

**Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC 20230**

In the Matter of)	
)	
Developing A Sustainable Spectrum Strategy)	Docket No. 18113099-8999-01
For America’s Future)	RIN 0660-XC044
)	

COMMENTS OF WI-FI ALLIANCE

Wi-Fi Alliance®^{1/} submits these comments in response to the National Telecommunications and Information Administration’s (“NTIA”) request for comments with regard to the development of a national spectrum strategy^{2/} as directed by an October 30, 2018 presidential memorandum.^{3/} Wi-Fi Alliance applauds NTIA’s efforts to develop a comprehensive, long-term strategy to guide the Federal government’s use of spectrum. As outlined below, over the last two decades, Wi-Fi technology has created significant socioeconomic benefits while maximizing spectrum utilization through unlicensed access. Unlicensed spectrum access models will continue to evolve, as evidenced, for example, by the

^{1/} Wi-Fi®, the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access® (WPA), WiGig®, the Wi-Fi Protected Setup logo, Wi-Fi Direct®, Wi-Fi Alliance®, WMM®, Miracast®, Wi-Fi CERTIFIED Passpoint®, and Passpoint® are registered trademarks of Wi-Fi Alliance. Wi-Fi CERTIFIED™, Wi-Fi Protected Setup™, Wi-Fi Multimedia™, WPA2™, WPA3™, Wi-Fi CERTIFIED Miracast™, Wi-Fi ZONE™, the Wi-Fi ZONE logo, Wi-Fi Aware™, Wi-Fi CERTIFIED HaLow™, Wi-Fi HaLow™, Wi-Fi CERTIFIED WiGig™, Wi-Fi CERTIFIED Vantage™, Wi-Fi Vantage™, Wi-Fi CERTIFIED TimeSync™, Wi-Fi TimeSync™, Wi-Fi CERTIFIED Location™, Wi-Fi Location™, Wi-Fi CERTIFIED Home Design™, Wi-Fi Home Design™, Wi-Fi CERTIFIED Agile Multiband™, Wi-Fi Agile Multiband™, Wi-Fi CERTIFIED Optimized Connectivity™, Wi-Fi Optimized Connectivity™, Wi-Fi CERTIFIED EasyMesh™, Wi-Fi EasyMesh™, Wi-Fi CERTIFIED Enhanced Open™, Wi-Fi Enhanced Open™, Wi-Fi CERTIFIED Easy Connect™, Wi-Fi Easy Connect™, Wi-Fi CERTIFIED 6™ and the Wi-Fi Alliance logo are trademarks of Wi-Fi Alliance.

^{2/} Dep’t of Commerce, *Developing a Sustainable Spectrum Strategy for America’s Future*, 83 Fed. Reg. 65640 (Dec. 21, 2018) (“*Spectrum Strategy PN*”).

^{3/} *Developing a Sustainable Spectrum Strategy for America’s Future*, Presidential Memorandum, Oct. 25, 2018 (“*Presidential Memorandum*”).

Wi-Fi Alliance proposal to the Federal Communications Commission (“FCC”) in the 5925-7125 MHz (“6 GHz”) band proceeding.^{4/} Wi-Fi Alliance urges NTIA, consistent with Section 617 of Ray Baum’s Act, part of the Consolidated Appropriations Act of 2018,^{5/} to consider the benefits and applicability of access to spectrum available for unlicensed operations in expanding flexibility, availability and utilization of spectrum. Also, in developing a national plan for unlicensed spectrum pursuant to Section 618 of Ray Baum’s Act, NTIA should consider the Wi-Fi Alliance suggestions below to reform the Spectrum Relocation Fund to address costs incurred by Federal entities to expand spectrum sharing with technologies that use unlicensed spectrum and to ensure that the Spectrum Relocation Fund can cover those costs.^{6/}

