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Subcommittee on Communications, Technology, Innovation, and the Internet

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The Evolution of Next-Generation Technologies: Implementing MOBILE NOW

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Introduction

Chairman Thune, Ranking Member Schatz, and Members of this Subcommittee, thank you for inviting me here today. I am Sarah Morris, Director of New America's Open Technology Institute, and I appreciate the opportunity to testify about wireless internet technology, its future, and its impact.

The United States still has a deeply troubling connectivity challenge. Ensuring that everyone has access to internet service that is both robust and affordable requires a multifaceted approach that takes into account varying circumstances and needs. Wireless access is a part of that approach, but it is not the entire solution; similarly, mobile 5G networks do not represent the full range of ways to deliver wireless service. And affordability remains a critical barrier to broadband adoption, even where networks exist.

Many rural areas lack fixed broadband service altogether. As the Pew Research Center notes: "Even though rural areas are more wired today than in the past, other research shows that substantial segments of rural America still lack the infrastructure needed for high-speed internet, and what access these areas do have tends to be slower than that of non-rural areas."[1] The Federal Communications Commission's 2018 Broadband Deployment Report found that only 69.3% of people living in rural areas lived in a census block where at least one fixed internet service provider (ISP) had deployed high-speed fixed broadband.[2] However, the data that underlies that report likely overstates broadband deployment numbers, as even the FCC has conceded.[3]

Wireless can help bridge the gap to rural communities, though many of the challenges that make it difficult to provision fixed broadband are also present in the deployment of wireless services. The role of cellular networks in supporting rural internet access is important, but limited, and reliant on a foundation of high-capacity fixed networks and Wi-Fi for offloading capacity. Point-to-multipoint wireless is another cost-effective solution for rural areas, but one that is similarly reliant on both fiber and Wi-Fi.

To support a robust internet ecosystem that is accessible to all internet users, whether they live in urban, suburban, small town or rural communities, we need a forward-looking and balanced

[1] Andrew Perrin, "Digital gap between rural and nonrural America persists," Pew Research Center, (May 31, 2019), https://www.pewresearch.org/fact-tank/2019/05/31/digital-gap-between-rural-and-nonrural-america-persists/.
[2] 2018 Broadband Deployment Report ("2018 Broadband Deployment Report"), GN Docket No. 17-199, (Feb. 2, 2018), ¶ 50 Table 1, https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2018-broadband-deployment-report.
[3] Section 706 NOI ¶¶ 16-17; Report and Order and Second Further Notice of Proposed Rulemaking, WC Docket No. 19-195, WC Docket No. 11-10 (Rel. Aug. 6, 2019)

approach that recognizes that substantial increases in mid-band spectrum on a licensed, unlicensed and shared basis for both mobile and fixed wireless service. The MOBILE NOW Act is an important component of that approach.

Moreover, as this subcommittee considers the role of wireless technologies in improving rural connectivity, it should also recognize the need for better data about internet deployment, quality of service, price, and adoption. While we need not completely halt deployment of next-generation wireless technologies in service of better mapping and data, it remains troubling that policymakers and consumers continue to lack adequate information about current broadband networks in the United States.

Finally, even where broadband service is available, it remains beyond the reach of many people in all areas—from rural to urban—because of cost. The digital divide is still very stark and real for low-income users, and wireless solutions for connectivity should be aimed at alleviating this divide, not exacerbating it.

As this subcommittee considers the implementation of the MOBILE NOW Act, and the evolution of next-generation technologies, I urge you to consider a broad framework for connectivity that recognizes:

- both the importance and limitations of mobile 5G networks;

- the role of other wireless technologies and approaches to both enabling and accelerating 5G-quality services, particularly high-capacity fixed wireless (point-to-multipoint) and next-generation Wi-Fi 6;

- the need for better data and clearer disclosures about internet price and service; and

- The ongoing affordability gap for low-income households and the role that the Universal Service Fund can play in mitigating that gap.

My testimony explores each of these considerations in detail below.

1. 5G is Important, But it is Not a Panacea

While mobile 5G can play a role in improving capacity in certain areas, it is not a panacea for addressing the rural and low-income digital divides. Both the business models for 5G deployment, and the characteristics of the technology itself, make it ill-suited for rural deployment, and beyond the reach of poor internet users.

Rural, small town, Tribal and historically marginalized communities are most likely to find themselves on the losing side of the digital divide. The FCC's most recent Broadband Deployment Report reveals that "the gap in rural and Tribal America remains notable: over 26% of people in rural areas and 32% of people in Tribal lands lack coverage from fixed terrestrial 25 Mbps/3 Mbps broadband, as compared to only 1.7% of Americans in urban areas."[4] A Pew Research Center survey reported that 24% of rural adults said that a lack of high-speed internet access is a "major problem" in their community.[5]

Affordability and choice among competing internet providers continue to be major deterrents as well. Just 45% of U.S. adults who make less than $30,000 a year have broadband at home, compared to 87% of adults who make more than $75,000 annually.[6] A recent Department of Education survey found that 38% of households with children under 18 and no home broadband access said it was because service was too expensive.[7] A lack of competition in many areas aggravates the issue of affordability. More than 50% of rural households had at most only one choice for an ISP offering service at the minimum adequate service level of 25/3 mbps as of year-end 2017, according to the FCC's December 2018 Communications Marketplace Report.[8] Even when rural consumers have access to broadband, they frequently pay higher prices for lower-quality service despite the fact that, on average, they earn less than people living in urban areas.[9]

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[4] FCC, *Fixed Broadband Deployment Data from FCC Form 477* (May 2, 2019) (data as of Dec. 31, 2017), https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477.
[5] Monica Anderson, "About a quarter of rural Americans say access to high-speed internet is a major problem," The Pew Research Center (Sep. 10, 2018), https://tinyurl.com/y6c6uqcl.
[6] "Internet/Broadband Fact Sheet," Pew Research Center (Feb. 5, 2018), https://tinyurl.com/y3bnc92t.
[7] "Student Access to Digital Learning Resources Outside of the Classroom," U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics (Apr. 2018), https://nces.ed.gov/pubs2017/2017098.pdf. Another 38% said it was because they did not need it or they were uninterested in it.
[8] FCC, *Communications Marketplace Report* (rel. Dec. 26, 2018), https://www.fcc.gov/document/fcc-adopts-first-consolidated-communications-marketplace-report-0.
[9] Sharon Strover, "Reaching rural America with broadband internet service," *PhysOrg* (Jan. 17, 2018), https://phys.org/news/2018-01-rural-america-broadband-internet.html#jCp.

