

UScellular™ Fixed Wireless Access

Introduction

At UScellular™ our mission is to connect our customers to the people and places that matter most to them. We have traditionally focused on providing mobile services to our over 5 million consumer and business customers, with a particular focus on rural and traditionally underserved areas. However, the combination of 5G technology and significant government investment provides an exciting opportunity to connect homes and businesses quickly and economically with a new solution – **Fixed Wireless Access (FWA)**.

The digital divide is real, and the need for connection is substantial. BroadbandNow estimates that more than 40 million people in the United States lack reliable access to high-speed internet, many of them in rural areas. The importance of connectivity has become increasingly obvious throughout the pandemic and is essential for economic development as well as quality of life. The lack of connection isn't due to lack of effort – it's a basic issue of economics. Either people can't afford the cost of broadband, or it's simply not economical for private companies

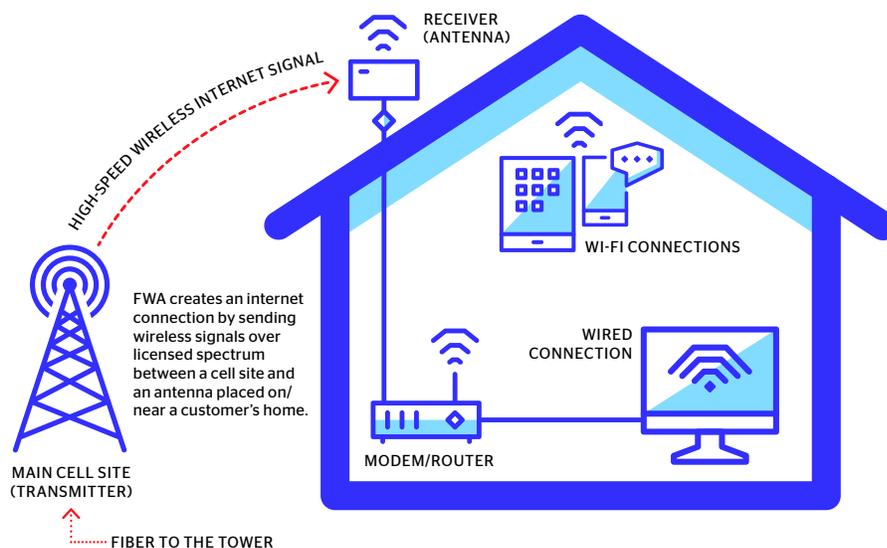
to provide connections to the remote and hard-to-reach areas where people live... usually both. The great news is that the intersection of government funding and wireless technology can provide a solution via FWA, and it can be implemented quickly.

The Federal Infrastructure Investment and Jobs Act (IIJA) provides unprecedented funding, in the amount of \$45 billion, to expand broadband to unserved and underserved areas throughout the U.S. Importantly, in contrast to previous, more restrictive funding vehicles the IIJA is technology neutral, meaning both wired and wireless solutions can qualify for funding. This additional flexibility provides policy makers and local communities with a tremendous opportunity for rapid deployment upon distribution of funds.

FWA technology can provide connectivity to homes and businesses in rural areas without some of the cost and timing burdens associated with wired solutions. Additionally, investments in FWA provide the **dual benefit of enhancing 5G mobile broadband – connecting people both at home or work and on the go.**

What is Fixed Wireless Access?

Fixed Wireless Access (FWA) is a wireless solution to broadband connectivity for the home or business. An antenna in the home or business connects wirelessly to a nearby cell tower, providing a high-speed broadband connection via a targeted wireless signal, as opposed to the wired connection provided by fiber or cable. Once the signal is received by the antenna, an in-home router enables that connection to be distributed throughout the home or business to connect devices to the internet via Wi-Fi, exactly like a traditional wired connection. There is no difference to the in-home experience, other than that you avoid the costly and time-consuming process of securing rights-of-way, digging up streets and lawns, and burying cables.



