TARANA

WHITE PAPER

Building Better Communities with Next-Generation Fixed Wireless Access

Municipal Use Cases

Municipalities are the bedrock of our communities. Cities and towns provide critical infrastructure that touches the lives of every resident on a daily basis. Technology, in particular broadband internet service, can be an important tool to build stronger communities with new or improved services that can streamline daily operations, improve public safety, and encourage economic development.

Tarana Wireless is partnering with municipalities to bring new services and opportunities through next-generation fixed wireless access (also known as ngFWA).

Next-Generation Municipal Services

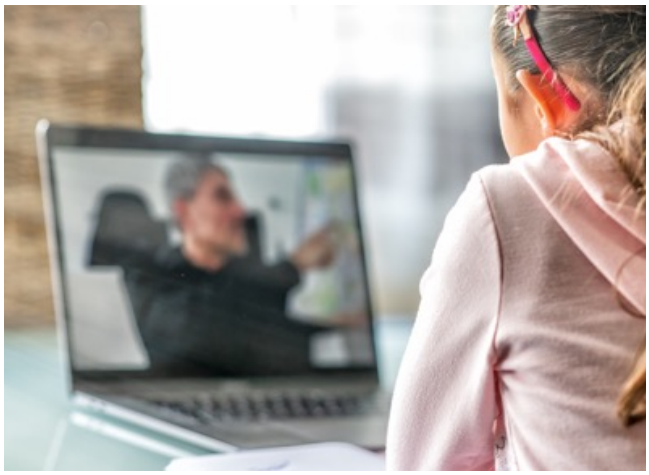
High-speed broadband is an invaluable tool for municipalities that can put even small communities on par with larger cities, in terms of infrastructure and capabilities. This includes:

- Video surveillance and monitoring of key infrastructure such as utilities, traffic, and public works
- Intelligent traffic system sensors for traffic control and optimization at highway or street level
- License plate scanning
- Enhanced public safety with mobile response unit data and video support
- 3D modeling for incident analysis and public planning
- Smart meter reading
- Public works (parks, waste/water, public pools, parking, transportation centers, etc.)
- Mobile broadband capacity for events, festivals, neighborhood days

Municipal Broadband

Connecting residents can also boost overall community wealth, health, and economic development. High-speed broadband attracts and retains residents and businesses alike and offers opportunity through broadband services such as:

- Telemedicine (see a doctor more quickly and conveniently from a computer rather than long drives for in-person visits)
- Distance learning (primary, secondary, and college students can study and do homework remotely from school)
- Economic development for small businesses with new markets via online sales and marketing
- Remote work at home
- Stream video and read email
- Virtual reality immersion



All of these services, and many more, are possible with high-speed broadband. Municipalities looking to deploy residential broadband have a choice of technologies. Selecting the right solution is critical to ensure funds are used wisely and to greatest effect.

Different Technologies Serve Different Purposes

There are many different ways to physically deliver broadband and each has its benefits. Selecting a technology will have significant implications for how long it takes to deploy, how easy it is to install in challenging terrain, cost, and so on.

Technology	How it Works
Wireless	❯ Requires a radio CPE at the home which connects to another radio on a tower that can be located miles away. From there, traffic is typically backhauled via fiber or wireless. ❯ Easy and economical to install, even in the toughest terrain, such as buttes, valleys, etc. Can be deployed in weeks or months. ❯ Offers hundreds of megabits to gigabit speeds.
Fiber	❯ Requires an inexpensive CPE at the home which connects to an aggregation point that then connects to the backhaul. ❯ Requires extensive digging to bury the fiber both from the home to the aggregation point and backhaul. ❯ Inexpensive CPEs but deploying fiber will cost tens of thousands of dollars per mile. ❯ Time consuming to deploy, often requiring extensive permitting and specialized tools. ❯ Offers hundreds of megabits to gigabit speeds.

Cable	❯ Requires a CPE at the home which connects to a nearby aggregation point (headend) from which traffic is backhauled via fiber. ❯ Requires extensive digging to bury cables. ❯ Requires expensive headend equipment and devices in the provider's operations center to deploy. ❯ Offers speeds of a few hundred Mbps, although upload speed (from the home to the aggregation point) is significantly slower, although newer DOCSIS 4.0 systems are reaching market with significantly faster speeds
DSL	❯ Similar to cable, DSL uses copper wires to transfer data from the home to an aggregation point. ❯ Uses existing telephone lines, but is limited by how far the subscriber can be from the provider's point of presence. ❯ Requires expensive headend equipment and devices in the provider's main operations center to deploy. ❯ Offers speeds of a few Mbps although upload speed (from the home to the aggregation point) is significantly slower.