Because of the enormous costs of building out geographically extensive 5G networks, national and regional carriers will focus initially on the more densely-populated urban and affluent suburban areas with the largest returns on investment. The characteristics of millimeter wave spectrum also suggest that the fastest speeds and capabilities of 5G that the industry has touted as "revolutionary," will only be possible in high-density urban areas. Mobile carriers have even admitted that their 5G networks will not be scaled to rural areas.[10] In fact, a Verizon executive conceded earlier this year that the low-band spectrum 5G services that mobile carriers are expecting to deploy to rural areas are likely to merely resemble "good 4G service."[11]

Mobile broadband and 5G should also not be considered a substitute for better fixed broadband services. Mobile networks are currently heavily reliant on Wi-Fi and fixed networks for backhaul and offloaded traffic. A majority of the mobile data traffic in 2017 was offloaded onto fixed networks, according to Cisco, and that number is set to increase to 59% of traffic being offloaded from mobile networks onto Wi-Fi by 2022.[12] 5G will be heavily reliant on fiber availability,[13] and in areas lacking in high-speed fixed networks (such as rural and Tribal areas), 5G will either make little to no impact, or will never be fully deployed. One cannot argue that mobile networks, and the possibility of future 5G networks—which have not been deployed in systemic and widespread manners—are a substitute for fixed networks when they rely on these fixed networks to operate.

Further, not only will the deployment of 5G in rural areas be limited, but both households and businesses consume on average nearly ten times the data allowed under existing monthly mobile plans.[14] The differential use of mobile versus fixed broadband plans along income levels further reiterates that mobile broadband is not a substitute for improved fixed broadband services: while

[10] Jon Brodkin, "Millimeter-wave 5G will never scale beyond dense urban areas, T-Mobile says," Ars Technica (April 22, 2019), https://arstechnica.com/information-technology/2019/04/millimeter-wave-5gwill-never-scale-beyond-dense-urban-areas-t-mobile-says/; Sean Hollister, "Verizon and T-Mobile agree much of the US won't see the fast version of 5G," The Verge (April 24, 2019), https://www.theverge.com/2019/4/24/18514905/verizon-t-mobile-agree-rural-united-states-dont-getmillimeter-wave-5g.

[11] Jon Brodkin, "Verizon: 5G speeds on low-spectrum bands will be more like "good 4G"," Ars Technica (Aug. 8, 2019), https://arstechnica.com/information-technology/2019/08/verizon-5g-speeds-on-lowspectrum-bands-will-be-more-like-good-4g/.

[12] Cisco, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022 White Paper (Feb. 18, 2019), https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visualnetworking-index-vni/white-paper-c11-738429.html.

[13] Ernesto Falcon, Enough of the 5G Hype, Electronic Frontier Foundation Blog (Feb. 11, 2019), https://www.eff.org/deeplinks/2019/02/enough-5g-hype.

[14] Jon Brodkin, "Comcast usage soars 34% to 200GB a month, pushing users closer to data cap," Ars Technica (April 26, 2019), https://arstechnica.com/information-technology/2019/04/comcast-usage-soars34-to-200gb-a-month-pushing-users-closer-to-data-cap/; Daniel Frankel, "Charter: Broadband-Only Users Average 400GB of Monthly Data Usage," Multichannel News (May 2, 2019), https://www.multichannel.com/news/charter-says-average-cord-cutter-uses-400gb-of-data-per-month.

26% of U.S. adults making less than $30,000 annually are smartphone-only broadband users, only 6% of those making more than double that a year are using only mobile broadband.[15] This is particularly worrying as mobile broadband is typically accessed through smartphones and other devices limited in their functionality for important online activities, like finding employment and completing homework. This means that lower-income consumers experience asymmetric difficulties in finding a job because they can't afford fixed broadband services nor have access to a computer.[16]

2. We Need Multiple Paths to Connectivity

The MOBILE NOW Act sent an important signal that a substantial increase in the amount of mid-band spectrum allocated for wireless broadband, both licensed and unlicensed, is critical for facilitating a robust and broadly-available 5G wireless ecosystem. In 2017 OTI supported the original Senate version of MOBILE NOW because it took a forward-looking and balanced approach that required substantially more unlicensed mid-band spectrum and also required the FCC and NTIA to evaluate the feasibility of greater shared use of underutilized bands including the lower 3 GHz band (3100 to 3550 MHz) and C-band (3700 to 4200 MHz). There are two fundamental reasons why it's critical that substantially more mid-band spectrum is made available on a licensed, unlicensed and dynamically shared basis.

First, the world's most robust and productive 5G wireless ecosystem will not be built out by mobile carriers alone or solely with exclusively-licensed spectrum. America's 5G wireless ecosystem, like the current 4G wireless ecosystem, will rely on a combination of national or regional carrier networks for truly "mobile" connections (for use 'on the go') and a far larger number of complementary, high-capacity and customized networks deployed by individual business firms and households to meet their particular needs at a lower cost.

