



# LICENSED SPECTRUM

The Key to Continuing

America's Wireless Leadership

and Growing Our Economy

February 2017



# OVERVIEW

Wireless is changing every aspect of our lives, and the U.S. is leading that revolution. It's spectrum that fuels our mobile life and our country's future economic growth. The U.S. wireless industry—thanks to licensed spectrum—contributes significantly to our nation's economy, productivity and jobs. Getting new spectrum into the marketplace acts as a powerful accelerant for economic growth and job creation. The demand for mobile data—past, present, and projected—continues to grow, and licensed, exclusive use spectrum will be critical to meeting that demand.

Recognizing the power of wireless connectivity and its economic impact, policymakers have wisely acted to free up more licensed spectrum for wireless. In July 2016, the Federal Communications Commission (FCC) opened up high-band spectrum to help realize the transition to 5G. Earlier this year, the FCC successfully completed the world's first incentive auction, freeing up 70 MHz of spectrum for wireless broadband. In addition, recognizing future needs, Congress in 2015 directed federal agencies to relinquish an additional 30 MHz (and identify 100 MHz for reallocation) over the next decade.

These steps were critical. Yet at the same time, wireless marketplace developments underscore just how quickly this industry continues to grow and innovate – and why policymakers need to redouble efforts to support the needs of mobile consumers. Even with the recent progress, it's clear the wireless industry needs more licensed spectrum. Mobile data continues to grow, providers are taking steps to deploy 5G, and municipalities and other industries across the economy are looking to wireless connectivity to transform their communities and how they deliver goods and services.

The new Administration, Congress and FCC should work to quickly complete the spectrum allocation initiatives underway while also jumpstarting efforts to identify new bands for future mobile broadband use. To put this spectrum rapidly to use policymakers at the local, state and federal levels should take a comprehensive review to ensure siting and zoning policies facilitate, and not inhibit, next generation network deployment.

## THE RIGHT POLICIES FOR AMERICA'S CONTINUED WIRELESS LEADERSHIP

Policymakers should adopt the right spectrum and infrastructure policies for America's continued wireless leadership.

### Spectrum

#### **Incentive Auction.**

Expedite the repacking process to provide timely access to this spectrum

#### **Federal Spectrum.**

Accelerate efforts to identify additional spectrum for mobile broadband

#### **High-Band Spectrum.**

Provide access to 11 GHz and identify additional high-band frequencies, with emphasis on licensed spectrum

#### **Unlicensed Innovation.**

Ensure that unlicensed spectrum remains a sandbox for wireless innovation for all, including LTE in unlicensed technologies

### Infrastructure

#### **Access.**

Improve access to poles, street lights, and rights of way for new wireless deployments

#### **Fees.**

Ensure reasonable and non-discriminatory fees that reflect 5G economics and architecture

#### **Zoning.**

Simplify zoning processes with set timetables and more uniform procedures

## Licensed Spectrum

Licensed spectrum is the type of spectrum that forms the core of mobile broadband networks. It provides exclusive access to spectrum with clear interference rights that provide the certainty needed to invest and provide the high quality reliable service Americans have come to expect. Licensed spectrum is typically made available through auctions.

## Data.

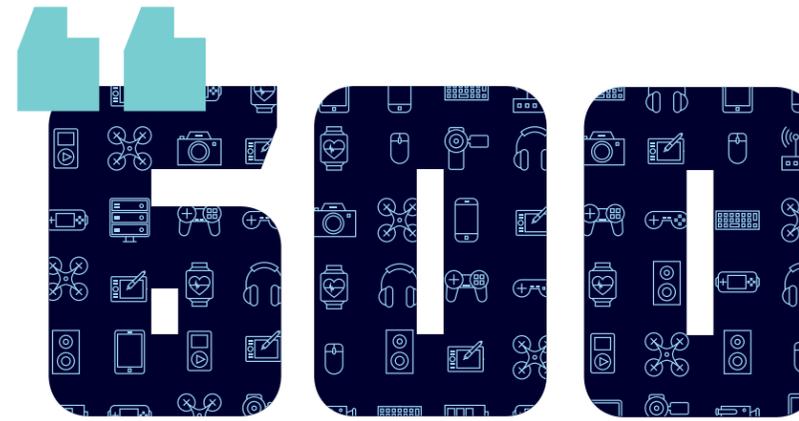
Demand for mobile data has continued to surge. CTIA's Annual Survey found that more than 9.65 trillion MBs of traffic passed over U.S. wireless networks in 2015 – more than double the amount of data used in 2014.<sup>1</sup> Looking ahead, Cisco predicts that mobile data traffic in the U.S. will grow five-fold from 2016 to 2021, or more than 139 times in 11 years.<sup>2</sup>



## The Internet of Things.

With 4G's broad coverage and carrier-grade security as a foundation for the Internet of Things (IoT), the increased connectivity supported by 5G will unlock the full promise of smart cities and the IoT. Communities across the country and every economic sector, from agriculture and transportation to healthcare and energy, have begun using the power of wireless connectivity. Today nearly 15 percent of all wireless connections in the U.S. are Machine-to-Machine (M2M) connections, connecting devices and industrial sensors rather than people. That number is expected to increase to around 30 percent by the end of the decade<sup>4</sup> as 600 million wireless connections come online, nearly all connected to 4G and 5G networks.<sup>5</sup> The scale of 5G networks will be necessary to support all the new devices and functionalities.

