

Case Study

Tohono O'odham Nation



Introduction

In the United States, only 67% of residents on tribal lands have access to a broadband connection. The digital divide on these lands is a fact of everyday life, and it's not abnormal to rely on slow, copper-wired connections or spotty public cellular to access the internet. Fortunately, awareness of this problem is rising. There are ongoing campaigns to solve this issue and an outpouring of federal funds to help build the infrastructure to improve internet connectivity across these communities.

The Tohono O'odham Nation is an exception. The Nation's utility authority, the Tohono O'odham Utility Authority (TOUA), led by Kristen Johnson, has championed connectivity across the Nation. For the past 15 years, TOUA has been experimenting, planning, deploying, and solving the internet access problem. Using a combination of fiber and fixed wireless technology, the Nation is now almost fully connected to high-speed internet. By all projections, every member of the Tohono O'odham will have multiple high-speed internet connectivity options by 2025.

The Tohono O'odham Nation is roughly the size of Connecticut (the second largest in the United States) and contains around 3,000 residences. The Nation is the definition of rural, surrounded by gorgeous and difficult-to-traverse terrain. Despite the low population density and rough geography, TOUA has made it a goal to connect every resident to the robust fiber network. Driven and vibrant individuals like Kristen, are championing internet connectivity through any technology necessary.

Our team was inspired by TOUA's work and wanted to learn the story behind the people, the problems, and the solutions the Tohono O'odham Nation encountered while building its ambitious internet network. We were curious how the Nation used Baicells 2.5 GHz products in conjunction with their fiber network. We aimed to discover three primary factors: how the equipment performed, the benefit of building a private network on top of a fiber network, and the long-term plans for the wireless system.

The Problem

Covering nearly 3 million acres and a border that extends beyond the United States and into Mexico, the Tohono O'odham Nation had struggled for years to provide their people with a reliable internet connection. Existing options were legacy ADSL, satellite, or spotty cellular service. Some communities only had connectivity to the copper-wired ADSL, which limited downlink capabilities to a mere 15 megabits per second on a good day.

Baicells was not the Nation's first foray into fixed wireless to solve the existing internet woes. During the Obama administration, the TOUA had built a wireless network but quickly realized the equipment they had chosen lacked the reliability,

range, and ease-of-use the organization needed to succeed. When COVID forced the world to shut down, TOUA was required to fire up this wireless network. Kristan Johnson states this wireless network "failed on all accounts." To access the network, end users needed to be close to the transmitting radios, and even if they could connect to the network, the speeds were abysmal.

While this failed wireless network was being installed, TOUA was building a fiber to the home network. The fiber network provided the backhaul to the wireless network, stalled, TOUA was building a fiber to the home network. The fiber network provided the backhaul to the wireless network, but it would still be several years until it could connect most residents in the community. TOUA was trenching the fiber across

the massive reservation. Progress was being made, but when COVID struck, many residents were left stranded and unable to connect to the internet. An alternative wireless solution desperately needed to be found.

TOUA pulled out all the legacy wireless equipment and began the hunt to fill the gap. LTE solutions were at the top of the list. The following wireless network would need to reach extended ranges, provide a high-speed broadband connection to the residents, and be easily installed by the existing utility team. Due to the massive distance between the Nation's communities, the hardware needed remote and easy management. Lastly, because TOUA had recently received a license to access the spectrum, the equipment needed to use the 2.5 GHz spectrum.



The Solution

TOUA began testing Baicells 2.5GHz equipment in 2021, as the organization began building fiber across some of the southern villages. Federal grants initially funded the equipment to bridge the digital divide. After the initial testing phase and some training, TOUA quickly began to install base stations and CPEs across the Nation to bring an internet connection to the people. Since the initial deployment, the wireless network has expanded across the Nation and now covers all of the 72 villages found on the reservation.

The Nation has used both 2.5 GHz spectrum and CBRS to connect the entire reservation. Recently, the Tohono O'odham Nation was a recipient of a 2.5GHz license. This spectrum supports most of the wireless internet connections across the reservation; however, the license didn't cover the entire reservation, so several northern villages are connected via CBRS.

Conrad Norris, the TOUA Outside Plant Foreman, reported that he and his team needed only a brief training period to understand the installation of the equipment. After that, his team

was comfortable with the equipment, and began installing it across the Nation. There are about 50 base stations deployed across the Tohono O'odham Nation. Speeds average about 60Mbps on the downlink and 15Mbps on the uplink. The farthest connection TOUA tested ranged about 4 miles, and they report it works well.

The Nation continues to trench fiber across the expansive landscape. The goal is to provide fiber to the home across the reservation, a rare opportunity made possible by extensive funding. By the end of 2024, TOUA has projected to have completed the fiber project. The wireless network will continue to operate, providing complete redundancy to the fiber network. By all accounts, this marks the Tohono O'odham Nation with one of the strongest private high-speed broadband networks found in North America.

End-users on the network have been nothing short of ecstatic. Speaking with Leo Porter, a local resident, he can connect multiple devices to the network and have them all work simultaneously, something unheard of on the ADSL connection he was using prior. "I've got two TVs and two laptops that are being used by students," he states. "It has been working well."



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LEO PORTER

Tohono O'odham Nation Reservation Resident



Baicells



Conclusion

In a landscape marked by digital inequality, the story of the Tohono O'odham Nation stands as an inspiring testament to the transformative power of determination and innovation. Faced with the challenge of connecting a vast and remote community to reliable internet, the Tohono O'odham Utility Authority (TOUA) embarked on a journey of exploration and adaptation. Led by dedicated individuals like Kristen Johnson, TOUA's relentless pursuit of connectivity brought about a remarkable transformation over the course of 15 years.

From the early struggles with legacy ADSL, satellite, and unreliable wireless networks, the TOUA recognized the urgency of their mission as the world turned its gaze towards the importance of virtual connectivity during the global pandemic. The failed wireless attempt during the Obama administration led them to a solution that leveraged Baicells 2.5GHz equipment. With a clear vision and well-defined goals, TOUA made substantial strides in extending its wireless network coverage, embracing the 2.5 GHz

spectrum and CBRS to bridge connectivity gaps across the expansive reservation.

The impact of TOUA's efforts has been profound, reflected in the lives of the Tohono O'odham Nation's residents. Through the partnership with Baicells, the Nation achieved reliable broadband speeds, allowing multiple devices to connect seamlessly and empowering activities previously hindered by limited connectivity. As the fiber infrastructure project progresses, the wireless network remains a robust backup, solidifying the Tohono O'odham Nation's position as a leader in high-speed private broadband networks.

TOUA's vision extends beyond the present success. Plans include integrating mobility services, telehealth initiatives, and portable connectivity solutions for community events. Their innovative spirit ensures that the future holds promise for even more significant enhancements to the lives of the Tohono O'odham people.

If you are trying to solve the digital divide in your community, please contact sales_na@baicells.com to get started.