Today Wi-Fi makes internet access and broadband data on smartphones and laptops faster and far more affordable. Wi-Fi already carries between 70 and 80% of all mobile device data traffic. In a 5G world, indoor and customized small cell networks using next-generation Wi-Fi, private LTE and other technologies will enhance the ecosystem and fuel advanced applications such as home and industrial Internet of Things, virtual reality and near-real time interactive video.

A second reason to make more mid-band spectrum available on a licensed, unlicensed and shared basis is that a guiding goal of the Communications Act is to "encourage the deployment

[15] Monica Anderson, "Mobile Technology and Home Broadband 2019," Pew Research Center (June 13, 2019), https://www.pewresearch.org/internet/2019/06/13/mobile-technology-and-home-broadband-2019/.
[16] Andrew Burger, "Pew: Smartphone-Only Internet Users Find Them an Incomplete Home Broadband Substitute," Telecompetitor (Oct. 6, 2016), https://www.telecompetitor.com/pew-smartphone-onlyinternet-users-find-them-an-incomplete-home-broadband-substitute/.

on a reasonable and timely basis of advanced telecommunications capability to all Americans."[17] 5G networks are not likely to reach rural, small town or even many exurban communities for many years. However, smaller and local providers of high-capacity fixed wireless broadband that rely primarily on unlicensed and coordinated sharing of unused spectrum capacity can more rapidly extend high-capacity and more affordable fixed broadband access to these underserved areas.

More mid-band unlicensed (at 5.9 and 6 GHz) and shared spectrum (unused C-band spectrum for fixed wireless broadband) can serve as the public infrastructure that enables high-capacity broadband in underserved areas. Capital costs to deploy fixed point-to-multipoint (P2MP) wireless connections using vacant C-band and unlicensed spectrum are about one-seventh the cost of fiber and are still able to provide high-throughput broadband service.[18] Fixed wireless networks are also far more cost-effective per gigabyte for this purpose than mobile systems. In addition, anywhere a high-capacity fixed service is available, next-generation Wi-Fi (known more formally as Wi-Fi 6) can provide the same consumer benefits as licensed 5G and more affordably.[19]

A. C-band: Public Auction Revenue and Spectrum to Close the Broadband Divide

The MOBILE NOW Act required the FCC to evaluate "the feasibility of allowing commercial wireless services, licensed or unlicensed, to share use of the frequencies between 3700 megahertz and 4200 megahertz." To its credit, the Commission exceeded this requirement by adopting a NPRM in July 2018 that sought comment on two proposals that together could make every megahertz of the C-band available for 5G services in rural and other less densely-populated parts of the country.

The C-band NPRM sought comment on two proposals that OTI generally supports: First, to reallocate at least 200 megahertz at the bottom of the band from incumbent Fixed Satellite Services (FSS) to flexible-use terrestrial broadband; and second, to authorize coordinated sharing of unused spectrum for high-capacity, fixed wireless service (on a licensed, P2MP basis) in the upper portion of the band that would remain dedicated to FSS. Since the Fixed Service is co-primary in the band (for the coordinated licensing of point-to-point links), the NPRM also proposed to redefine the Fixed Service to include localized P2MP fixed wireless broadband use that is most needed in rural and underserved areas.

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[17] 47 U.S.C. § 1302(a).
[18] *See* The Carmel Group, *Ready for Takeoff: Broadband Wireless Access Providers Prepare to Soar with Fixed Wireless*, at 12, Fig. 6 (2017).
[19] Wi-Fi 6: The Next Generation of Wi-Fi is Here, WiFi Forward (May 20, 2019), http://wififorward.org/2019/05/20/wi-fi-6-the-next-generation-of-wi-fi-is-here/.

OTI and multiple public interest coalitions support both of these proposals. A reallocation of C-band has the potential to ensure that *all 500 megahertz* of today's grossly underutilized C-band is put to work to fuel America's 5G future and to close the rural broadband divide. Each of these proposals represents an essential component of a potential win-win-win solution that achieves three vital public interest outcomes: First, to reallocate and auction a substantial portion of the C-band to promote mobile 5G networks; second, to enable high-speed fixed wireless service in rural, small town, Tribal and other underserved areas at a fraction of the cost of trenching fiber; and third, to protect existing earth stations from undue disruption or harmful interference.

i. The Opportunity to Designate Public Auction Proceeds for Broadband Infrastructure

OTI strongly supports the "Investing in America's Digital Infrastructure Act," introduced last month by Senators Cantwell, Schatz and Markey. This legislation would require a public auction of not less than 200 megahertz of C-band, designate proceeds to a Digital Divide Trust Fund, and reimburse the costs of incumbent C-band services while also ensuring their protection from harmful interference. Although Chairman Pai recently announced that he will be proposing a public C-band auction, it remains important for Congress to both reinforce the public auction requirements of the Communications Act and take advantage of this rare opportunity to designate spectrum auction revenue to invest in advanced broadband infrastructure in unserved and underserved communities, as well as other advanced technologies, particularly next-generation 9-1-1 services.

Both of these objectives should have strong bipartisan support. First, just as Congress in 2012 designated the initial $7 billion from the auctions of AWS-3 and 600 MHz TV spectrum to fund FirstNet, under your leadership Congress can set aside up to $30 billion or more of C-band auction revenue to pay for broadband infrastructure in unserved and underserved areas. According to FCC data, broadband is unavailable to roughly 25 million people in the United States, more than 19 million of whom live in rural communities. With proceeds set to be raised by the auction, Congress should not miss this rare opportunity to narrow the rural/urban digital divide by directing both dollars and unused C-band spectrum for fixed wireless broadband and backhaul in rural areas.