I. INTRODUCTION AND BACKGROUND

Wi-Fi Alliance is a global, non-profit industry association of over 800 leading companies from dozens of countries devoted to connecting everyone and everything everywhere. With technology development, market building, and regulatory programs, Wi-Fi Alliance has enabled widespread adoption of Wi-Fi® worldwide, certifying thousands of Wi-Fi products each year. The mission of Wi-Fi Alliance is to provide a highly effective collaboration forum for Wi-Fi matters, grow the Wi-Fi industry, lead industry growth with new technology specifications and programs, support industry-agreed standards, and deliver greater product connectivity through interoperability, testing, and certification. It is also an active participant before the FCC and the NTIA, among other U.S. fora, and in international proceedings, among other things, promoting

^{4/} See *Reply Comments of Wi-Fi Alliance*, GN Docket No. 17-183 (filed Nov. 15, 2017).

^{5/} See *Consolidated Appropriations Act 2018*, Pub. L. No. 115-141, div. P, tit. VI, § 617.

^{6/} See *Consolidated Appropriations Act 2018*, Pub. L. No. 115-141, div. P, tit. VI, § 618. NTIA is obligated to present those recommendations as an appendix to the National Plan for Unlicensed Spectrum that must be submitted to Congress by September 23, 2020.

governmental actions that facilitate Wi-Fi connectivity and maximize unlicensed spectrum availability.

Both government and non-government entities increasingly rely on wireless technologies, which have become a cornerstone of the Nation's economy. All wireless technologies rely on access to radio spectrum – a limited natural resource. As with all natural resources, radio spectrum must be carefully managed to maximize the public interest. That management must consider the needs of government and non-government users and the designation of spectrum for licensed and unlicensed use. Because of the centrality of wireless technologies to all aspects of consumer and business life, this management function has assumed increased importance.

Therefore, this proceeding represents an important opportunity for NTIA to recognize the critical role, detailed below, that spectrum which supports unlicensed devices, like those incorporating Wi-Fi technology, plays in America's Internet ecosystem, carrier networks, the Internet of Things ("IoT"), and other connectivity applications. Without appropriate spectrum management, including necessary spectrum access, these and other developing needs may not be met. That is why Wi-Fi Alliance strongly supports the FCC's efforts to allow unlicensed devices access to more mid-band spectrum, and in particular the 6 GHz band.^{7/}

But, as detailed below, there is more that the Federal government, including NTIA, can do to promote the availability of spectrum for devices that use Wi-Fi technology. Wi-Fi technology has made efficient shared use of spectrum for decades, experience of which the Federal government can take advantage. Doing so will enable the Federal government to promote efficient shared use of spectrum.

^{7/} See *In the Matter of Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295, FCC 18-147, Notice of Proposed Rulemaking (rel. Oct. 24, 2018) ("6 GHz NPRM").

II. COMMENTS

A. Question 7: What are the likely future needs of spectrum users, both terrestrially and for space-based applications, within the next 15 years?

CISCO's recently released VNI analyses indicate that devices that incorporate Wi-Fi technology carry more than 50% of the total Internet traffic in the U.S., and that number is expected to increase dramatically in the coming years.^{8/} More than three quarters of American households rely on devices with Wi-Fi as their primary connection technology.^{9/} Wi-Fi technology will also be essential to extending wireless carriers' Fifth Generation ("5G") networks' coverage and enabling ubiquitous broadband, low-latency connections.^{10/} And Wi-Fi technology provides ways for devices to connect to one another, such as for virtual reality, file transfer, and local video streaming.^{11/} That is why Wi-Fi technology is, and will continue to be,

^{8/} CISCO, VNI Complete Forecast Highlights Tool, North America, United States, Wired Wi-Fi and Mobile Growth (2018), http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html (select "United States" from the "North America" drop-down menu, select "2022 Forecast Highlights" and expand "Wired Wi-Fi and Mobile Growth.") (finding that "fixed/Wi-Fi was 50.4% of total Internet traffic in 2017, and will be 56.6% by 2022." In contrast, pure mobile traffic carried only 4.3% of the total Internet traffic in 2017, and is expected to rise to 6.6% by 2022).

