

Residential Broadband for Municipal Governments

Local governments in rural areas are building municipal broadband networks to address the lack of affordable, high-speed internet access in their communities. While municipally-owned broadband networks have many recognized benefits, local governments must overcome key challenges of infrastructure, affordability, and adoption.¹ Ciena's Residential Broadband Solution delivers the openness, modularity, and scalability required to deliver high-speed internet access that ensures digital equity for all citizens.

Whether for work, study, or play, real-time access to digital applications, data, and video is critical for the success of a community. High-speed internet access provides the real-time services required by citizens and businesses, and significantly impacts where businesses locate and where employees choose to live.

Reliable and affordable broadband access—currently defined as 25 Mb/s or greater internet connectivity—adds multiple benefits to a community: employees can work where they live rather than live where they work; students can attend classes online; entrepreneurs can connect with far-flung markets; and patients can leverage telemedicine to access medical expertise without the need to travel.² The FCC is proposing raising the minimum broadband speeds in the U.S. to 100 Mb/s for downloads and 20 Mb/s for uploads, further emphasizing the need for next-generation broadband networks. Broadband access is becoming as vital in the daily lives of community members as public utilities like water, sewer, gas, and electric power.

Access to high-quality broadband has been historically limited in rural areas, with an estimated 35 percent of rural residents lacking access.³ Low population density and long distances to existing infrastructure make the upfront investment of broadband expansion too costly for private service providers. But unlike profit-driven private companies, municipal governments can take a long-term view and serve their communities, while achieving return on investment over longer time periods.

¹ Federal Reserve Bank of Richmond, "Community Scope: Bringing Broadband to Rural America", 2020

² Next Century Cities, "The Opportunity of Municipal Broadband"

³ Reviews.org, "Nearly 1 in 4 Households Don't Have Internet—and a Quarter Million Still Use Dial-Up", Catherine McNally, August 2021

Highlights

- Access to high-speed internet in rural areas provides economic development, remote work opportunities, online education, and better telehealth and emergency services
- Access to high-quality broadband has been historically limited in rural areas because it poses a costly business case for traditional Internet Service Providers (ISPs)
- Approximately 10 percent of U.S. households, mostly in rural communities, do not have broadband service
- Over 500 municipalities have invested in creative public networks, using a variety of models to connect rural and underserved communities
- Open-by-design broadband solution combines routing and switching platforms, management software with XGS-PON pluggable technology, leading optical technology, MCP domain controller, Blue Planet® Intelligent Automation Software, and Ciena Services to address the challenges of infrastructure, affordability, and adoption

Given the importance of internet access to modern businesses and quality of life, some local governments have invested in networks that have revitalized local economies and saved taxpayer dollars.⁴ But municipal governments, like their private company counterparts, face many challenges when building municipal broadband networks, including:

- **Access infrastructure:** The network technology that ensures high-speed internet access to all citizens, businesses, and institutions throughout the community
- **Affordability:** The network architecture and management that contains cost, along with federal and local programs that subsidize internet access
- **Adoption:** How to quickly build and maintain a subscriber base to ensure the financial sustainability of the municipal broadband network.

Why Ciena for residential broadband

- **Open:** Protects future growth by enabling providers to focus on quality customer experiences while containing cost and offering services at affordable prices
- **Modular:** Allows providers to start small and expand networks where and when residential, business, and institutional customers need it—streamlining operations and ensuring financial sustainability
- **Scalable:** Helps build a high-capacity, affordable, automated residential broadband network that scales dynamically so providers can deliver on customer expectations to ensure quality services and quickly achieve a high adoption rate through the MaaS program⁵

Ciena's Residential Broadband Solution

Ciena's approach to residential broadband is designed to deliver the scalability, openness, and modularity required by municipal broadband network operators to create a sustainable business while protecting their network investment, ensuring digital equity and serving the community well into the future.

This solution leverages the power of Ciena's portfolio, including Routing and Switching platforms with XGS-PON pluggable technology, market-leading optical networking technology, Ciena's Manage, Control and Plan (MCP) domain controller,

Blue Planet Intelligent Automation Software, and Ciena Services. This solution allows end-customers access to applications for working from home, telemedicine, remote learning, cloud gaming, and Ultra-High Definition (UHD) video streaming now—and enables municipal operators to upgrade their service portfolio when required by Metaverse and Augmented Reality/Virtual Reality (AR/VR) applications—without the need to rip and replace existing network infrastructure. Ciena goes beyond network infrastructure by offering municipal network operators a complete solution to accelerate their network modernization journey—from business planning to marketing execution to system integration, implementation, and managed services.

Innovative residential broadband architecture for municipal government

Ciena's Routing and Switching Platforms provide unmatched scalability and flexibility to the solution by aggregating Fiber-to-the-Home (FTTH) or middle-mile traffic using multiple 100, 200, or 400 GbE Network-to-Network Interfaces (NNI), powered by market-leading WaveLogic™ 5 Nano (WL5n) coherent optical pluggables to support the community's existing and future bandwidth requirements.