Second, as OTI has explained in multiple FCC filings, a private auction or sale would violate Section 309(j) of the Communications Act and willfully ignore Congressional intent and precedent. Congress has twice passed legislation ensuring that when the TV bands at 700 MHz and 600 MHz were consolidated for auction to mobile carriers, local broadcast stations would

either receive no windfall (the 2002 Auction Reform Act[20]) or receive at most incentive payments limited by a competitive reverse auction (the 2012 incentive auction bill[21]).

A multi-billion-dollar windfall for satellite companies that never paid for the spectrum they share is both unprecedented and unnecessary, particularly for the 200 megahertz or more than can be cleared by consolidating existing satellite services into unused transponder capacity in the upper portion of the band. The vast majority of the local TV stations that are being cleared off the 600 MHz band received only compensation for expenses incurred to switch frequencies. This approach would work well for at least the lower 200 megahertz of C-band, given that incumbents have acknowledged all current FSS video and radio distribution can be accommodated above 3900 MHz. If incentive payments are necessary to clear an additional 100 megahertz, FCC precedent suggests that the Commission should authorize winning bidders to engage in good-faith negotiations with incumbents for premium payments that would secure their agreement to clear at an early date.

Legislation reinforcing the requirement of public auctions also remains important, regardless of the FCC's ultimate decision. Private auctions or sales tend to distort competition in the mobile market, excluding smaller and rural ISPs. Even serious consideration of a private sale and windfall sets a dangerous precedent, suggesting that incumbent licensees should always wage maximum resistance against giving up or sharing unused spectrum unless the Commission agrees to give them public revenue that until now has always, with few exceptions, flowed back to the public.

ii. Shared Access to Unused C-band Spectrum Can Spur Fixed Wireless Broadband

OTI and a broad coalition of rural ISPs and high-tech companies believe any Congressional action on C-band should also require the FCC to authorize coordinated, shared access to *unused* spectrum across the entire band to the extent it does not cause harmful interference to incumbent services (viz., earth stations that receive satellite signals) or to future licensed mobile services.

Like the TV band prior to its consolidation, the C-band's overall capacity is grossly underutilized—and even after repacking the FSS incumbents, large amounts of spectrum will remain unused in rural areas in particular. Spectrum itself is public infrastructure that can be used

[20] *Spectrum Reform Act of 2002*, Pub. L. No. 107-195, 47 U.S.C. §309(j)(15)(C)(iv), available at https://www.congress.gov/bill/107th-congress/house-bill/4560/text?overview=closed.
[21] *Middle Class Tax Relief and Job Creation Act of 2012*, Pub.L. 112–96, Subtitle D—Spectrum Auction Authority, § 6402, (enacted Feb. 22, 2012), codified at 47 U.S.C. § 309(j)(8)(G) ("Spectrum Act"), available at https://www.congress.gov/112/plaws/publ96/PLAW-112publ96.pdf.

to help close the digital divide. Unlocking every megahertz of the C-band will promote a more inclusive, robust and affordable 5G wireless ecosystem for everyone.

By requiring rural ISPs and other operators to rely on an automated coordination system, the FCC can fully protect existing earth stations (and thereby TV and radio consumers) in the same way that the FCC has certified a Spectrum Access System (SAS) to coordinate shared use of the adjacent 3.5 GHz band between the U.S. Navy and terrestrial broadband providers. The FCC should be required to authorize shared use of unused spectrum across the entire C-band and to determine the technical rules that ensure there is no harmful interference to licensed and incumbent services. An engineering study filed in July by wireless ISPs, Google and Microsoft showed that even on a co-channel basis, unused spectrum can be easily coordinated with earth stations and shared locally for rural broadband, enterprise networks and other uses in 78% of the country where at least 80 million people live.

In sum, C-band gives Congress an opportunity to mandate *both* a public auction and coordinated shared access to unused spectrum in the C-band, which together can provide billions in funding for digital infrastructure *and* the spectrum that rural broadband providers, schools and other enterprises need to close the connectivity gap in underserved areas.

B. Next-Generation Wi-Fi: Accelerating Affordable 5G Services for Everyone

The MOBILE NOW Act took a balanced approach that required the identification of substantial new allocations of both licensed and unlicensed spectrum. Although OTI strongly preferred the original Senate version of MOBILE NOW—which would have required 100 megahertz of unlicensed below 6 GHz, rather than below 8 GHz—the Act nevertheless had the salutary impact of encouraging the FCC's ambitious effort to authorize unlicensed sharing of unused spectrum across the entire 6 GHz band (as much as 1200 megahertz). OTI and our broad-based Public Interest Spectrum Coalition strongly support the Commission's proposals to increase unlicensed spectrum access at both 5.9 GHz and from 5925 to 7125 MHz.

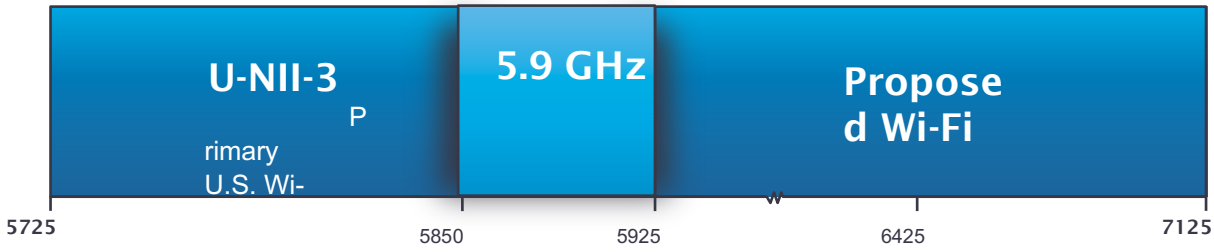
Unlicensed spectrum is what ultimately makes both mobile and fixed broadband service more available, more productive and more affordable for an overwhelming majority of people at home, at work, at school and in public places. Wi-Fi generates hundreds of billions of dollars in economic activity and consumer surplus each year, in substantial part as a critical complement to mobile carrier networks that would otherwise be overwhelmed by consumer demand.[22] Most consumers do not even realize that between 70 and 80% of the total mobile data traffic flowing over smartphones never touch their mobile carrier network. Wi-Fi also plays a key role in