^{9/} Doug Brake, *Keeping Up with Spectrum Policy: Mid-Band Opportunities*, Information Technology and Innovation Foundation, November 2018 at 7 (available at http://www2.itif.org/2018-spectrum-policy-mid-band.pdf?_ga=2.81837206.1055728607.1546453832-373585763.1546453832).

^{10/} See e.g. Brian Santo, *Wi-Fi vs. 5G? Nope, it's both*, EDN Network, Dec. 5, 2017 (available at <https://www.edn.com/electronics-blogs/5g-waves/4459120/Wi-Fi-versus-5G--Nope--it-s-both>). Like 5G, Wi-Fi works across spectrum bands, taking advantage of different standards and propagation characteristics to provide the right performance for the required use case. Despite the increased capacity of wireless carriers, the demands that a 5G economy will place on commercial wireless networks will make offloading of traffic onto Wi-Fi even more crucial in the future, especially as Wi-Fi 6 promises speeds and performance that rivals or exceeds those of 5G networks. See e.g. Jacob Kastrenaks, *Qualcomm's new Wi-Fi Chips are meant to rival 5G speeds*, THE VERGE, Oct. 16, 2018 (available at <https://www.theverge.com/circuitbreaker/2018/10/16/17980124/80211ay-wigig-qualcomm-wifi-10-gigabit-speeds>).

^{11/} See Wi-Fi Alliance, *Wi-Fi Certified Wi-Gig*, Discover Wi-Fi, available at <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-wigig>.

an important part of the IoT architecture. Most IoT connections already rely on Wi-Fi-enabled networks.^{12/}

Not only is Wi-Fi technology a key component of the Nation’s telecommunications infrastructure – a trend that will dramatically escalate – it is also critical driver of economic growth. A recently produced analysis of the economic value of Wi-Fi concluded that the annual Wi-Fi contribution to the U.S. economy is almost \$500 billion today, and will nearly double by 2023.^{13/} The report found that Wi-Fi technology is an “enabling resource” which extends connectivity to underserved areas, allows other innovative products and services to develop and thrive (including portable devices that require Internet access but lack a wireless carrier connection), expands access to communications services and increases the value of those offerings (such as by spreading a wireline connection throughout the home and through off-loading to reduce the strain on wireless carrier networks), and enhances the effectiveness of existing product and service offerings (such as “smart home” devices).

But Wi-Fi’s future, and indeed the ability of Wi-Fi enable devices to continue performing their functions today, depends on access to spectrum, particularly in the mid-band. The spectrum currently designated for Wi-Fi operation is becoming congested as more and more devices that use Wi-Fi and other unlicensed technologies are deployed. To assess this threat, Wi-Fi Alliance commissioned a Spectrum Needs Study that analyzed current and future Wi-Fi spectrum

^{12/} Wi-Fi Alliance is developing a standard for IoT operations in sub-1 GHz spectrum which will allow for low-power, long-distance operations for machine-to-machine connections. See, *Wi-Fi Alliance, Discover Wi-Fi HaLow*, available at <http://www.wi-fi.org/discover-wi-fi/wi-fi-halow>.

^{13/} Telecom Advisory Services, *THE ECONOMIC VALUE OF WI-FI: A GLOBAL VIEW (2018 AND 2023)*, at 10, rel. Oct. 2018, available at <https://www.wi-fi.org/download.php?file=/sites/default/files/private/Economic%20Value%20of%20Wi-Fi%202018.pdf>

requirements.^{14/} Based on projected growth in demand for use of spectrum on which Wi-Fi devices operate, by 2025, up to 1500 megahertz of additional mid-band spectrum may be needed to sustain the Wi-Fi ecosystem.^{15/} NTIA should consider these needs in its Spectrum Strategy so it, along with the FCC, can identify spectrum that can potentially be shared by Wi-Fi devices.