The U.S. leads the world in 4G and is poised to lead the world in 5G. Maintaining that leadership and unlocking our **wireless future depends on more licensed spectrum.**



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## 5G.

In 2016, the wireless industry began conducting 5G trials across the country. This built on years of R&D investment laying the groundwork for the next generation of wireless. 5G networks – which will be ten times faster than 4G networks, connect 100 times the number of devices, and respond 5 times as quickly – will transform business and the consumer experience and drive even more data usage.<sup>3</sup>

5G networks will be

**10X FASTER**

than 4G networks,

**CONNECT 100X**

the number of devices, and respond

**5X AS QUICKLY.**



# SPECTRUM FUELS ECONOMIC GROWTH

Wireless connectivity based on spectrum has created good jobs and generated significant economic growth, and will continue to do so.

## Industry Impact.

The wireless industry as a whole generates over \$400 billion in total U.S. spending,<sup>6</sup> with \$194.8 billion of domestic economic value in the U.S. in 2014 (up 34 percent from 2011) and \$282.1 billion in US Gross Domestic Product (GDP) (up 44 percent from \$195.5 billion in 2011), making it larger than the agriculture and the petroleum and coal production industries.<sup>7</sup> In 2015, the mobile industry made a total contribution of \$710 billion to North America in value added terms, equivalent to 3.6 percent of the total GDP. That number is expected to rise to nearly \$1 trillion by 2020, representing 4.5 percent of GDP by the end of the decade.<sup>8</sup>

## Spectrum Impact.

The economic value of all licensed spectrum made available to date is estimated to be approximately \$500 billion, with social benefits at least 10 to 20 times that.<sup>9</sup> Looking at a particular band freed up for commercial purposes, the introduction of AWS-1 increased US GDP by \$48.6 billion from 2011 to 2014.<sup>10</sup> Making available additional spectrum has the potential to unleash substantial economic benefits. In fact, just an additional 10 MHz of licensed spectrum is estimated to increase U.S. GDP by \$3.1 billion.<sup>11</sup> Overall, 5G is expected to add another \$500 billion to our economy.<sup>12</sup>

## Jobs Impact.

Economic growth translates to jobs thanks to licensed spectrum and the wireless industry. Over 4.6 million Americans have jobs that depend directly or indirectly on the wireless industry.<sup>13</sup> Equally impressive, employing one person in the wireless industry results in 6.5 people finding employment.<sup>14</sup> This is almost one and a half times higher than the employment multiplier of the manufacturing sector.<sup>15</sup> Here again adding licensed spectrum has an immediate impact: an additional 10 MHz of licensed spectrum is estimated to increase U.S. employment by approximately 105,000 jobs.<sup>16</sup> The deployment of 5G will add 3 million additional wireless jobs.<sup>17</sup>

## WIRELESS EFFECT:

100 MHz of new spectrum leads directly to one million new jobs & \$30 billion in new GDP

## Innovation Impact.

4G also has driven the creation of entirely new industries, such as mobile apps and wearable devices, and these industries call America home. 99.6% of smartphone operating systems around the world are made by U.S. companies.<sup>18</sup> Nearly three-quarters of the companies that comprise the \$120 billion app economy are based in the U.S., and 82 percent of these companies are small businesses.<sup>19</sup>