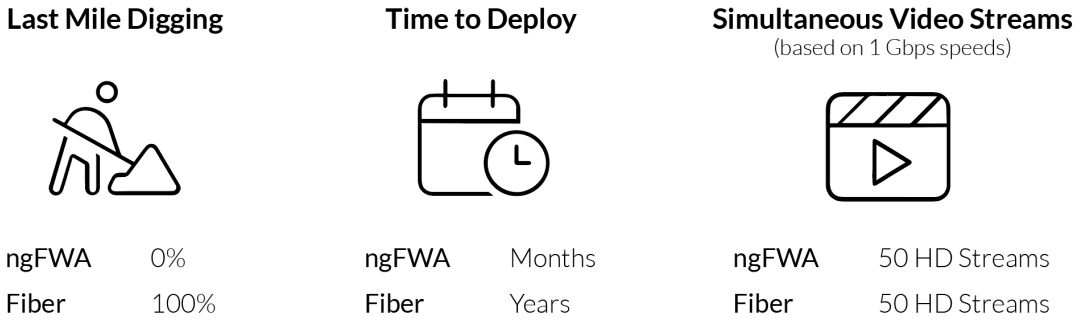
In general, older copper cable and DSL are considered legacy broadband systems that are rarely deployed in new networks. They are included here for reference only.

New networks typically use fiber, wireless, or a combination of both. Fiber is often seen as a preferred technology due to its faster speeds, however it can be quite expensive and time-consuming to deploy. This is particularly true in challenging terrain (mountains, valleys, lakes, rivers) or where extensive right of way permitting is required (railroad tracks, public lands, etc.). Because of this, residents and businesses may have to wait years for fiber-based broadband service.

Wireless offers speedy deployments, due to the fact that it does not require trenching to bury fiber in the ground. This also makes it easier to overcome difficult terrain and requires less permitting. A wireless radio tower can immediately begin servicing locations for many miles around it once installed — where fiber can only service locations one at a time, as the fiber is brought to each location. When locations are miles apart, this can take a long time.

Downsides to wireless have traditionally been due to older wireless equipment that may offer slower speeds (1 – 50 Mbps), may have difficulty when a service location is not directly visible to the tower (known as non-line-of-sight), and may be susceptible to interference from other, nearby radios such as on the tower or in buildings. New advances in wireless technology, known as next-generation fixed wireless (ngFWA), have overcome these obstacles and can deliver gigabit speeds even over non-line-of-sight paths and in the presence of interference without sacrificing the rapid deployment for which wireless is known.

Figure 1: Trenched Fiber vs. Next-Generation Fixed Wireless Access

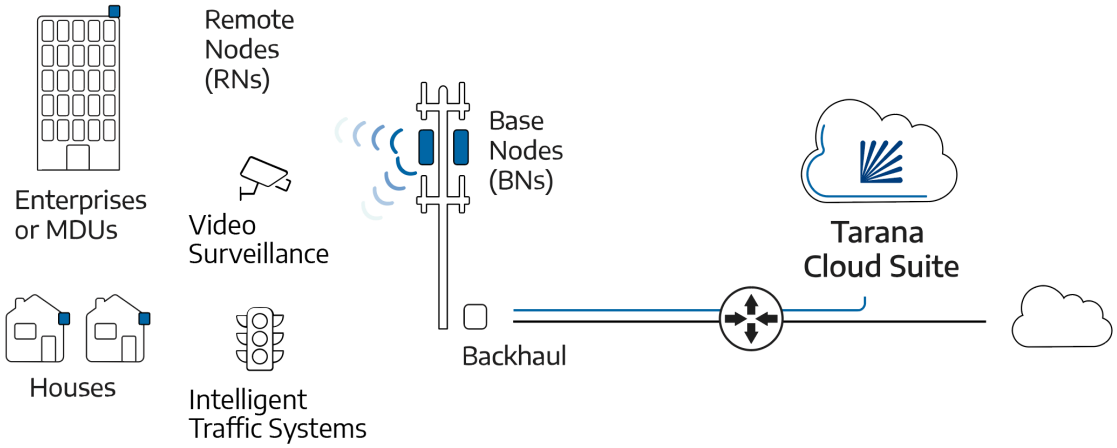


Next-Generation Wireless for Better Broadband

Tarana is the performance leader in next-generation wireless access, powered by a number of industry firsts and well-proven breakthroughs that allow municipalities to rapidly deploy networks that would not have been possible with previous legacy wireless systems or taken years to build with fiber. We do this by taking a fresh, clean sheet approach that re-imagines the meaning of high-performance broadband communications.