B. Presidential Memorandum (Section 4(a)): [Seeking recommendations to] increase spectrum access for all users, including on a shared basis, through transparency of spectrum use and improved cooperation and collaboration between Federal and non-Federal spectrum stakeholders.

The success of the device ecosystem that relies on unlicensed spectrum, and Wi-Fi in particular, is based on spectrum sharing. Well-established techniques, such as “Dynamic Frequency Selection” protocols ensure coexistence between different users of the same frequency bands.^{16/} This encourages spectrum efficiency, allowing for dense deployments, and protects incumbents. Indeed, Wi-Fi technology has shown that it is able to accommodate millions of devices on the same limited spectrum at the same time using these techniques, with millions more operating in that spectrum on alternate, but nonetheless compatible, unlicensed protocols. Over the years, Wi-Fi also demonstrated the capability to protect important licensed operations using advanced interference mitigation techniques established in the FCC’s rules.^{17/}

^{14/} Wi-Fi Alliance, *Spectrum Needs Study*, Feb. 2017, available at <https://www.wi-fi.org/downloads-registered-guest/Wi-Fi%2BSpectrum%2BNeeds%2BStudy0.pdf/33364> (“Spectrum Needs Study”).

^{15/} *Id.* at 1. The Spectrum Needs Study also evaluated different spectrum requirement scenarios, depending in part on whether current spectrum with dynamic frequency selection (“DFS”) limitations can be made more accessible. The Spectrum Needs Study found that if there is greater use of DFS-limited spectrum, spectrum needs for Wi-Fi may be reduced to 600 megahertz. *Id.* at 25.

^{16/} IEEE, Part 11: Wireless LAN Medium Access Control and Physical Layer Specifications, IEEE 802.11 § 9.19.2.3 (2012), http://eclass.uoa.gr/modules/document/file.php/D428/%CE%91%CF%81%CE%B8%CF%81%CE%B1/WiFi/Standard_802.11-2012.pdf.

^{17/} *See* 47 C.F.R. 15.407.

These spectrum access techniques, which are inherent to Wi-Fi technology, are models for how sharing can increase the efficient use of spectrum, including spectrum designated for Federal government use. Wi-Fi Alliance encourages NTIA to study the success of Wi-Fi technology as it considers future techniques for sharing Federal spectrum to most efficiently use this resource.

C. Question 2 (and Presidential Memorandum Section 4(b) and (d)): To what extent would the introduction of automation facilitate assessments of spectrum use and expedite the coordination of shared access, especially among Federal and non-Federal spectrum stakeholders?

As noted above, Wi-Fi devices rely on self-organizing “listen-before-talk” techniques to access spectrum. Such an approach, however, may not always be appropriate, particularly when spectrum is shared between unlicensed devices and licensed users. Frequency management databases with geolocation capabilities can also be important tools for enabling increased spectrum sharing. Wi-Fi Alliance encourages NTIA to consider the potential use of such databases in its Spectrum Strategy. This type of solution underlies the FCC’s (and Wi-Fi Alliance’s) proposal for the 6 GHz band, allowing unlicensed devices to access spectrum without constraining current or future licensed operations.^{18/}

This system, which will leverage existing (and publicly-available) FCC licensing databases and perform calculations to ensure interference avoidance to incumbent licensees, will make available valuable spectrum access opportunities to unlicensed devices, including those using Wi-Fi. The system will take advantage of the work already performed in the development of the 3.5 GHz Spectrum Access System^{19/} and the TV White Spaces databases.^{20/} Most

^{18/} *6 GHz NPRM* at ¶ 74.

^{19/} *See* 47 C.F.R. Part 96, Subpart F.

^{20/} *See* 47 C.F.R. Part 15, Subpart H.

importantly, this spectrum access mechanism will be a market-driven approach based on a technology-neutral regulatory framework. Wi-Fi Alliance encourages NTIA to carefully analyze the FCC's 6 GHz proceeding for future spectrum management techniques.