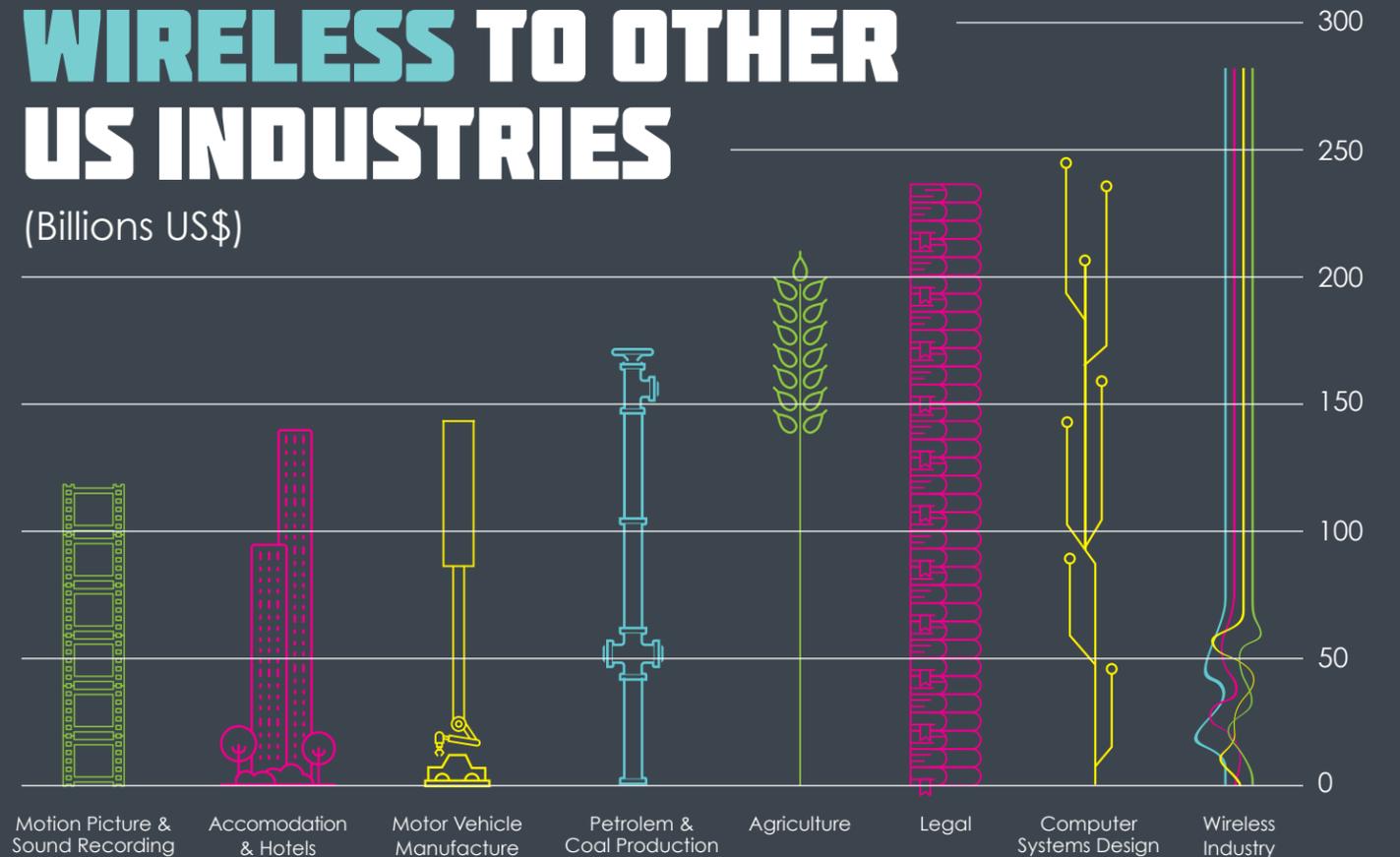
And the economic impact of these new industries is substantial and growing. One analyst recently estimated that the app economy employs 1.66 million Americans, up from approximately 750,000 in 2013,<sup>20</sup> and the value of the North America wearable technology market alone exceeds \$10 billion.<sup>21</sup>

## Future Impact.

Wireless will continue to be a driver of economic growth going forward, particularly as the increased wireless connectivity of 5G transforms entire industry sectors. As physical industries like manufacturing, health care, and construction embrace digital and wireless technologies, economic productivity will increase.<sup>22</sup> Successfully digitizing these industries means vastly increasing the use of wirelessly connected devices, including remote sensors and remote-controlled devices like drones, cars, and construction equipment. The Progressive Policy Institute (PPI) estimates that digitizing the physical industries in this way could add roughly \$2.7 trillion to U.S. GDP by 2030.<sup>23</sup>

# COMPARING WIRELESS TO OTHER US INDUSTRIES

(Billions US\$)



# MOBILE DATA EXPLOSION

Since the turn of the decade, Americans have embraced mobile and the traffic flowing across wireless networks has increased more than 25 fold.<sup>24</sup> This remarkable increase was foretold by policymakers, as the FCC's 2010 mobile data demand projections correctly projected the skyrocketing demand.<sup>25</sup> Smartphones, tablets, the rise of mobile video and ubiquitous 4G networks are driving this demand.

