

APPLICATION NOTE

Broadband for consulting and engineering firms

The importance of delivering broadband service to underserved communities and supporting digital inclusion continues to receive increased attention—but it is not new for consulting and engineering firms (CEFs). For years, CEFs have been at the center of the expansion of broadband services, supporting internet service providers, regional service providers, municipalities, and utility co-ops in the development of business plans, design and deployment of network, and—in some cases—managing the entire solution and service lifecycle.

Today's availability of public and private financing targeting the buildout of broadband networks presents a once-in-a-lifetime opportunity for network operators—and the important role of CEFs will grow substantially.

Ensuring digital inclusion for those in rural and remote areas is an important mission. In many cases, it can overwhelm the resources of small and medium-sized network operators. In these cases, CEFs are more than trusted advisers—they are the glue that binds different stakeholders together while helping to define and deliver the highest-value solution possible.

CEFs have been advising network operators for decades in how to design, build, and operate their network infrastructure—focusing on solving today's challenges while preparing for the future. That role is as important as ever, and the stakes have never been higher. Today, operators find themselves at a crossroads, a critical decision point regarding the build-out of their broadband access networks. This decision could impact the direction of their business over the three-decade lifespan of their fiber.

Broadband connectivity has transitioned from being a luxury to becoming a critical utility—one that people are deeply dependent upon. The CEF mission has evolved, and they now need to support network operators in building a

Benefits

- The adoption of home-based activities like remote work and learning, gaming, and video streaming have changed broadband service requirements, particularly those requiring performance and symmetric traffic
- CEFs must now help their customers implement a best-of-breed and future-proof network, integrate multiple suppliers and technologies, develop operational expertise, and focus on long-term sustainability
- CEFs are revisiting their supplier relationships in the design of next-generation broadband networks—looking for solutions with more flexibility, scalability, and sustainability
- Unpredictable subscriber demand requires a flexible broadband solution that can efficiently scale where and when needed, which can be difficult with legacy approaches