[22] "Economic Value of Unlicensed Spectrum in the U.S. Tops $525 Billion," Wi-Fi Forward, (May 17, 2018), http://wififorward.org/2018/05/17/new-report-economic-value-of-unlicensedspectrum-in-the-u-stops-525-billion/.

connecting education, manufacturing, agriculture and healthcare technologies. IoT and other high-capacity, local-area networks—most of which will be indoors and connect everything—are likely to make unlicensed spectrum an even more critical part of a truly robust 5G ecosystem.

The good news is that Wi-Fi 6, is ready to go now and can accelerate 5G-quality services for *everyone*. Because mobile 5G networks are massively expensive to deploy, they won't be available outside dense urban, high-traffic and affluent suburban areas for many years. Wi-Fi 6, by contrast, can upgrade connectivity in any home or business that has a gigabit-capable fixed broadband service.

In other words, Wi-Fi 6 can bring 5G capabilities more quickly to urban, suburban and rural areas alike. But, there's a *big if* . . . Accelerating affordable 5G capabilities for everyone depends on a sufficient amount of contiguous, wide-channel unlicensed spectrum.



i. Extending Gigabit-Fast Wi-Fi Across the 6 GHz Band is Feasible and Essential

Authorizing unlicensed use of 1200 contiguous megahertz of spectrum across the entire 6 GHz band—from 5925 to 7125 MHz—is the fuel necessary to power gigabit-fast and affordable Wi-Fi 6 and other unlicensed innovations of greatest benefit to consumers and the economy. OTI and the Public Interest Spectrum Coalition strongly support the FCC's pending proposal to allow at least indoor use of unlicensed devices and networks across all four band segments (a total of 1200 megahertz). We likewise support the FCC's proposal to allow outdoor unlicensed operations—as well as indoor operations at standard power (1 watt)—in two band segments that total 850 megahertz, subject to registration and recurring authorization by a geolocation database. These Automated Frequency Coordination (AFC) systems will be similar to, but simpler than, the Spectrum Access System that facilitates sharing and protects Navy operations in the new CBRS band at 3.5 GHz.

The FCC's proposed rulemaking has one critical shortcoming, however, that threatens to diminish the value of Wi-Fi 6 to the vast majority of Americans at home and at work. In addition to authorizing Wi-Fi at standard power, subject to coordination by an automated database (AFC), the Commission also proposes to allow indoor-only operations at a much lower power (one-

fourth the power of the limit for standard Wi-Fi), but *only* in the U-NII-6 and U-NII-8 band segments. These two band segments are not contiguous and total only 350 megahertz.

Consumer advocates, as well as rural broadband providers and the nation's largest high-tech companies, have all urged the Commission to authorize lower-power, indoor-only unlicensed use across the much larger U-NII-5 and U-NII-7 band segments without the cost and complexity of geolocation database coordination. These two band segments total 850 megahertz. Although expensive, professionally-installed, higher-power and AFC-controlled unlicensed access will be important for enterprise networks and outdoor deployments, the failure to set a power level at which Wi-Fi can operate indoors across the entire 6 GHz band will sacrifice what is likely to be the greatest benefit of this rulemaking.

Wi-Fi is the workhorse of the internet because low-cost, off-the-shelf routers and devices can easily and affordably offer access to unlicensed spectrum that provides high-capacity connectivity in homes, at work, at school, in libraries, restaurants, retailers and most public spaces. Without affordable, do-it-yourself access to the 850 megahertz in U-NII-5 and U-NII-7, a majority of homes and small businesses in particular could be limited *to a single 160 megahertz channel* between 6875 and 7125 MHz, greatly limiting the potential of what could be a wide-channel Wi-Fi band for all of the essential uses noted above.

We remain hopeful that engineering facts will prevail over incumbent fears. Members of this Committee should encourage the Commission to adopt a rebuttable presumption that lower-power, indoor-only (LPI) unlicensed access does not create an undue risk of harmful interference to incumbents.

First, harmful interference to incumbent point-to-point (FS) links at this power level from LPI inside a building would be extremely rare. The two operate in entirely different locations and with transmit characteristics that are complementary.

Second, fixed point-to-point links are high power and use high-quality, highly-directional antenna, whereas Wi-Fi on a LPI basis would operate indoors at very low duty cycles and at extraordinarily low power.

Third, moving Wi-Fi and other unlicensed traffic onto networks required to be low-power and indoors could reduce the overall risk of interference to FS incumbents. And by making 1200 contiguous megahertz available inside every building, unlicensed routers and other devices will spread their transmissions over multiple and much wider channels, further reducing the risk.

Finally, while we agree that AFC systems will be necessary to avoid interference outdoors and for standard power deployments, AFCs in this band can be relatively simple databases that are

easy to implement. Geolocation database coordination is well-established and reliable in bands, such as in U-NII-5 (5925 to 6425 MHz) and U-NII-7 (6525 to 6875 MHz), where incumbent operations are geographically fixed and change location or operating parameters infrequently. The FCC has a long history of ensuring that coordination technologies and procedures work to give primary licensees in shared band a high degree of protection from harmful interference. Fears about theoretical and corner-case scenarios that could result in fleeting interference should not preempt the truly enormous economic and social benefits of authorizing unlicensed sharing across the entire 6 GHz band.

ii. The Vacant 5.9 GHz Band is a Roadblock to a Potential Wi-Fi Superhighway

OTI welcomed Chairman Pai's recent announcement that the Commission will vote this month to seek comment on a further notice of rulemaking that proposes to reallocate the lower 45 megahertz of the unused Intelligent Transportation Services (ITS) band for next-generation Wi-Fi and other unlicensed public uses. The 5.9 GHz band lies directly between the upper portion of the 5 GHz band, which is currently used for unlicensed Wi-Fi and rural broadband, and the 6 GHz band that the FCC has proposed to open for shared unlicensed use.