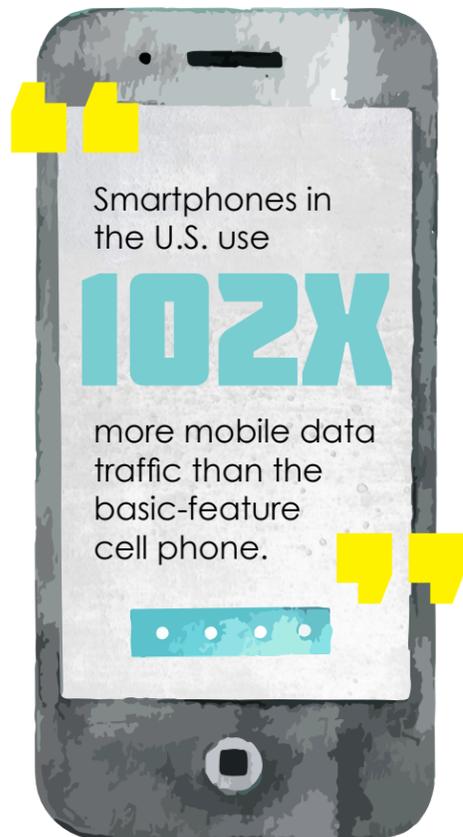
DATA USAGE HAS INCREASED **3 TIMES**



## Smartphones/Tablets.

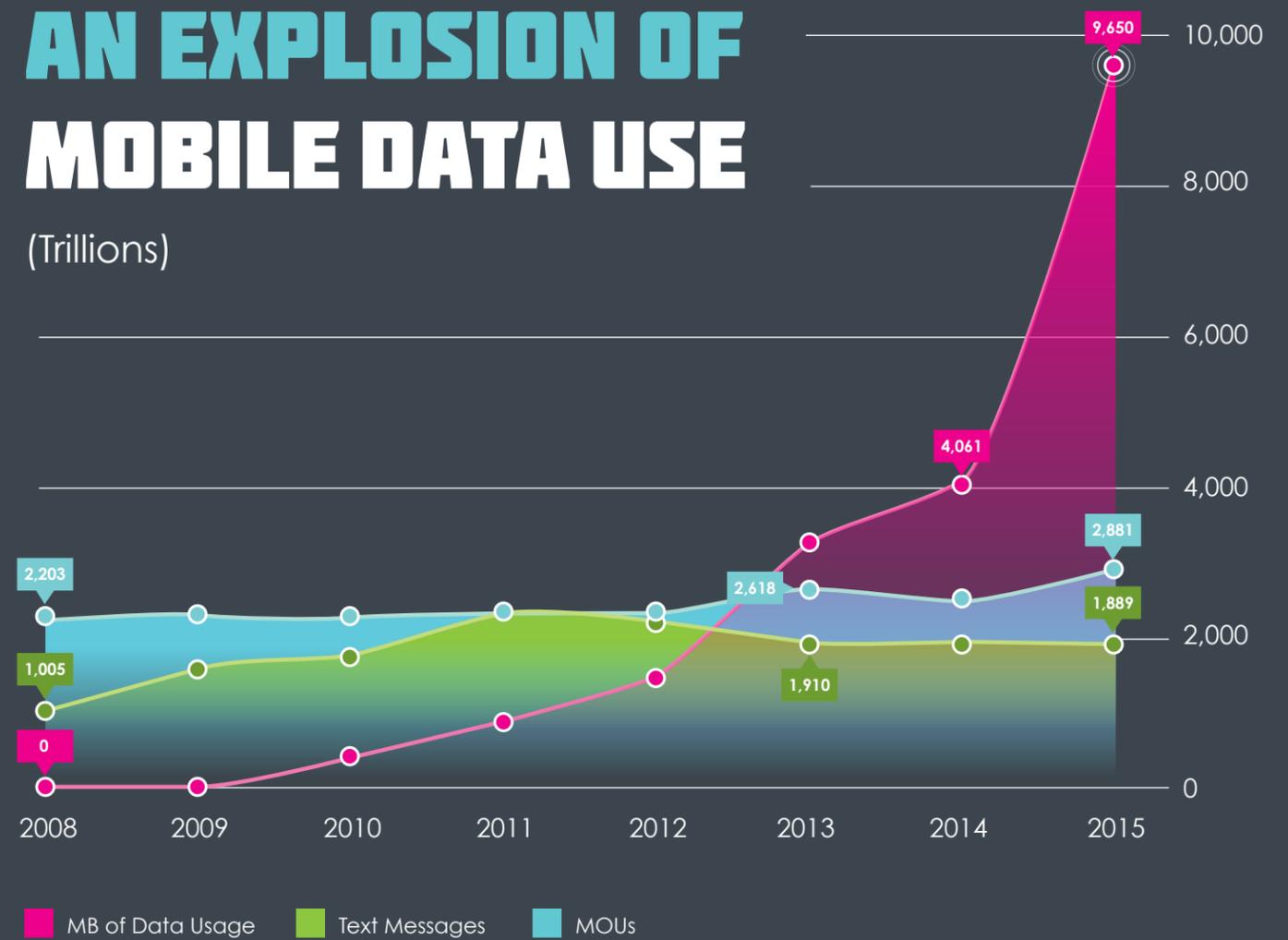
In 2010, the same year U.S. carriers launched 4G service, about one-third of Americans owned a smartphone,<sup>26</sup> and the first commercially popular tablets were being rolled out to market.<sup>27</sup>

Today, 77% of consumers have a smartphone and more than 41 million tablets are connected to wireless networks.<sup>28</sup> Smartphones in the U.S. use 102 times more mobile data traffic than the basic-feature cell phone.<sup>29</sup> Consumers are using more voice minutes, more SMS/MMS messages, and vastly more data on their wireless devices compared to 2010.<sup>30</sup>



# AN EXPLOSION OF MOBILE DATA USE

(Trillions)



## Mobile Video.

Thanks to these new wireless devices and vastly enhanced mobile networks, content consumption patterns have dramatically changed, with mobile video growing over 3,700 percent from 2009 to 2014.<sup>31</sup> In 2016, video accounted for 64 percent of all U.S. mobile data traffic.<sup>32</sup>

Video accounts for

**64%**

of all U.S. mobile data.