Fixed Wireless Access Provides Three Key Benefits

1. Support for both Home Broadband and Mobility
2. Faster time to market
3. Lower cost to deploy

The most important aspect of FWA is the dual benefit to both home broadband AND mobile connectivity— cell phone capability on the go. To deploy FWA, UScellular™ needs to put radio equipment on a cell tower – either one of our thousands of existing towers or a new one. When we install the FWA equipment on the tower, those same radios also enhance 5G mobility in the area, enabling the connected-on-the-go lifestyle demanded by consumers. People want to be connected, not just at their homes and businesses, but also on the go. In fact, if forced to choose, there is a growing number of consumers who would first give up their home connection over their mobile phone. We firmly believe, however,

that this is not a choice Americans should have to make. As a nation, we need to invest in cellular infrastructure – towers, radios, spectrum – and those investments to enable FWA are the same investments that enable 5G mobility.

FWA can also provide rapid results. Implementing FWA on a cell tower can connect many locations within the radius of the tower (note: the length of the radius can vary based on which spectrum is deployed, which we explain in a following section.) Fiber only needs to be run to the cell tower, as opposed to a fiber-to-the-home (FTTH) solution, where fiber must be run to every single home or business, adding cost, complexity and uncertainty. FWA can enable rapid connections to unserved areas, delivering high-speed broadband quickly to those who need it, and enabling faster access to results-based funding programs.

Finally, it is estimated that [a FWA solution can eliminate as much as 40% of the cost compared to FTTH](#). To be clear, denser fiber is still very much needed – towers need to be connected with fiber, and there are certain urban and suburban communities where a fiber-to-the-home approach makes economic sense. However, as you move towards more rural or hard-to-serve areas, FWA can provide a more timely and cost-effective approach than trying to cover every square mile of unserved America with fiber, while also benefiting mobility.

UScellular's Fixed Wireless Access

UScellular's first FWA product, UScellular™ Home Internet, has been in the market for several years and provides internet connections via 4G/LTE technology. We have more than 50,000 customers on this product, which delivers speeds up to 20 Mbps. Although the speeds are fairly low, it's an attractive solution for customers who live in areas unserved by cable companies and who want an alternative to unreliable and costly satellite options.

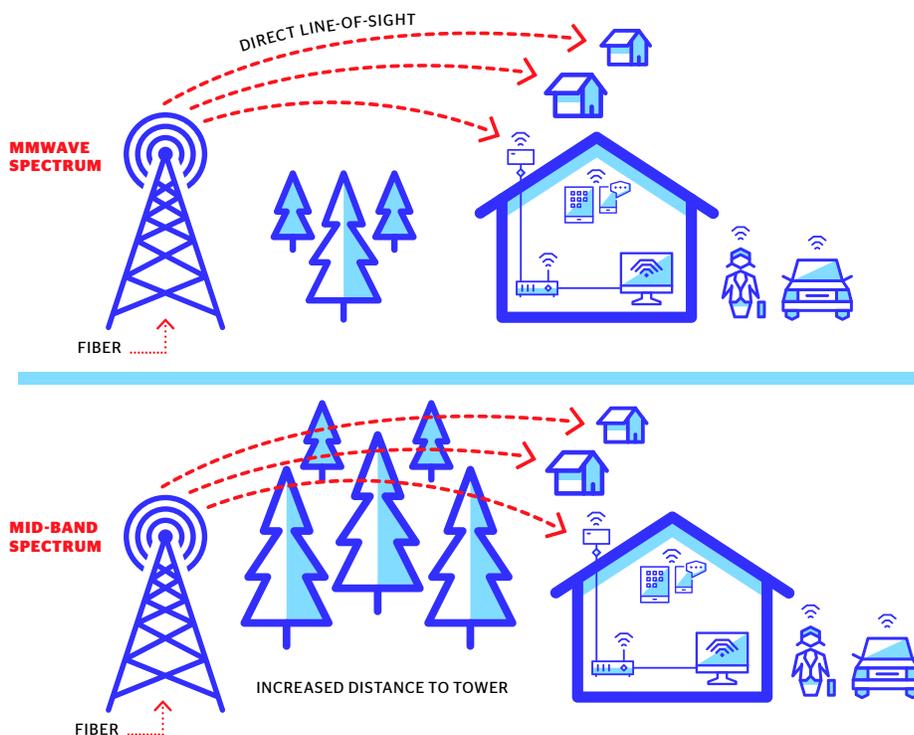
Due to recent advancements in wireless technology, we have recently launched a second FWA product with far greater speeds – UScellular™ Home Internet Plus. The Home Internet Plus solution delivers speeds of up to 300 Mbps, an increase in capacity of 10-15x compared to the 4G/LTE product. The product was piloted in 2021, with a broader roll-out to a targeted number of areas in 2022. Home Internet Plus currently utilizes our licensed high frequency millimeter wave (mmWave) spectrum, and the speeds delivered far exceed the requirements of 100 Mbps Download/20 Mbps Upload outlined in the federal infrastructure bill. Moreover, the technology and equipment used for FWA will continue to evolve and upgrade with future mobile technology advancements. Given this, FWA offers a viable solution for broadband connectivity both now and into the future.