Indeed, we believe the Commission should go further and relocate auto safety communications to a different band (such as the mostly vacant 4.9 GHz public safety band) and thereby create a contiguous "Wi-Fi Superhighway" that extends from the upper 5 GHz band continuously up to 7125 MHz. As Commissioner Mike O'Rielly so aptly put it, the 5.9 GHz band is "the missing link between the 5 GHz and 6 GHz bands." Reallocating the 5.9 GHz band for unlicensed use would create a very high-capacity Wi-Fi "superband" that would enable multiple contiguous channels of gigabit-fast connectivity in every home and business.

The 5.9 GHz band is currently allocated for auto safety signaling using a specific technology called Dedicated Short-Range Communications ("DSRC"). Back in 1999 the FCC allocated this 75 megahertz (5850 to 5925 MHz) for shared use by DSRC technology on a licensed basis. For two decades the band has gone almost completely unused. The 5 GHz band has become a telling experiment in market forces and innovation. Wi-Fi also emerged in 1999 and consumers today are celebrating its 20th anniversary. Over that time, while the auto industry left the 5.9 GHz band fallow, unlicensed innovation and Wi-Fi use has surged, saturating both the 2.4 GHz band and two segments of the 5 GHz band with intensive spectrum re-use that generates hundreds of billions of dollars annually in consumer surplus. Wi-Fi bands are congested because they carry the vast majority of wireless internet traffic and are an input for virtually every other industry. The "car band," meanwhile, sits idling and empty.

DSRC has also been eclipsed by newer technologies that render the requirement to use DSRC in the 5.9 GHz band a relic of an abandoned policy that would have mandated DSRC radios in

every new vehicle and would have taken at least another two decades, at a high cost to consumers, to be effective.[23] Unfortunately, the Department of Transportation (DOT) has not yet formally withdrawn its proposed DSRC mandate; nor has it acknowledged, as the European Union has, that real-time safety signaling for V2X applications will require at most 30 megahertz. Since Cellular V2X is in its infancy and is likely to operate as an application on general purpose mobile 5G networks, it would be a win-win for consumers to relocate V2X safety signaling and achieve a Wi-Fi superhighway capable of fueling affordable 5G-quality connectivity for everyone, whether they live in rural, suburban or urban communities.

3. We Need Better Data and Consumer Disclosures

As we move to another generation of cellular wireless technology, policymakers and consumers still lack good, comprehensive data on the current landscape. While we need not halt progress until our data and maps are perfect, the federal government's current data collection efforts have significant gaps.

Most notable in those gaps is the complete absence of pricing data. The high cost of internet service is one of the biggest reasons the digital divide exists,[24] and yet no government agency collects data on prices or affordability. This must change. The FCC's Form 477 program, and the related broadband availability maps, are an ideal opportunity for the federal government to begin collecting these data.

OTI has long urged the FCC to add pricing data to its Form 477 data collection, but the Commission continues to ignore this recommendation. It's now time for Congress to act. Congress is moving on legislation to direct the FCC to improve its broadband maps after years of inaction; similarly, Congress should pass legislation directing the FCC to collect pricing data. Without this information, Congress and the FCC will not fully understand the digital divide or how to combat it.

The issue of pricing data highlights another fundamental problem: it is difficult, if not impossible, for policymakers, researchers and consumers to find even basic information about the cost of broadband service in the United States—hidden and incomprehensible fees are a frequent complaint of consumers who do not understand why they are being charged as much as

[23] Harding, J. *et al*., "Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application," National Highway Traffic Safety Administration, Report No. DOT HS 812014 (Aug. 2014), at 24 ("Even if the market drives faster uptake by consumers of aftermarket devices . . . it will still take 37 years before we would expect the technology to fully penetrate the fleet.").
[24] Monica Anderson, Andrew Perrin, Jingjing Jiang, Madhumitha Kumar, "10% of Americans don't use the internet. Who are they?" Pew Research Center (April 22, 2019), https://www.pewresearch.org/fact-tank/2019/04/22/some-americans-dont-use-the-internet-who-are-they/

they are.[25] This makes it virtually impossible for consumers to comparison shop or hold their provider accountable if they don't get the service they paid for.

This lack of information is true for both mobile and fixed internet service. On mobile, the problem is exacerbated because, unlike advertisements for fixed internet service that usually include at least a reference to speed tiers, mobile advertisements tend to reference service in the context of sweeping statements about "lightning fast speeds" or "the fastest mobile internet." Even if consumers know what they are paying, they don't know what they are paying *for*.

Senator Markey's TRUE Fees Act would be a good step toward clearer advertisements and disclosures. But Congress should also direct the FCC to implement what we call a "broadband nutrition label," a clear, standardized format for broadband service plans that is based on the FDA's nutrition label for food products.[26] OTI has long advocated for such a label, and the FCC adopted it in 2016.[27] However, just a year later, new FCC Chairman Ajit Pai repealed the nutrition label.[28] Congress can and should restore the broadband nutrition label. It's clear that consumers need to be empowered with better knowledge about the service to which they are subscribing.