## 4G Networks.

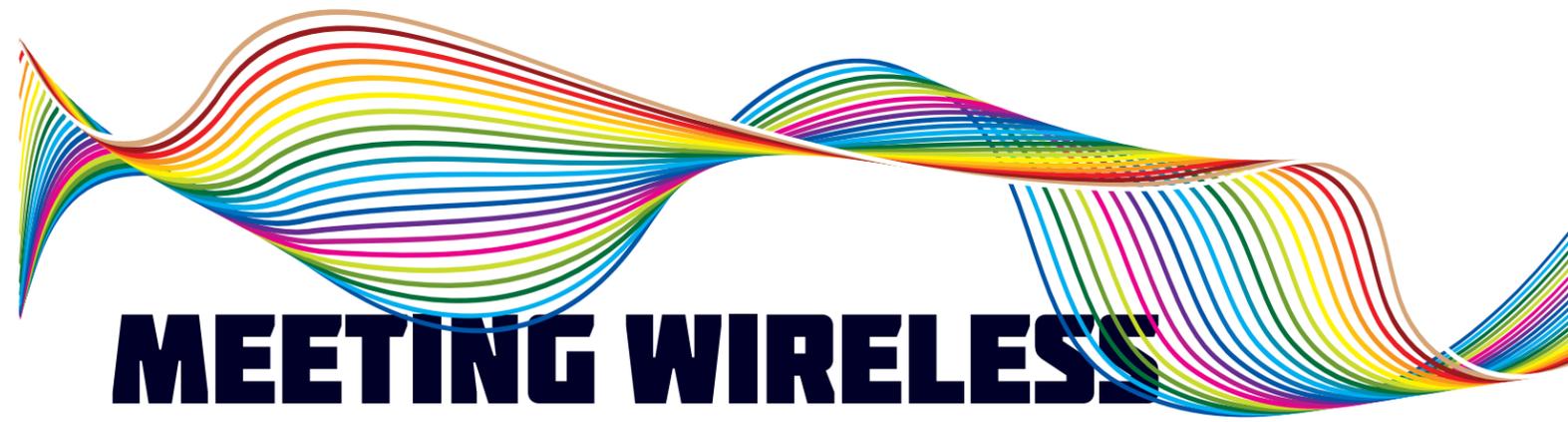
Smartphones, tablets, and mobile video depend on the powerful 4G networks that wireless carriers have deployed across the country. In just seven years, these high-speed mobile networks have become ubiquitous. In fact, 99.7 percent of Americans have 4G LTE coverage and 96 percent have 3 or more mobile broadband options.<sup>33</sup> Indeed, the four largest wireless carriers' 4G networks each cover between 300 and 317 million Americans, and dozens of regional operators' 4G networks expand coverage to reach communities across the country.<sup>34</sup>

This level of network coverage is remarkable for a country of our size and geography – and it's a deeply competitive wireless market that drives this investment to create better networks. Since 2010, the wireless industry has invested almost \$200 billion in these networks – building towers, deploying new antennas – and committed the U.S. Treasury \$42.9 billion for spectrum licenses.<sup>35</sup> In 2015, we invested **over \$32 billion.**<sup>36</sup>

These data points demonstrate how wireless connectivity has become a cornerstone of our lives today. But tomorrow's wireless networks will go beyond just advancing progress on this already-built foundation and will transform our communities, our homes, and our workplaces.

The wireless industry's **\$200 Billion** investment is equal to buying the World Series winning Chicago Cubs

