

# Cullman Electric

Powers Gigabit Broadband Speeds to Rural Alabama  
Using 100G Middle Mile Aggregation



Cullman Electric was one of the first cooperatives to be formed in the state—second out of a total of 22 co-ops—and was the first to provide electricity to its members. Now, 85 years later, Cullman is paving another path—launching the Sprout Fiber Internet broadband service to its customers.

## **Cullman Electric: Serving the community since 1936**

Cullman Electric Cooperative serves 45,000 member accounts distributed over approximately 1,000 square miles of Northern Alabama, primarily in Cullman and Winston counties between Birmingham and Huntsville. The co-op was founded by local farmers to ensure rural residents were afforded the same services and opportunities as those living in urban areas. Its mission today has stayed true to its founding principles to support and empower member's communities—ensuring these rural communities have access to reliable and affordable energy products and services.

## **Rural broadband in the United States**

Historically, high-quality broadband has been limited in rural areas because it is difficult for incumbent providers to build a business case for deployment where populations are sparse. In fact, about 10 percent of U.S. households—mostly in rural communities—do not have broadband service, defined as 25 Mb/s or greater. Yet people living in rural communities work from home; they shop, consume entertainment, and access advanced education services and critical healthcare data online. The COVID-19 pandemic has only accelerated these trends—elevating high-speed, reliable broadband from an optional service to an essential one—just like water or electricity.

## **Challenges at a glance**

- Aging OT network in need of modernization
- Insufficient capacity to add broadband traffic
- Aggregation of OT and broadband traffic
- Prioritization for OT traffic
- Integration with last-mile FTTH

When rural communities lacked access to electricity in the 1930s, co-ops like Cullman Electric filled the gap. Now, they have a similar gap to fill in delivering essential broadband connectivity to their communities. Access to fiber internet opens up opportunities for rural communities in education, healthcare, economic development, entertainment, and much more. It also helps electric co-ops utilize the latest smart grid technology to improve the quality and reliability of their electric service.

### **Cullman Electric's approach**

Cullman Electric recognized that the lack of broadband connectivity was having a negative impact on the residents in its service area, preventing them from enjoying the many benefits of modern technology—including telecommuting, streaming video services, and smart home appliances. It was also having a broader economic impact, deterring new businesses and industries from expanding or relocating into the region. Given its founding principles to support and empower members' rural communities, the co-op wanted to help.

Cullman Electric knew it would need much more capacity to deliver high-speed fiber internet to its residents. The rapid surge in demand due to COVID-19 resulted in significant overall broadband traffic growth—38 percent\* in less than three months. When employed adults shifted to work from home and students in schools, colleges, and universities moved to online learning, traffic dramatically increased. The use of video calling and conferencing applications, such as Zoom and Microsoft Teams, and the demand for cloud services contributed to the mounting pressure placed on the network.

Additionally, the phenomenon of consumers cutting broadcast cable packages in favor of streaming services such as Netflix and Hulu compounded the situation. As people began to access entertainment through these platforms, demand increased accordingly.

With these challenges in mind, Cullman Electric launched Sprout Fiber Internet, a Gigabit broadband service that brings Fiber to the Home (FTTH) of its rural members. To accomplish this, the co-op built a 100G fiber middle mile backbone between their electric substations to aggregate their electrical Operational Technology (OT) and their new broadband traffic using Ciena's 5171 Platform.

*\*Source: Sandvine Global Internet Phenomena – May 2020*

### **Key network challenges**

As an electricity utility, Cullman Electric had legacy OT connectivity in place. Evolving to smart grid required a modernization plan, and the addition of broadband traffic required a modernization of its middle mile infrastructure.

With a plan to offer broadband customers 300 Mb/s or 1 Gb/s packages, and use its connections to their full potential, Cullman Electric needed to build a middle mile solution between its substations with the scalability to meet its customers' demands—regardless of the amount of Netflix streamed or Zoom calls attended. A 100G middle mile aggregation solution was the clear choice.

However, the challenge was bigger than just delivering higher data speeds. It was essential that the modernized network could continue to deliver secure, prioritized, and ultra-low delay connectivity for their mission-critical OT services. Cullman Electric needed a solution that enabled the aggregation of broadband and OT traffic onto a converged, modernized middle mile aggregation network with appropriate class of service differentiation between traffic types.

### **Ciena's solution**

With its 5171 Platform, which delivers best-in-class middle mile universal aggregation, Ciena enabled Cullman Electric to build a scalable 100G-200G middle mile backbone for its mission-critical OT traffic while aggregating its Gigabit Sprout Fiber Internet broadband traffic in a converged solution. The 5171 can scale to enable Cullman Electric to add broadband customers and increase bandwidth utilization per household. It can also segregate the co-op's mission critical OT traffic, ensuring OT traffic gets the highest priority to keep the lights on in Cullman and Winston counties.

Cullman Electric's 100G middle mile network means that Cullman's customers can have faith in the performance of their subscribed services and know that they have the bandwidth to satisfy all their streaming, work-from-home, remote education, smart home, and remote healthcare needs—well into the future.

