commission therefore should take prompt action to accelerate deployment, which, in turn, will increase competition and give consumers the benefits of more choices.

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<sup>272</sup> *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment, et al.*, Notice of Proposed Rulemaking and Notice of Inquiry, DA 17-38, WT Docket No. 17-79 (rel. Apr. 21, 2017).

<sup>273</sup> *See Ex Parte* Letter from Brian M. Josef, Assistant Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 16-421, *et al.* at 1-2 (filed Apr. 13, 2017).

**c. The Commission Should Promote an Open Internet While Avoiding Public Utility Regulation of Dynamic and Competitive Mobile Broadband Services.**

The vibrant competition in the U.S. wireless market counsels heavily toward a flexible and deregulatory approach that enables providers to invest and innovate to the benefit of consumers. Consistent with that approach, Chairman Pai is to be commended for his proposal to restore the Internet to a light-touch regulatory framework by classifying broadband Internet access service as an information service.<sup>274</sup> Chairman Pai's proposal appropriately recognizes the harmful impact of applying Title II utility rules to broadband. Notably, nothing about the proposal changes U.S. wireless providers' commitment to an open Internet. CTIA looks forward to participating in the Commission's proceeding and working with Congress to develop sustainable, common sense net neutrality rules under a regulatory framework that promotes billions of dollars of investment, millions of jobs, and the innovation needed to sustain consumers' mobile-first lives.

**d. A Renewed Focus on Assessing the Costs and Benefits of Regulatory Mandates Will Foster Greater Competition in the Wireless Market.**

CTIA lauds Chairman Pai's efforts to create an Office of Economics and Data to further ensure that unnecessary or costly regulatory barriers do not stand in the way of further competition.<sup>275</sup> According to Chairman Pai, the new Office will leverage its economists and data

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<sup>274</sup> See FCC Press Release, FCC Announces Tentative Agenda for May Open Meeting (rel. Apr. 27, 2017), [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-344615A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-344615A1.pdf); see also *Restoring Internet Freedom*, Draft Notice of Proposed Rulemaking, FCC-CIRC1705-05, WC Docket No. 17-108 (dated Apr. 27, 2017); Remarks of FCC Chairman Ajit Pai at the Newseum, The Future of Internet Freedom (Apr. 26, 2017), [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0426/DOC-344590A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0426/DOC-344590A1.pdf); Remarks of FCC Commissioner Michael O'Rielly, FreedomWorks and Small Business & Entrepreneurial Council Event (Apr. 26, 2017), [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-344594A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-344594A1.pdf).

<sup>275</sup> See Ali Breland, *FCC head announces new office focused on economics*, THE HILL (Apr. 5, 2017), <http://thehill.com/policy/technology/327425-fcc-head-announces-new-economic-focus-at-agency>.

experts to “ensure that well-informed decision making is the norm, not just a box to check.”<sup>276</sup>

The Commission has an opportunity—and indeed an obligation—to ensure the continued growth of the wireless industry and continued improvement and expansion of high-speed wireless networks. Evaluation of good data by economic experts will provide the best assessment of the wireless industry and the best source of support for regulatory or deregulatory efforts. When collecting data, the Commission should look in particular to third-party resources for support in their potential new cost-benefit process. The Office of Economics and Data can carefully assess the data provided in this proceeding and elsewhere by providers, vendors, consumers, and others, to ensure the Commission’s policies best support the evolution of next-generation networks.

## **XI. CONCLUSION.**

Wireless connectivity has delivered tremendous benefits to both U.S. consumers, businesses, and the economy. The attendant demand for high-speed wireless service is driving investment and innovation by wireless service providers and manufacturers. The result is an intensely competitive wireless market. Wireless providers are competing for customers across every measure, from pricing and data plans to devices and premium functionality. Consumers are seeing benefits from this competition in every facet of their daily lives. The facts therefore permit no other conclusion than that the mobile wireless market is characterized by effective competition, and CTIA urges the Commission to honor its obligation under the Communications Act and make an affirmative finding that the mobile wireless market—or, at a minimum, the core CMRS market—is subject to effective competition.

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<sup>276</sup> Remarks of Chairman Ajit Pai at the Hudson Institute, “The Importance of Economic Analysis at the FCC” (Apr. 5, 2017), [https://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0405/DOC-344248A1.pdf](https://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0405/DOC-344248A1.pdf).

Respectfully submitted,

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