# 200 TIMES



## MEETING WIRELESS DEMAND

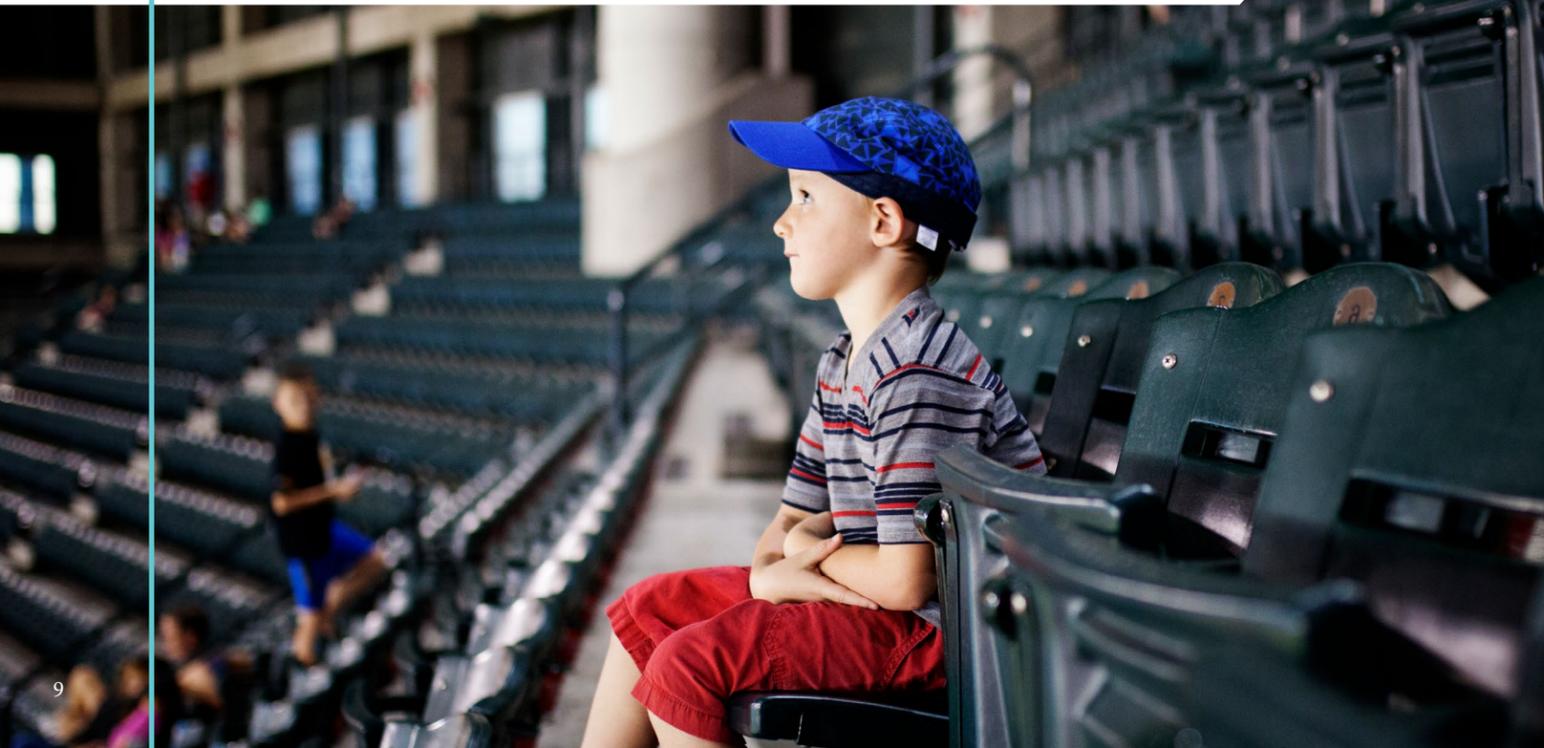
The stakes are high. Consumers demand more wireless data for their mobile-first life. Next-generation wireless networks will connect hundreds of millions of new devices. This increased connectivity will remake how our communities deliver core government services and accelerate economic growth and job creation in nearly every industry.

The wireless industry has and will continue to deploy multiple approaches to ensure the demand for wireless connectivity is met. We are deploying innovative new wireless infrastructure technologies like distributed antenna systems and small cells. We are investing in R&D and empowering our engineers to improve spectrum efficiency – with techniques like carrier aggregation – so we can boost network capacity, increase data rates, and utilize new spectrum bands. And offloading mobile data to Wi-Fi/LTE-U/LAA or other technologies using unlicensed spectrum is an important network response to the increasing data traffic on wireless networks.

But those efforts alone can't meet consumers' demand for mobile data and unlock the potential of 5G, IoT, and smart communities. Even after accounting for additional infrastructure and spectrum efficiency enhancements, wireless traffic per site "is projected to grow by an adjusted 343 percent" – all of which additional spectrum must be ready to absorb.<sup>37</sup>

More spectrum, in particular licensed spectrum, is critical to that effort. We also fully support efforts to expand access to unlicensed and shared spectrum where appropriate. We need to do both to lead the world in 5G. Policymakers need to make more licensed spectrum available to meet our country's mobile broadband needs. And those efforts must start now, because the timeline from identifying spectrum to getting new products into consumers' hands generally takes over a decade. In fact, it takes, on average, 13 years to re-allocate spectrum for wireless use.<sup>38</sup> For instance, the legislative and regulatory process for the 2015 AWS-3 auction began in 2002.

Fortunately, policymakers on both sides of the aisle, from the FCC to Capitol Hill, agree that the U.S. must maintain our global leadership in wireless – and spectrum is the key. We must recognize the importance of spectrum and begin the process of identifying additional spectrum as soon as practicable. Our wireless future – and America's continued mobile leadership – depends on it.



# ENDNOTES

<sup>1</sup> **Press Release, Americans' Data Usage More than Doubled in 2015, CTIA** (May 23, 2016) (“CTIA 2015 Annual Survey”), <http://www.ctia.org/industry-data/press-releases-details/press-releases/americans-data-usage-more-than-doubled-in-2015>.

<sup>2</sup> **Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021** (Feb. 9, 2017), <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html>.

<sup>3</sup> See **Thomas K. Sawanobori & Paul V. Anuszkiewicz, High Band Spectrum: The Key to Unlocking the Next Generation of Wireless**, at 3, CTIA (June 13, 2016), <http://www.ctia.org/docs/default-source/default-document-library/5g-high-band-white-paper.pdf>.

<sup>4</sup> **GSMA, The Mobile Economy: North America 2016**, at 3 (2016) (“GMSA 2016 Report”), <https://www.gsmainelligence.com/research/?file=28a21e457f1b516b804f8b0f6cef5815&download>.