Mid-Band Spectrum Driving Additional Adoption

As previously noted, UScellular's FWA solution currently uses our licensed and dedicated mmWave spectrum (note: 'licensed and dedicated' is important in order to provide consistent

service; many current rural wireless providers offer unlicensed services which can vary wildly in consistency and quality-of-service.) mmWave spectrum lies between 20 – 40GHz and gives us the capability of delivering up to 1 Gbps speed in uninhibited trials (line-of-sight, no foliage). Although 1 Gbps is achievable, we currently market the product at 300 Mbps, to allow for foliage and weather irregularities.

mmWave spectrum serves a narrower footprint that is more dependent on line-of-sight connectivity between the home antenna and the tower (see diagram below). However, mid-band spectrum can also be used for FWA, which can reduce dependence on line-of-sight connectivity and facilitate greater coverage than mmWave. UScellular™ was a significant participant in recent mid-band auctions (C-Band and DoD), and this spectrum will become available for use within the next 24 months. Mid-band spectrum will enable an even broader and cost-effective deployment of FWA. Mid-band FWA will also address many of the frustrations that our customers have expressed with satellite-based options, including inconsistent service and expensive equipment.



Economics

FWA can provide a more rapid and lower cost deployment while also enabling mobility, but deploying across such a large geography will require considerable investment. Our current 2022 plans include expansion to economically viable areas, but to justify unsubsidized investment, we must be able to reach several hundred homes and businesses per tower (note: our economics require over 150 subscribers at \$65 per month to equip an existing tower with the necessary equipment; or approximately 500 subscribers to build a new tower, and we can't assume that everyone will adopt the service.) This density is rare in unserved and underserved locations, which is a key driver of the current digital divide. The cost of building and maintaining a tower in rural America can be nearly twice as expensive as building a tower in an urban area, and the density of customers in these areas is far less than in suburban and urban areas, thereby putting pressure on the revenue generation needed to drive a positive return on investment. These factors highlight the importance of the support provided in IIJA to expanding broadband. These funds can be effectively used by subsidizing infrastructure investments like FWA – improving both access and affordability.

Closing

At UScellular,[™] we continue to put all our resources to work to deliver on our mission of connecting people and communities to what matters most to them. We have a legacy of focusing on underserved America, and we are passionate and motivated to continue doing our part. FWA can provide a timely and cost-effective solution to connecting unserved and underserved America and carries the dual benefit of providing high-speed broadband to the home and enabling 5G mobility to support on-the-go connections. UScellular[™] is committed to partnering with state and local governments to bridge the digital divide.