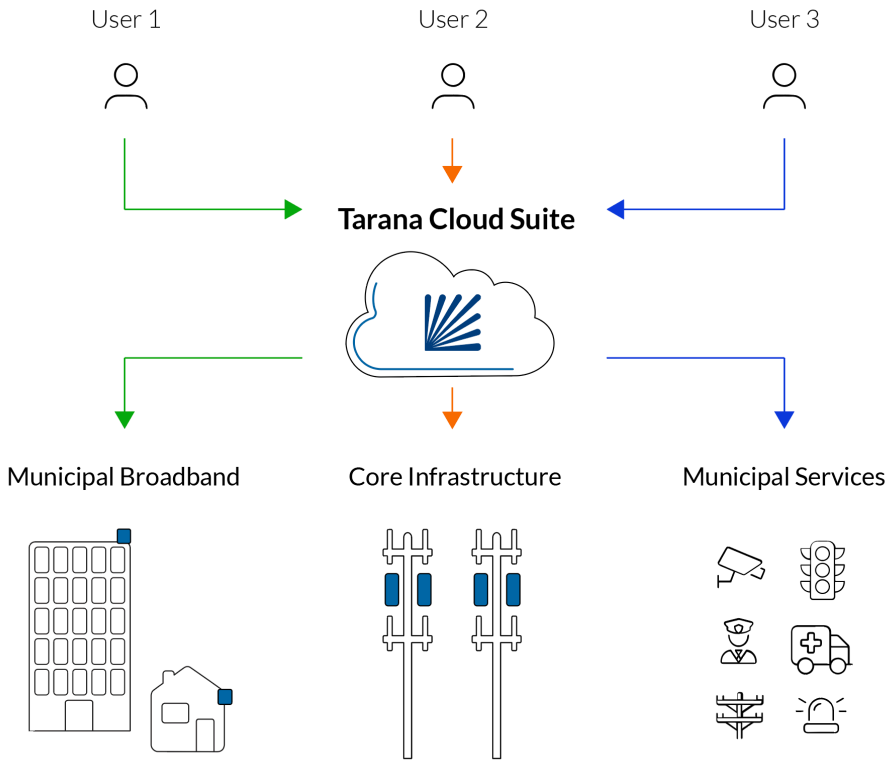
Our Gigabit 1 (G1) platform comprises base node (BN) radios that are mounted on towers or other assets similar to cellular networks, which then communicate with remote nodes (RNs) mounted on the sides or rooftops of the municipal service location, home, school, community center, or business. All hardware is managed via cloud-based management software called Tarana Cloud Suite (TCS).

Figure 2: Tarana G1 supports a wide variety of applications with fiber-class, next-generation fixed wireless.



Tarana Cloud Suite offers a multi-tenant model in which the city can deploy and operate base nodes while allowing other organizations to install and manage just the remote nodes located at police or fire stations, schools, community centers, city halls, residential homes, and so on. This flexible approach allows multiple

organizations to leverage the same infrastructure to implement their own networks. If desired, each group will only see and manage its own deployment.



At Tarana, we believe there is a role for both fiber and wireless within a broadband network. Fiber is an excellent choice for backhaul or very close locations, while wireless represents a cost-effective way to rapidly deliver high-quality, last mile, gigabit speeds over a large area. This is crucial to the timely roll out of municipal services where residents and departments expect their needs to be met in months rather than years. Together, fiber and wireless technologies can help municipalities achieve their broadband goals at affordable economics to connect communities and allow them to develop and thrive.

Interested in learning more about our innovative solutions? Get in touch with us at taranawireless.com/how-to-buy

Tarana is on a mission to accelerate the deployment of fast, affordable internet access around the world. With a decade of research and more than $400M of investment, the Tarana engineering team has created a unique next-generation fixed wireless access (ngFWA) technology instantiated in its first commercial platform, Gigabit 1 (G1). G1 delivers a game-changing advance in broadband economics in both mainstream and underserved markets, using both licensed and unlicensed spectrum. G1 started production in mid-2021 and has been sold to more than 200 service providers globally. Tarana is headquartered in Milpitas, California, with additional research and development in Pune, India.
Visit www.taranawireless.com for more on G1.

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