4. Affordability Remains a Critical Barrier to Robust Internet Adoption

With 5G service out of reach for low-income internet users, Congress must ensure that other, more affordable connectivity options remain available. The digital divide remains pervasive, with stark differences in connectivity between lower-income and higher-income users. As the Pew Research Center found in a study conducted earlier this year, 44% of adults in households making less than $30,000 annually are without home broadband services, and 46% lack

[25] James K. Willcox, People Still Don't Like Their Cable Companies, CR's Latest Telecom Survey Finds, Consumer Reports (Aug. 8, 2018), https://www.yahoo.com/news/people-still-don-apos-t-100123290.html; Jonathan Schwantes, How Cable Companies Use Hidden Fees to Raise Prices and Disguise the True Cost of Service, Consumer Reports (Oct. 2019), https://advocacy.consumerreports.org/wp-content/uploads/2019/10/CR_WhatTheFeeReport_6F_sm-1.pdf.

[26] *See* Emily Hong et al., *Broadband Truth -in -Labeling: Empowering Consumer Choice Through Consumer Disclosure*, New America's Open Technology Institute (Aug. 3, 2015), https://static.newamerica.org/attachments/4508-broadband-truth-in-labeling-2/Broadband%20Truth-in-Labeling%202015.c9ecf56cc29149488ad3263779be60b0.pdf.

[27] Jon Brodkin, FCC's "nutrition labels" for broadband show speed, caps, and hidden fees, Ars Technica (April 4, 2016), https://arstechnica.com/information-technology/2016/04/fccs-nutrition-labels-for-broadband-show-speed-caps-and-hidden-fees/.

[28] *See* Micah Singleton, *FCC Introduces Broadband Labels Inspired by Nutrition Facts*, The Verge (Apr. 4, 2016); *Restoring Internet Freedom*, FCC Declaratory Ruling, Report, and Order, WC Docket No. 17-108 (rel. Jan. 4, 2018) at ¶ 231.

computers.[29] Meanwhile, 94% of adults in households making $100,000 or more annually have home broadband services.[30]

Unequal broadband access can also be seen in the "homework gap"—the gap between school-age children who had access to broadband at home and those who don't. There are an estimated three million students in the U.S. without internet access at home, and that lack of home broadband access is linked with lower test scores in reading, math and science than students who can use the internet at home for homework and studying.[31] According to a Pew Research Center analysis of 2015 U.S. Census Bureau data, 35% of households with children between 6 and 17 years old earning less than $30,000 annually do not have broadband access at home, compared to just 6% of such households earning $75,000 or more annually.[32] These broadband disparities are even more pronounced for black and Hispanic low-income households.[33]

A well-functioning and fully-supported Universal Service Fund is key to making broadband, including mobile broadband, accessible for low-income households. The Fund's Lifeline Program provides a $9.25 monthly subsidy to offset the costs of phone and internet service for qualifying households. Approximately 10.7 million people in the United States subscribe to Lifeline, although that number represents only about 28% of eligible households.[34]

Rather than work on ways to increase participation in this successful but underutilized program, the FCC has undertaken multiple efforts to weaken the Lifeline program under Chairman Pai's leadership. A recent report from USA Today in collaboration with the Center for Public Integrity notes: "Enrollment nationwide has dropped by 2.3 million people—about 21%—since 2017."[35] In November 2017, the agency proposed a series of changes to the program that, together, would

[29] Monica Anderson and Madhumitha Kumar, "Digital divide persists even as lower-income Americans make gains in tech adoption," Pew Research Center, (May 7, 2019), https://www.pewresearch.org/fact-tank/2019/05/07/digital-divide-persists-even-as-lower-income-americans-make-gains-in-tech-adoption/
[30] *Id*.
[31] Michael Melia et al., AP: 3 million US students don't have home internet, Associated Press (June 10, 2019), https://apnews.com/7f263b8f7d3a43d6be014f860d5e4132.
[32] Monica Anderson and Andrew Perrin, "Nearly one-in-five teens can't always finish their homework because of the digital divide," Pew Research Center, (October 26, 2018), https://www.pewresearch.org/fact-tank/2018/10/26/nearly-one-in-five-teens-cant-always-finish-their-homework-because-of-the-digital-divide/
[33] Monica Anderson and Andrew Perrin, "Nearly one-in-five teens can't always finish their homework because of the digital divide," Pew Research Center, (October 26, 2018), https://www.pewresearch.org/fact-tank/2018/10/26/nearly-one-in-five-teens-cant-always-finish-their-homework-because-of-the-digital-divide/
[34] "Get Started," Universal Service Administrative Co., https://www.usac.org/li/about/process-overview/stats/default.aspx.
[35] Jared Bennett and Ashley Wong, Millions of poor lose access to cellphone service under Trump administration reforms, USA Today (Nov. 5, 2019), https://www.usatoday.com/story/news/investigations/2019/11/05/under-trump-millions-poor-lose-cellphone-service/2482112001/.

severely hobble the program.[36] These proposed changes include: a ban on standalone broadband from the program; strict limitations on subscribers' lifetime use and the program's budget; and a ban on wireless resellers, which make up around 70%[37] of Lifeline-supported connections. OTI vigorously opposes this proposal.