D. Question 6 (and Presidential Memorandum Section 4(c)): How could a spectrum management paradigm be structured such that it satisfies the needs of commercial interests while preserving the spectrum access necessary to satisfy the mission requirements and operations of Federal entities?

In 2004, Congress amended the NTIA Act to create the Spectrum Relocation Fund ("SRF") to compensate Federal entities' relocation or sharing costs.^{21/} The SRF is funded by spectrum auctions proceeds.^{22/} But since unlicensed spectrum is not auctioned, there is no mechanism for Federal entities to seek reimbursement for making additional spectrum available for the innovative wireless uses that unlicensed spectrum supports.

As noted above, Congress has specifically directed NTIA to provide it with recommendations (as part of the National Plan for Unlicensed Spectrum required by Section 618 of Ray Baum's Act)^{23/} to reform the SRF to address costs incurred by Federal entities to expand spectrum sharing with technologies that use unlicensed spectrum and to ensure that the Spectrum Relocation Fund can cover those costs. The spectrum management paradigm that NTIA develops in response to the *Presidential Memorandum* should therefore also include those SRF recommendations.

^{21/} See *Commercial Spectrum Enhancement Act*, Pub. L. 108-494, Title II (2004). The NTIA Act has been amended over time to generally expand Federal entities' ability to access the SRF. See *Middle Class Tax Relief and Job Creation Act of 2012*, Pub. L. 112-96 § 6702 (2012) (Providing greater flexibility in the use of funds by Federal agencies) and *Spectrum Pipeline Act of 2015*, Pub. L. No. 114-74 (2015) (Providing additional funding for the SRF and allowing the use of funds for a wider range of research activities).

^{22/} 47 U.S.C. § 928.

^{23/} See *Consolidated Appropriations Act 2018*, Pub. L. No. 115-141, div. P, tit. VI, § 618.

One possible way to facilitate Federal entities' reimbursement for accommodating unlicensed spectrum access would be to mandate a percentage of revenues generated from spectrum auctions for that purpose. In considering this issue, NTIA should note that, in addition to significant socioeconomic benefits, unlicensed technologies deliver a direct benefit to the licensed wireless providers. Specifically, according to CISCO's VNI Report, more than 60% of the mobile traffic is offloaded to Wi-Fi.^{24/} Thus, degradation in Wi-Fi performance and functionality due to unlicensed spectrum congestion would impact licensed wireless operations in the auctioned spectrum.

E. Question 5 (and Presidential Memorandum Section 4(e)): What are the risks, if any, to the global competitiveness of U.S. industries associated with spectrum management and policy actions?

U.S. spectrum regulations should promote global harmonization, allowing companies to develop products for both national and global markets, while benefiting consumers with lower prices and expanded capabilities (e.g., international roaming). In the increasingly interconnected world, nation-specific regulations inhibit economic growth by increasing costs and competitiveness. U.S. spectrum policy efforts should focus on innovative solutions, allowing new opportunities for spectrum access and on leading other countries to follow suit.

III. CONCLUSION

Wi-Fi Alliance commends NTIA's efforts to develop a comprehensive Spectrum Strategy for the U.S. In developing this strategy, NTIA should consider the growing socioeconomic benefits of unlicensed spectrum use cases, in particular those employing Wi-Fi. This includes promoting shared spectrum access among Federal and unlicensed spectrum users. Finally, NTIA

^{24/} CISCO, *Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021*, White Paper (Mar. 28, 2017) (available at <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html>).

should develop recommendations to expand use of the SRF to support federal spectrum users in enabling unlicensed spectrum access to promote increased spectrum utilization and development of innovative wireless technologies.

Respectfully submitted,

_____/s_____

Alex Roytblat
Senior Director of Regulatory Affairs

WI-FI ALLIANCE
10900-B Stonelake Blvd.
Suite 126
Austin, TX 78759
(512) 498-9434
aroytblat@wi-fi.org

January 22, 2019