

# APPLICATION NOTE Broadband for rural utilities

Broadband service deployment in rural communities has been limited because it is difficult for legacy providers to justify a business case for broadband in sparsely populated areas. Consequently, the lack of adequate bandwidth for broadband challenges rural residents—from unreliable work, retail, and entertainment services to unavailable critical healthcare and advanced education services. Recent customer behavior and the proliferation of new and performance-hungry applications have only accelerated these trends, cementing high-speed, reliable broadband as an essential service rather than a luxury, no different from other essential utilities we sometimes take for granted, like electricity, gas, or water.

Rural utilities are uniquely positioned to have physical infrastructure for electric power and customer relationships that can be used to bridge the digital divide. However, their core business remains the supply of electrical power, which must be delivered safely, cost-effectively, and with fewer staff covering multiple roles. This fuels the need to emulate larger utilities in modernizing their power grid and automating their operations and billing with innovations such as deploying smart meters. The shift toward renewable energy generation, the growth in smart devices in homes, and the expanding electric-vehicle ecosystem create further challenges that strain communications solutions for utilities.

Managing the significantly increased volume of broadband traffic while allowing the prioritization and protection of critical teleprotection traffic demands a converged network for both broadband and smart grid services. This is a key factor when considering investing in a network that can address the core utility operational challenges and deliver rural broadband to the communities they serve.

### Highlights

- Electric co-ops in rural areas can deliver broadband like they did for electricity 90 years ago
- Utilities need a network that can modernize their power grid communications with capacity to support broadband services for their communities
- Ciena's broadband solution for utilities can support latencysensitive smart grid traffic with the scalability and safety to support broadband
- Ciena's flexible approach to broadband allows utilities to deploy a network with best-of-breed components
- Ciena's solution goes beyond the network elements to help utilities in their broadband journey, offering insight into other areas like Marketing as a Service (MaaS)



Figure 1. Converged residential broadband/smart grid network for utilities

#### Broadband is becoming an essential service

In recent years, society has been experiencing a major shift in how we work, play, and access entertainment. The move to working from home both for employed adults and students in schools, colleges, or universities—has dramatically increased the use of collaboration applications such as Zoom and Microsoft Teams, causing an exponential growth in internet traffic. While some schools and offices have a hybrid approach, the home-working trend has become more permanent. The move to remote working and learning and the massive uptick in entertainment streaming services such as Netflix and Hulu have led to a shift in internet traffic consumption.

Despite the increase in traffic levels, traditional service providers' metro networks coped well, and connectivity for consumers and businesses in urban areas remains a well-served market. Yet rural areas are still lagging regarding broadband network reach, access speeds, and cost. Despite government incentives, it is difficult for traditional service providers to justify the capital investment across the more dispersed population that characterizes rural broadband. But high-speed broadband is essential for people living in these locations. The need for reliable broadband is now a fundamental part of their working and recreational lives—no different than electricity was over 90 years ago.

## Broadband brings new monetization opportunities for rural utilities

Utilities have an existing business justification for investment in high-performance networks between their substations to carry traditional operational technology (OT) traffic. Building infrastructure for a utility's smart grid impacts how it deploys its substation OT services, such as teleprotection for power lines. Faster and more widespread monitoring and control at substations help the network respond to failures with corrective action. The modernized network must continue to support, secure, prioritize, and deliver ultra-low delay connectivity for these essential mission-critical services. It makes sense for utilities to use this smart grid communication infrastructure to support broadband services to meet the needs of their new residential and business customers. Not only does it create a new revenue stream, but it also provides an essential service for their rural communities.

The wholesale market provides further opportunities to resell additional network capacity. For example, the rollout of 5G mobile network technology means a tenfold increase in capacity for existing cell sites and many additional new sites. This is a great opportunity for wholesale in areas where the cost of a new build would be prohibitive for mobile carriers. Many businesses are focused on digital transformation, which requires improved connectivity. Rural utilities



Figure 2. Ciena's broadband solution for access networks

are well-positioned to help businesses achieve the high-performance connectivity they need to support their network modernization plans.

### Broadband delivers a network for smart grid and new services

A change of this magnitude in the network and the introduction of completely new service types may be viewed as high risk. Cultural factors must also be considered when merging the traditionally separate OT and IT networks and teams. A plan that divides the transition into three steps can mitigate this.

The first step is to build that portion of the network needed to support smart grid traffic. This provides confidence that the solution meets mission-critical teleprotection needs and other high-volume traffic, such as surveillance cameras and smart meters.