The efforts to undermine the Lifeline program don't end there. Last month, the FCC released a Report and Order that eliminates Lifeline Broadband Providers (LBPs) designation from the 2016 Lifeline Modernization Order, which directly affects the number of carriers who participate in the Lifeline program. Additionally, the FNPRM lays out a series of troubling questions that the Commission is considering asking Lifeline applicants, such as "whether they would be able to afford their Lifeline-supported service without the Lifeline discount," and statements that some consumers may be willing to "purchase some level of broadband service even in the absence of a Lifeline benefit" because they "may value broadband access so highly."[38] As Commissioner Starks pointed out, "To the best of my research, I don't believe we've ever probed elderly Medicare recipients on how much they actually value their medical services; nor should we probe vulnerable, Lifeline recipients on how much they value their connectivity."[39] Separately, the FCC has also announced new minimum standards, increasing the broadband usage standard from 2 GB per month to 3 GB starting this month[40]—significantly less than the 8.75 GB outlined in the 2016 Order.[41]

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[36] "FCC Passes Proposal That Would Destroy the Lifeline Program," (November 16, 2017). https://www.newamerica.org/oti/press-releases/fcc-passes-proposal-would-destroy-lifeline-program/; Fourth Report and Order, Order on Reconsideration, Memorandum Opinion and Order, Notice of Proposed Rulemaking, and Notice of Inquiry in the Matter of Bridging the Digital Divide for Low-Income Consumers, Lifeline and Link Up Reform and Modernization, Telecommunications Carriers Eligible for Universal Service Support, WC Docket No. 17-287, WC Docket No. 11-42, WC Docket No. 09-197 (Rel. Dec. 1, 2017), https://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db1201/FCC-17-155A1.pdf

[37] FCC, Universal Service Monitoring Report, CC Docket No. 96-45, WC Docket No. 02-6, WC Docket No. 02-60, WC Docket No. 06-122, WC Docket No. 10-90, WC Docket No. 11-42, WC Docket No. 13-184, WC Docket No. 14-58, (Data Received Through September 2017), https://www.fcc.gov/sites/default/files/2017_universal_service_monitoring_report.pdf

[38] Fifth Report and Order, Order on Reconsideration, Memorandum Opinion and Order, Notice of Proposed Rulemaking, and Notice of Inquiry in the Matter of Bridging the Digital Divide for Low-Income Consumers, Lifeline and Link Up Reform and Modernization, Telecommunications Carriers Eligible for Universal Service Support, WC Docket No. 17-287, WC Docket No. 11-42, WC Docket No. 09-197, (Rel. Nov. 14, 2019), https://docs.fcc.gov/public/attachments/FCC-19-111A1.pdf

[39] *Id*.

[40] Order in the Matter of Lifeline and Link Up Reform and Modernization, Telecommunications Carriers Eligible for Universal Service Support, Connect America Fund, WC Docket No. 11-42 WC Docket No. 09-197 WC Docket No. 10-90 (Rel. Nov. 19, 2019), https://docs.fcc.gov/public/attachments/FCC-19-116A1.pdf

[41] Third Report and Order, Further Report and Order, and Order on Reconsideration in the Matter of Lifeline and Link Up Reform and Modernization, Telecommunications Carriers Eligible for Universal Service Support, Connect America Fund, WC Docket No. 11-42, WC Docket No. 09-197, WC Docket No. 10-90 (Rel. April 27, 2016), https://docs.fcc.gov › public › attachments › FCC-16-38A1

In addition to the attempts to weaken the Lifeline program directly, the FCC has also proposed capping the Universal Service Fund more broadly, a move that would pit the Fund's four programs against each other, potentially limiting eligible access in the already underutilized Lifeline program and overstretched E-Rate fund.[42] The Commission has also proposed combining the E-Rate and Rural Health Care programs under a single program cap.[43] These proposals undermine the very purpose of the Universal Service Fund: to help critical populations—including low-income consumers, tribal communities, schools and libraries, and rural residents—gain vital communications services. These changes would likely reduce participation from eligible consumers, especially low-income consumers who already underutilize Lifeline. The changes would also likely harm participation in the program from providers who have told the Commission that capping the USF would bring uncertainty to the future of each program.[44]

We must ensure that affordable internet access remains a cornerstone to both the Lifeline and E-Rate programs. Rather than trying to expand low-income communities' participation in these programs, the FCC has continually added new barriers to make the programs less accessible to these critical communities. These changes have been misguided, and Congress should urge the FCC to reverse its course.

In addition to the Universal Service Fund, Congress should consider other mechanisms to make internet access more affordable. For instance, we need more competition among internet service providers. Competition lowers prices, and there are things Congress can do to facilitate a more competitive internet market.[45] For example, Congress should remove barriers to municipal broadband networks, which have been successful in introducing affordable and fast broadband access in underserved communities.[46] More than a dozen states have laws on the books that prevent these networks from existing. These laws were written by the big incumbent broadband providers, like AT&T, to protect them from competition. They are doing nothing to help the

[42] Notice of Proposed Rulemaking in the Matter of Universal Service Contribution Methodology, WC Docket No. 06-122, (Rel. May 31, 2019), https://docs.fcc.gov/public/attachments/FCC-19-46A1.pdf
[43] Id.
[44] Comments of CTIA, WC Docket No. 06-122 (filed July 29, 2019), at 5 ("The Commission has recognized that predictability is essential for those who receive support from the four USF programs, as certainty of funding is necessary to help support recipients plan, invest, and innovate. As described below, however, an overall USF cap may introduce uncertainty for both program participants and beneficiaries, and reduce the Commission's flexibility to respond to the evolving needs of low-income consumers and rural communities.").
[45] See, e.g., Comments of New America's Open Technology Institute on Competition and Consumer Protection Issues in U.S. Broadband Market, Docket No. FTC--2018--0113, (May 31, 2019), https://newamericadotorg.s3.amazonaws.com/documents/Comment_Submitted_by_Joshua_Stager.pdf.
[46] Jon Brodkin, "Comcast, beware: New city-run broadband offers 1Gbps for $60 a month," Ars Technica, (August 30, 2019), https://arstechnica.com/tech-policy/2019/08/comcast-beware-new-city-run-broadband-offers-1gbps-for-60-a-month/

millions of people in the country who lack any broadband service. Congress should remove these laws and allow local communities to invest in their own infrastructure.

Conclusion

I am grateful for the Committee's attention to these important issues, and for the opportunity to present this testimony. I look forward to your questions.