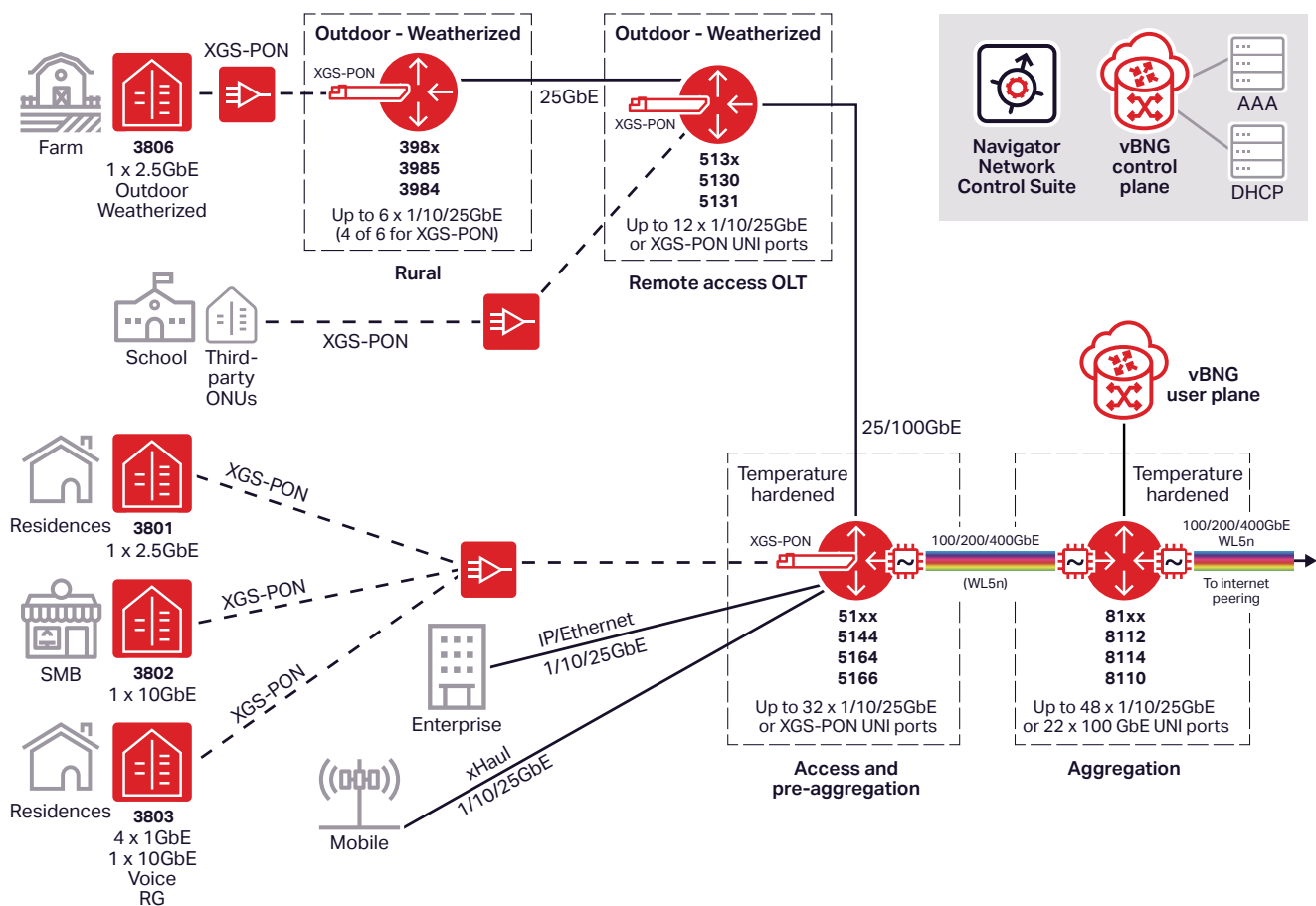


Figure 1. Ciena's broadband solution for access networks

network that can meet the current needs of cities, regions, and communities, while creating a clear path for the future.

New applications and evolving market dynamics are significantly changing broadband service requirements. CEFs must rethink how they architect and design networks and how they choose technology collaborators that can deliver a solution with the flexibility, performance, and cost-effectiveness that network operators need now and in the future.

Historical approaches and legacy architectures limit the ability of CEFs to deliver on this mission because those legacy approaches fail to address fundamental business challenges:

Lack of flexibility: The specific sizing and port count of fixed form factor (pizza box or chassis-based) optical line terminals (OLTs) and broadband network gateways (BNGs) dictate where they can be physically and economically deployed in the network. Operationally, legacy OLTs are limited as they can only deliver a single shared service and require a separate router to deliver additional services.

Inability to incrementally scale: In fixed form factor OLTs, initial deployment and future scaling is dictated by platform size (small, medium, or large) or port count. Operators are often forced to initially deploy more capacity than needed and scale in chunks of capacity as opposed to gracefully scale as demand dictates.

Poor sustainability model: Traditional access networks are typically built with single-purpose, power-hungry equipment that take up a less-than-optimal amount of space. All this is in direct opposition to operators' sustainability goals.

CEFs and their network operator clients shouldn't have to choose between:

- Overspending on initial deployment or limiting the ability to match scaling to demand
- Supporting a single service type or deploying multiple devices to support multiple services
- Sacrificing sustainability driven by being locked into legacy architectures

The mission to create a digital future for all is too important for network operators to compromise. Ciena's broadband solution is designed to deliver

the flexibility, scalability, and sustainability required by network operators to remain competitive and to support the mission of ensuring equitable access to broadband services while protecting their network investment well into the future.

Ciena's broadband solution harnesses the power of Ciena's portfolio by using groundbreaking innovations in passive optical network (PON) pluggables (micro-OLT or uOLT), purpose-built routers, optical network units (ONUs), and subscriber management (Ciena's virtual Broadband Network Gateway [vBNG]) and network control software (Navigator Network Control Suite™ [Navigator NCS]). Ciena's broadband solution gives operators unprecedented flexibility to build and evolve their access networks to serve more customers in more locations, scale cost-effectively, and achieve greater sustainability. (See Figure 1.)