<sup>5</sup> See **Thomas K. Sawanobori & Dr. Robert Roche, Mobile Data Demand: Growth Forecasts Met: Significant Growth Projections Continue to Drive the Need for More Spectrum**, at 7 n.44, CTIA (June 22, 2015) (“Mobile Data Demand Report”), (citing Dr. Robert Pepper, Cisco Visual Networking Index (VNI) Forecast: Mobile Data Traffic Update, 2014-2019 (Focus on U.S.), Cisco (Feb. 21, 2015), <http://www.ctia.org/docs/default-source/default-document-library/062115mobile-data-demands-white-paper-new.pdf>).

<sup>6</sup> **Coleman Bazelon & Giulia McHenry, Mobile Broadband Spectrum: A Vital Resource for the American Economy, The Brattle Group** (May 11, 2015) (“Battle Group Report”), [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>7</sup> See **Roger Entner, The Wireless Industry: Revisiting Spectrum, the Essential Engine of US Economic Growth**, at 2, 17-18, Recon Analytics (Apr. 2016) (“Wireless Industry Report”), <http://www.ctia.org/docs/default-source/default-document-library/entner-revisiting-spectrum-final.pdf>.

<sup>8</sup> **GSMA Report** at 24, 26.

<sup>9</sup> See **Battle Group Report** at 1.

<sup>10</sup> **Recon Analytics, The Impact of 10 MHz of Wireless Licensed Spectrum**, at 1 (Dec. 2015), <http://www.ctia.org/docs/default-source/default-document-library/for-every-10-mhz.pdf>.

<sup>11</sup> See **id.**

<sup>12</sup> **How 5G Can Help Municipalities Become Vibrant Smart Cities, Accenture Strategy** (Jan. 12, 2017), <http://www.ctia.org/docs/default-source/default-document-library/how-5g-can-help-municipalities-become-vibrant-smart-cities-accenture.pdf>

<sup>13</sup> See **Wireless Industry Report** at 18.

<sup>14</sup> See **Battle Group Report** at 2.

<sup>15</sup> **Id.** at 20.

<sup>16</sup> See **id.**

<sup>17</sup> **How 5G Can Help Municipalities Become Vibrant Smart Cities, Accenture Strategy** (Jan. 12, 2017).

<sup>18</sup> **IDC, Smartphone OS Market Share** (August 2016), <http://www.idc.com/prodserv/smartphone-os-market-share.jsp>.

<sup>19</sup> See **ACT THE APP ASSOCIATION, State of the App Economy** (4th ed. 2016), <http://actonline.org/state-of-the-app-economy-2016/>.

<sup>20</sup> **Michael Mandel, App Economy Jobs in the United States** (Part 1), Progressive Policy Institute Blog (Jan. 6, 2016), <http://www.progressivepolicy.org/slider/app-economy-jobs-part-1/>.

<sup>21</sup> **Grand View Research, Wearable Technology Market Size, Industry Report, 2022**, <http://www.grandviewresearch.com/industry-analysis/wearable-technology-market>.

<sup>22</sup> **Dr. Michael Mandel, Long-term U.S. Productivity Growth and Mobile Broadband: The Road Ahead, at 2, 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>23</sup> **Id.** at 5.

<sup>24</sup> **CTIA Year-End 2015 Survey.**

<sup>25</sup> See **Mobile Data Demand Report. See also Ericsson, Traffic Exploration Tool**, (Data Traffic, Mobile PC/Router/Tablet, and Smartphone), <https://www.ericsson.com/TET/trafficView/loadBasicEditor.ericsson>.

<sup>26</sup> See **FCC, Connecting America: The National Broadband Plan**, at 77 (Mar. 2010), citing Mary Meeker et al., Morgan Stanley Research, The Mobile Internet Report 1 (Copyright 2009 Morgan Stanley).

<sup>27</sup> **James Kendrick, 2010: Year of the Tablet, GigaOm** (Dec. 13, 2010), <https://gigaom.com/2010/12/13/2010-year-of-the-tablet/>.

<sup>28</sup> **Aaron Smith, Record shares of Americans now own smartphones, have home broadband, Pew Research Center** (Jan. 12, 2017), <http://www.pewresearch.org/fact-tank/2017/01/12/evolution-of-technology/>, and CTIA Annual 2015 Survey.

<sup>29</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).

<sup>30</sup> **CTIA Year-End 2015 Survey.**

<sup>31</sup> See **Mobile Data Demand Report** at 5.

<sup>32</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).

<sup>33</sup> **Implementation of Section 6002(b) of the Omnibus Reconciliation Act of 1993, Nineteenth Report**, DA 16-1061, ¶ 39, Chart III.A.2 (Sept. 23, 2016).