Ciena's Residential Broadband Solution allows the convergence of last/middle-mile or FTTH/metro aggregation functionality by integrating XGS-PON micro Optical Line Terminal (μOLT) pluggables in Ciena's Routing and Switching Platforms—offering shared fiber broadband services for residential customers, schools, hospitals, government agencies, and businesses. Ciena offers the best XGS-PON port density per Rack Unit (RU) and the lowest energy consumption per port for typical deployments, while allowing customers to buy only the necessary XGS-PON plugs, when required, in a modular approach. As the application requirements evolve, Ciena's Routing and Switching Platforms are ready to support 25G PON plugs when they are available in the future.

Ciena offers a highly scalable approach that allows municipal government networks to easily go from tens to hundreds of XGS-PON ports without losing sunk platform investments, replacing existing network equipment, or needing significant upfront costs. Ciena's Universal Aggregation (UA) and access capabilities support multiple service options in addition to XGS-PON.

⁴ Institute for Local Self-Reliance, "Snapshots of Municipal Broadband", May 2021

⁵ The Ciena Partner Network's Marketing as a Service (MaaS) is currently only available in the Americas Region. The products and services described here are available only to participants in the Ciena Partner Network (CPN). For more information about CPN, visit www.ciena.com/partners.

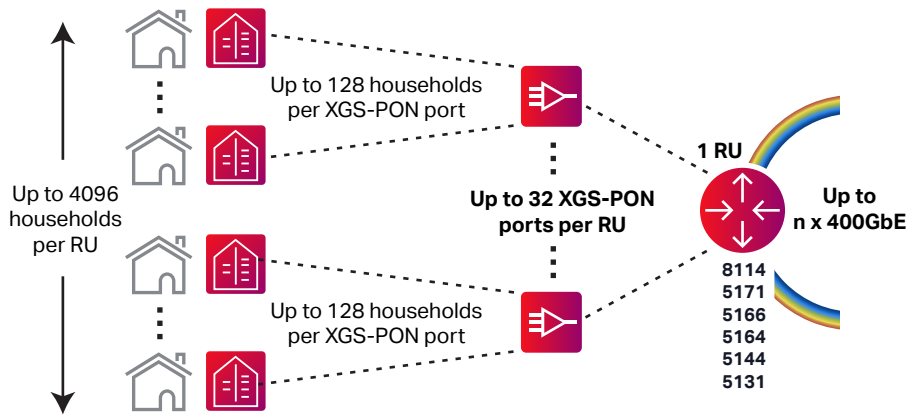


Figure 1. Ciena's Residential Broadband Solution

With this solution modularity, municipal broadband network operators can offer business and institutional customer services over IP or dedicated Ethernet and mobile wholesale services with xHaul transport capabilities. Moreover, they can have a highly-optimized footprint that reduces energy and space requirements to expand addressable market and revenue opportunities. Hardened and weatherproof platforms provide municipal network operators with maximum flexibility and the ability to move their OLTs closer to end-users for improved performance.

From the customer side, Ciena's Residential Broadband Solution offers a family of Optical Network Units (ONUs), allowing end-users to benefit from multi-Gb/s connectivity

while being open to support other vendors' ONUs to provide increased choice.

Ciena's solution is open by design, allowing municipal broadband network operators to create the best possible network infrastructure by choosing preferred vendors that complement Ciena's market-leading network technology. This helps operators ensure they deliver a high-quality customer experience by not limiting their solution to a specific vendor's innovation cycle. This also allows operators to maintain better control over their procurement processes to minimize, and outright eliminate, lock-in. For municipal broadband network operators that need support to implement a multi-vendor network, Ciena's System Integration Service helps streamline the design, integration, validation, and implementation of a best-of-breed infrastructure.

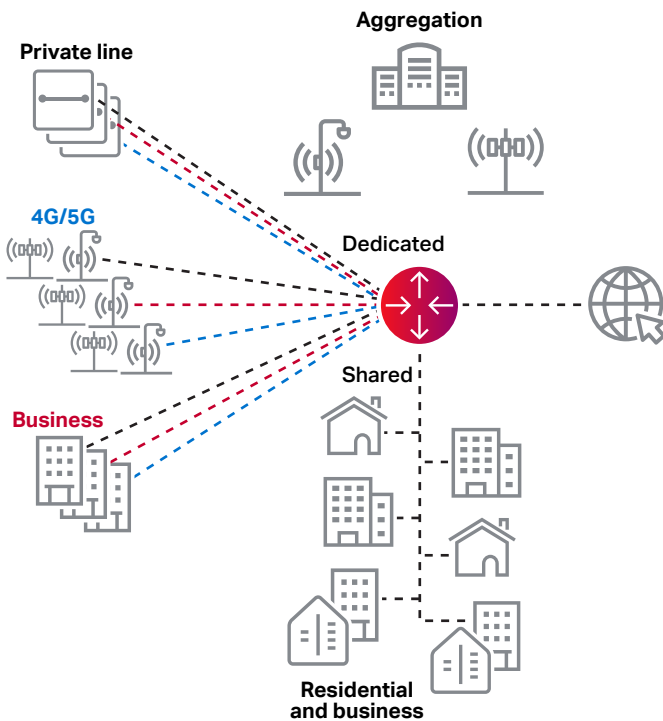


Figure 2. Ciena's Universal Aggregation Solution

Town of Dryden: One of New York's first municipal broadband providers [Read how](#)