Universal Aggregation and Access
over 10G PON Transceivers

[Learn more](#)

Pave your path to better broadband

[Navigator NCS](#)

Flexibility and scalability begin with Ciena's 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 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—in an outdoor cabinet, pole, or controlled environment—with port-level granularity. It enables the delivery of 10G PON cost-effectively, whether on a small or large scale and in greenfield, brownfield, or mixed-supplier networks. Since no dedicated OLT chassis is required, other converged router/switch ports can be used for other services, including Ethernet, IP, xHaul, TDM, OLT, and more. PON can be deployed where and when needed and in the increment required to maximize revenue and broadband penetration. Scaling can occur in increments as small as one port/one uOLT and scale up based on traffic demand. This enables a true pay-as-you-grow economic model.

In addition, Ciena's extensive router offerings include hardened and weatherproof options. They provide

network operators with maximum flexibility and the ability to move the OLT function out to the far reaches of their network to deliver PON anywhere in the access network, including remote rural locations. And, by aggregating and supporting multiple services, Ciena's routing and switching offerings deliver unmatched flexibility in a highly optimized footprint that reduces energy and space requirements for improved sustainability.

The pluggable uOLT model easily allows a move to higher speeds (25GS-PON uOLT) without major disruption and opens new market opportunities. ASIC development is key to the uOLT and PON scaling to higher speeds (25GS-PON and beyond). Ciena owns, develops, and controls the ASIC technology. Combining this with our leadership in coherent technology provides unmatched flexibility and an assured path to future innovation—an important consideration as technology continues to evolve.

Additionally, the fixed broadband access network has several critical components, but the linchpin is the BNG. The BNG establishes and manages subscriber sessions by acting as the authentication point through which subscribers connect to a carrier's broadband access network. It aggregates subscriber traffic from the access network and handles several important subscriber management functions, including authentication, authorization and accounting, IP address assignment, quality of service, and policy management.

Legacy chassis-based BNGs, with their historically closed architectures, make it difficult to address the rapidly changing demands for scalability and flexibility. Ciena's vBNG is an open architecture built to the Broadband Forum's TR-459 standard: "Control and User Plane Separation for a disaggregated BNG." User planes can be sized and placed throughout the network where traffic demands dictate and can then scale gracefully to meet growing demand.

Ciena's broadband solution offers a family of ONUs, so end-users benefit from multi-Gb/s connectivity for a range of solutions, including residential, multiple dwelling units, and small-to-medium business/enterprise. Realizing that operators may have existing ONU relationships, and with a focus on openness, the solution supports the ONU management control interface (OMCI) so operators can deploy third-party ONUs.

Ciena's universal aggregation

[Get insights](#)

Management and control are critical. Service providers also want to operate and scale their broadband access networks in a cost-effective and sustainable way. However, they are often encumbered with multiple legacy element management systems or controllers that require manual coordination of IP and optical operational workflows, resulting in long lead times and suboptimal network designs. With Navigator NCS, network operators gain a single point of control to visualize the performance of their multi-layer, multi-vendor infrastructure. They can then simplify, optimize, and automate network operations, reducing costs and improving customer quality of experience.

Expanding broadband access to underserved communities requires planning, deployment, management, and support along with specialized skillsets, tools, and deep institutional knowledge for this emerging technology. In some cases, CEFs may not have the resources to provide all the necessary functions. Ciena offers a full suite of professional support services, as well as learning and marketing services to augment those offered by the CEF, if the CEF chooses.

Ciena Services includes the following offerings, available individually or as a package, to complement those provided by the CEF: Consulting Service, Implementation Service, Systems Integration Services, Maintenance Service, Managed Services, Optimization Service, and Learning Service.

[Ciena Services](#)

[Learn more](#)

Why Ciena for broadband access?

- **Flexible:** Allows operators to deploy anywhere in the access network with the ability to start small and expand networks where and when customers need it—streamlining operations and ensuring financial sustainability
- **Scalable:** Helps build a high-capacity broadband access network that scales dynamically so providers can deliver a top customer experience now and into the future while matching subscriber growth to deployment
- **Sustainable:** Accelerates sustainability goals with smallest-footprint and lowest-power consumption over traditional architecture

With once-in-a-generation broadband investments, the moment is here for CEFs to rethink how they support their clients in planning, building, and deploying broadband access networks. Focusing on a flexible, scalable, and sustainable solution, CEFs can continue their role as trusted advisers as they help network operators serve their communities and thrive in the broadband market.