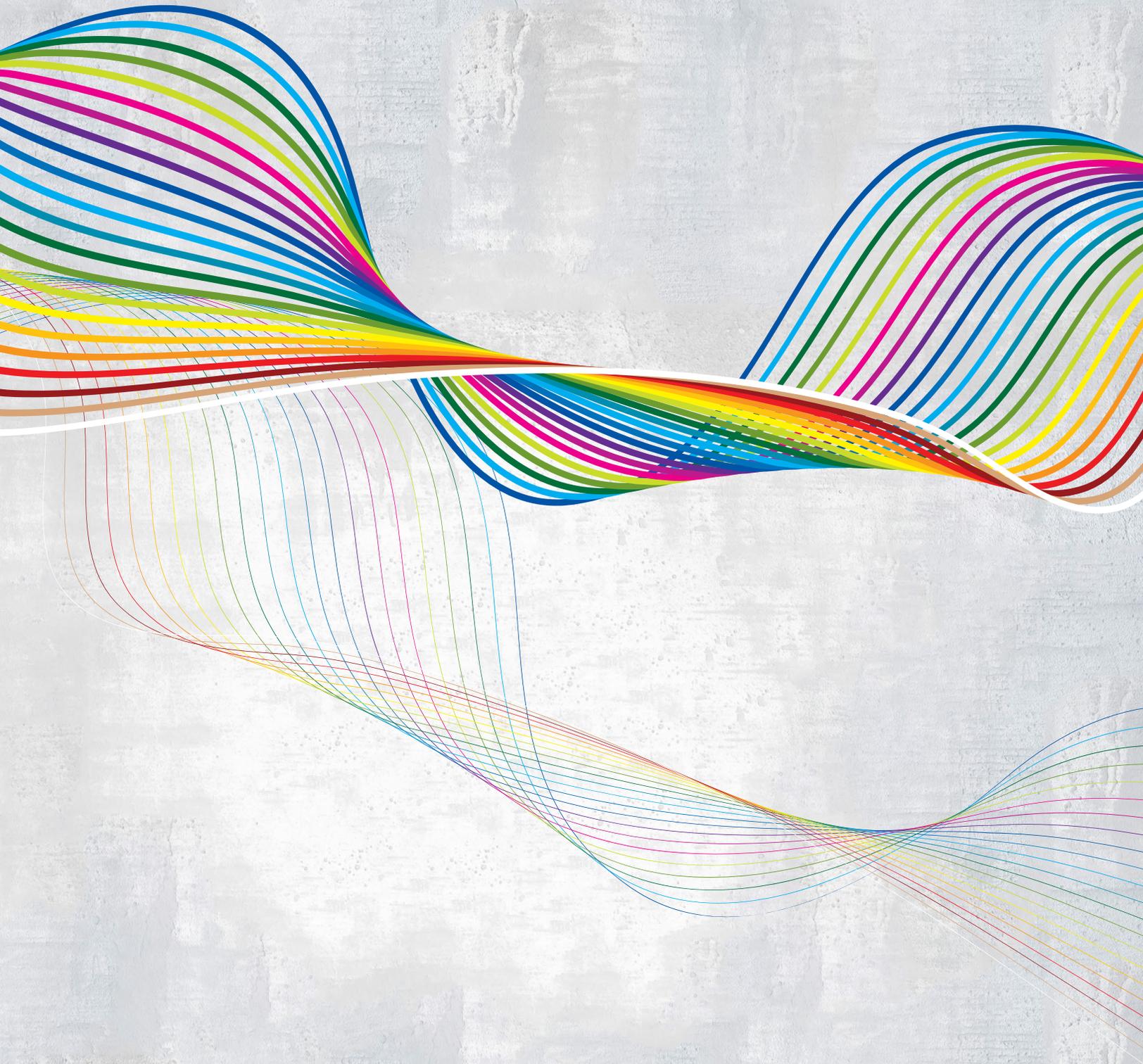
<sup>34</sup> See e.g., <http://www.verizonwireless.com/news/LTE/Overview.html>; <http://www.t-mobile.com/company/company-info/overview/quick-facts.html>; <https://www.att.com/network/en/index.html#att-adapt>; **Bluegrass Cellular, LTE in Rural America Partner Becomes First to Add XLTE** (May 3, 2016), <https://bluegrasscellular.com/about/news/lte-in-rural-america-partner-becomes-first-to-add-xlte>.

<sup>35</sup> See e.g., **CTIA 2015 Annual Survey. See also FCC, Fiscal Year 2017 Budget Estimates to Congress**, at 36 (Feb. 2016), [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-337668A2.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DOC-337668A2.pdf).

<sup>36</sup> **CTIA Year-End 2015 Survey.**

<sup>37</sup> **Coleman Bazelon & Giulia McHenry, Substantial Licensed Spectrum Deficit (2015-2019): Updating the FCC's Mobile Data Demand Projections**, at 19, The Brattle Group (June 23, 2015), [http://www.brattle.com/system/news/pdfs/000/000/891/original/Substantial\\_Licensed\\_Spectrum\\_Deficit\\_\(2015-2019\)\\_-\\_Updating\\_the\\_FCC's\\_Mobile\\_Data\\_Demand\\_Projections.pdf?1435613076](http://www.brattle.com/system/news/pdfs/000/000/891/original/Substantial_Licensed_Spectrum_Deficit_(2015-2019)_-_Updating_the_FCC's_Mobile_Data_Demand_Projections.pdf?1435613076).

<sup>38</sup> See **Thomas K. Sawanobori & Dr. Robert Roche, From Proposal to Deployment: The History of Spectrum Allocation Timelines** (July 20, 2015), <http://www.ctia.org/docs/default-source/default-document-library/072015-spectrum-timelines-white-paper.pdf>.



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