Broadband beyond the network elements

Municipal government network operators are looking to deliver the best Quality of Experience (QoE) to their customers while increasing operational efficiencies. Broadband network planning, infrastructure commissioning, service fulfillment, and service assurance can be complex as networks have grown. Ciena's PON Operations, Administration, and Maintenance (OAM) software simplifies network and service management. PON OAM's carrier-class management and control supports Northbound IP API support for gNMI, NETCONF/YANG, and streaming telemetry over Secure Shell (SSH). PON OAM can be cost-effectively hosted on an external x86 server or internally on Ciena's UA platforms WebGUI.

Ciena's Residential Broadband Solution also leverages Ciena's MCP domain controller which allows municipal network operators to scale the network—simplifying operations, reducing cost, and delivering the agility and resiliency their customers expect. It provides operators with the ability to manage and orchestrate their multi-layer network from end to end—including middle mile, last mile, and Customer Premise Equipment (CPE)—when delivering broadband, enterprise, or mobile wholesale services using a common and integrated platform.

Supporting multi-vendor interop or third-party ONU integration, Ciena's solution avoids vendor lock-in by supporting both ONU Management Control Interface (OMCI) and Ethernet OAM in-band management. With rich carrier-class OAM and Provisioning (OAMP) software, operators can store configurations, provide Performance Monitoring (PM) data collection, perform fault monitoring, and manage firmware image.

Sustainability cannot be an afterthought

Investing in infrastructure to close the digital divide without considering all relevant environmental and economic sustainability aspects can negatively impact any service provider's long-term financial viability.

At Ciena, we continue to invest in the sustainability of all critical network elements by converging the access infrastructure with best-in-class routers, WaveLogic coherent optics, and innovative uOLTs and corresponding ONUs.

Sustainability models show we have already helped our customers avoid more than 550,000 metric tons of CO₂e over an eight-year period (2014–2021) with our Routing and Switching Platforms—helping our customers' production networks achieve 23 percent savings in power consumption, equaling 96,000,000 kWh saved which resulted in \$12 million per year OPEX savings.⁶

Through our WaveLogic coherent optic investments, we introduced the industry's first 400 Gb/s transceiver in 2017 and are delivering the pluggable version five years later at one fifth the power, one tenth the space, and with improved industry-leading systems performance.

Combining Ciena's routing, optical, and PON innovations together offers significant improvements in footprint and power savings to enable more efficient and sustainable networks for our customers—and the planet at large. For example, evolving from a traditional pure PON chassis-based,

multi-boxed solution to Ciena's converged access with XGS-PON and routing in a single platform results in a 67 percent reduction in footprint and 63 percent reduction in power consumption. This is just one example and, when applied to 100,000 homes passed at 50 percent market share (12 sites) using a 64 OLT split, can avoid 84,400 kWh annually, resulting in 59.8 metric tons of CO₂e avoided. A higher market share rate or homes passed would yield much larger sustainability results.

Full support to new and existing municipal governments

Many governmental agencies may not necessarily be set up to execute complex IT deployments. That's where Ciena Services' extensive experience, processes, and economies of scale can help assure a successful rollout. Depending on needs, Ciena Services is ready to assist—from initial planning and design, systems integration, and implementation to 'Day 2' services to optimize, support, and manage this powerful solution. Ciena Services also offers an extensive library of learning courses and labs to grow IT teams' residential broadband knowledge. Ciena Services are designed to be flexible—they are available individually or as a packaged solution—and consist of Consulting, Implementation, Systems Integration, Maintenance, Managed Services, Optimization, and Learning.

Ciena Services
Learn more



Ciena's solution also includes the MaaS program—an award-winning marketing service that takes network operators to market faster with collaborative engagement, execution, and dedicated marketing experts to accelerate time to revenue. Ciena not only supports the development of go-to-market strategies, but also executes to win business together.

Municipal broadband network operators should avoid legacy chassis-based approaches because they simply do not offer the capacity, efficiency, or adaptability required to succeed in a rural community while sustainably supporting new and emerging application requirements. Ciena leverages innovative broadband architecture and proven expertise in deploying ultra-high-capacity networks to enable providers to serve their community and thrive in the residential broadband market.



Was this content useful?

Yes

No

⁶ Ciena's Routing and Switching Sustainability Model to Quantify Equivalent CO₂ Emissions Avoided: 2014-2021