The second step is to offer residential customers broadband services in rural communities provided through the same flexible, scalable, and sustainable network for the smart grid. The final step is to offer wholesale and business connectivity services. For example, in regions with a 5G rollout in progress, mobile carriers will be looking for significant additional capacity. There are opportunities for capacity to support business applications, telemedicine, or remote learning in both the business and public sectors. With a flexible network, utilities can offer enterprise business services over IP or dedicated Ethernet and mobile wholesale services with xHaul transport capabilities.

### Ciena's broadband solution for access networks

Ciena offers unparalleled flexibility in broadband network deployment. It begins with Ciena's micro– optical line terminal (uOLT). It is the industry's first fully functional OLT in a small form factor pluggable (with embedded Ethernet-to-PON OLT MAC bridge). The uOLT turns qualified Ethernet ports in a host switch or router into a fully functional OLT on a port-by-port basis (no dedicated chassis required). The uOLT can be deployed anywhere in the access network, whether in an outdoor cabinet, pole, or controlled environment, with port-level granularity. This flexibility allows operators to use existing infrastructure and deploy 10G PON cost-effectively, whether on a small or large scale, in greenfield, brownfield, or mixed-vendor networks. With Ciena's broadband solution, no dedicated OLT chassis is required, and converged router/switch ports can be used for all services, including Ethernet, IP, TDM, OLT, and more. This protects the operator's investment and introduces several revenue opportunities. It also eliminates the need to qualify multiple OLT boxes for PON deployment.

Ciena's broadband solution allows for granular scaling, starting in increments as small as one port/one uOLT and scaling up based on traffic demand. This enables a pay-as-you-grow economic model. Ciena's virtual Broadband Network Gateway (vBNG) subscriber management function can be positioned anywhere in the network and scaled to handle evolving traffic patterns.

The key to the uOLT and higher-speed PON is ASIC development. Ciena owns, develops, and controls the ASIC technology, which is an industry-leading innovation that enables a fully functional OLT to be put on a chip. The pluggable uOLT model allows a graceful move to higher speeds (25GS-PON and CPON) when market demand dictates. Combined with Ciena leadership in coherent technology, owning and developing the technology provides unmatched flexibility and a guaranteed path to future innovation.

Ciena's broadband solution is designed with sustainability in mind—since no large, power-hungry fixed chassis is required, pluggable uOLTs can be deployed in a switch or router a port at a time and only use power, cooling, and space when needed. Additionally, converged router/switch ports can be used not only for PON but for other services as well (xHaul, enterprise, and so on) thereby reducing the number of platforms needed to deliver multiple services.

Legacy OLTs and chassis-based broadband network gateways (BNGs) often come in fixed sizes (small, medium, or large), which force service providers to sacrifice flexibility, scalability, and access sustainability. Ciena's pluggable uOLT, converged routers, and vBNG can be deployed anywhere in the access network with granular scalability to help optimize deployment economics and reduce environmental impacts in the access network without sacrifice. When managed by Ciena's Navigator Network Control Suite<sup>™</sup> (Navigator NCS), service providers can perform infrastructure, service, and subscriber lifecycle management to simplify operations, reduce OPEX, and transform the access network.

### Ciena Services supports new and existing utilities

As most utilities may not be set up to execute complex IT deployments, Ciena Services can provide extensive experience, processes, and economies of scale to ensure a successful rollout. Depending on needs, Ciena is ready to assist—from initial planning and design to systems integration and implementation, as well as 'Day 2' services to optimize, support, and manage this powerful solution. Ciena Services also provides a full learning course portfolio and labs to grow your team's residential broadband knowledge.

Marketing as a Service (MaaS) is also available as part of Ciena's broadband solution. MaaS features customized marketing strategies and tactics designed to enable participants to get the most from their network investments. MaaS is available to participants in the CPNe program and/or select customers.

### Summary

Modernizing the network requires investment, so utilities must ensure that the new network is fit and ready for all its services. Utilities must also ensure that they can scale to support not just smart grid traffic but also residential broadband and business services, bringing benefits to rural communities. Wholesale services can also support 5G mobile backhaul, further improving connectivity in rural settings.

Utilities are moving away from legacy approaches because they simply do not offer the flexibility, scalability, or adaptability required to succeed in a highly competitive market while supporting new and emerging application demands. Ciena uses an innovative broadband architecture and proven expertise in deploying ultra-high–capacity networks to help utilities thrive in the growing broadband market.



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