Cullman also partnered with Walker & Associates which played a key role in integrating the end-to-end solution, including Ciena for the middle mile and a target 10G PON solution for the last mile.

**Cullman Electric – Sprout Broadband**  
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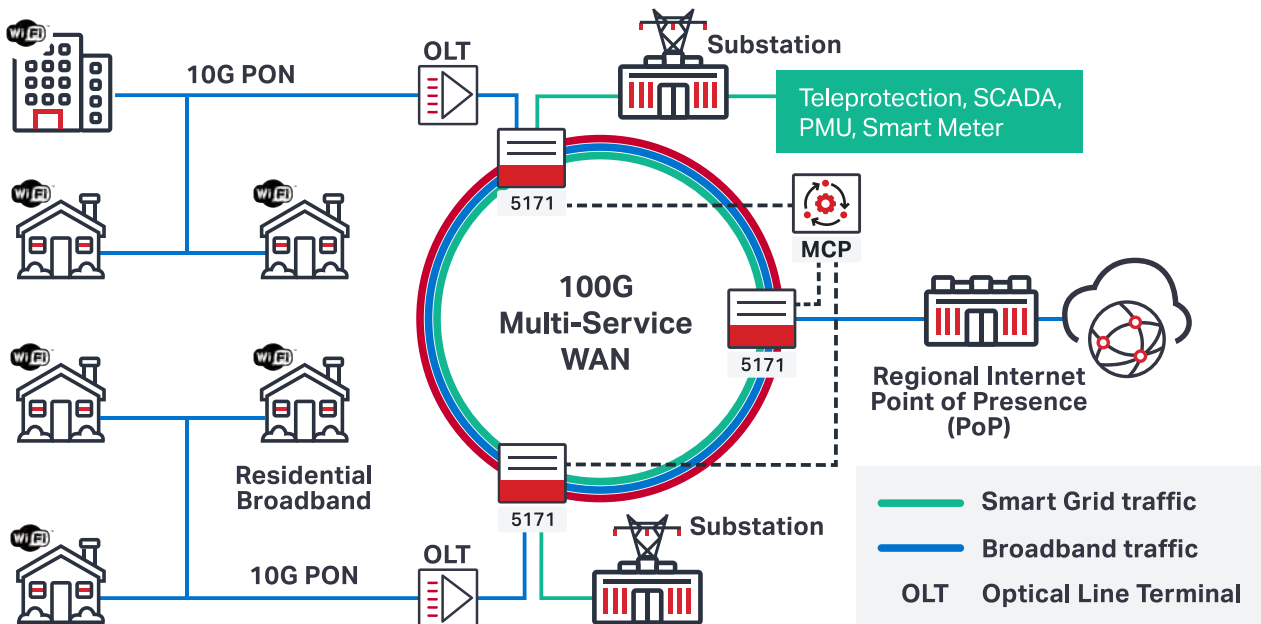


Figure 1. Ciena's 5171 as an optical substation WAN solution for a target 10 Gb/s PON architecture

### Ciena's 5171 for 100G middle mile aggregation

The 5171 is a next-generation 100G packet-optical universal aggregation platform with enhanced Operations, Administration, and Maintenance (OAM) capabilities. Complete visibility and centralized software control of the network is provided by Ciena's Manage, Control and Plan (MCP) domain controller so that provisioning, monitoring and service assurance operations can be performed most efficiently. Utilizing WaveLogic™ 5, it allows DWDM to be used to build an advanced middle mile network with 100GbE packet aggregation. It is compact in size and temperature-hardened for the varied, remote, and often hostile environment in which substations must operate—making it ideal for serving rural substations.

The 5171 addresses the multi-service needs of utilities which wish to offer residential optical broadband (Passive Optical Network), high-bandwidth services to enterprises, and wholesale applications such as mobile backhaul, by delivering high-density 10GbE aggregation. It delivers the standards-based, predictable low-latency performance that is essential for OT applications, and provides reliable, instant failure detection for quick recovery and maximum availability.

### Cullman Electric's results

Cullman Electric now has the performance and scalability needed across its entire 1,000 square mile service footprint and is poised to successfully roll out its Sprout Fiber Internet broadband service.

- **Increased bandwidth speed** to deliver a middle mile aggregation layer at 100G that has sufficient headroom for Cullman's residential customer applications
- **Improved smartgrid performance** delivered through field-proven, ultra-low latency packet WAN enabling optimal teleprotection performance
- **Converged mission-critical smart grid and substation traffic** along with broadband customer traffic via middle mile aggregation, while ensuring OT traffic gets the highest priority

### Summary

Ciena's middle mile aggregation solution addressed Cullman Electric's challenges to deliver scalable rural broadband internet services for its community.

The solution enabled Cullman to deliver its mission-critical smart grid and OT traffic while providing the scalability to support the broadband applications its members demand today and will require into the future. It enhanced bandwidth capacity, lowered latency, and prioritized teleprotection—and gave Cullman an efficient, streamlined, secure foundation for future services.

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