APPLICATION NOTE

Broadband for internet and regional service providers

Internet service providers (ISPs) and regional service providers (RSPs) have been major drivers of broadband infrastructure growth across the globe. With a commitment to developing the communities they serve, they face the challenges of connecting geographically large, lower-density areas but with a tight business case. To deliver a high quality of experience (QoE) while remaining profitable as both technology and demand evolve, they require a smarter, more flexible broadband infrastructure.

Broadband network investments face unprecedented momentum. Technological and behavioral shifts in the spheres of work, education, and entertainment have radically accelerated, making high-performance broadband connectivity essential to everyday life—and a highly coveted resource. This expectation for ubiquitous connectivity has been met by a surge in private funding, coupled with massive public stimulus. The convergence of exploding demand and abundant capital has created an extraordinary opportunity for fiber-to-the-home (FTTH) expansion. ISPs and RSPs have been at the forefront of this movement, advancing new infrastructure, services, and capabilities to areas previously unserved or underserved, where often lower household density makes the business case particularly challenging for network expansion and/or modernization.

These service providers are critical to the communities they serve, and they often have strong local ties. They help bridge the digital divide and, by enabling high-quality broadband internet access, promote tangible economic and social development—ultimately integrating and connecting society. It is a noble mission but not an easy one.

Delivering a high QoE at competitive prices over large areas of sparse and uneven demand requires an extremely flexible broadband solution, capable of adapting to the reality of each location and scaling as needed. But even

Highlights

- ISPs and RSPs play a critical role in their communities, helping bridge the digital divide, promote economic development, and integrate and connect society
- Uneven and hard-to-predict subscriber demand requires a flexible broadband infrastructure that can start small and efficiently scale when needed
- To continue delivering great QoE as technologies and demand evolve, providers must embrace flexible, scalable, and sustainable architectures that can easily adapt to future requirements
- Network monetization is crucial to sustaining business profitability, achieved through converged platforms capable of seamlessly supporting business and wholesale services
- Once-in-a-generation private and public funding has created a unique opportunity to modernize access networks and address the digital divide

in remote areas, laying fiber and offering superior technology is no guarantee of avoiding competition. The sustained success of ISPs and RSPs depends on seizing every opportunity to monetize investments and to keep competitors in check.

Why Ciena for broadband access?

- **Flexible:** Allows providers 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 sustaining user growth
- **Sustainable:** Accelerate sustainability goals with the smallest-footprint, lowest-power technology

Innovation in deploying broadband access networks

Unfortunately, the legacy approaches of incumbent vendors force ISPs and RSPs to compromise in building their broadband access networks. Legacy architectures lack flexibility and are hindered by traditional chassis-based or pizza-box architectures of the optical line terminal (OLT) and broadband network gateway (BNG). They are typically constrained in size (small, medium, or large) or in fixed port count, often forcing operators to:

- Overspend on their initial deployment or limit their ability to gracefully scale
- Deploy several network elements to support multiple services
- Choose between either optimizing OPEX or delivering great QoE
- Compromise on sustainability or scalability

Creating an inclusive digital future is too important for service providers to sacrifice. ISP and RSPs are seeking modern and sustainable alternatives to implement their broadband networks—moving away from closed chassis-based approaches toward more flexible and scalable architecture.

There is a newer and smarter way to build broadband access networks. Using ground-breaking innovations in passive optical network (PON) pluggables, purpose-built routers, and subscriber management and network control software, Ciena's broadband solution provides a new way to build and evolve access networks. ISPs and RSPs gain unprecedented flexibility to serve more customers in more locations, scale cost-effectively and only as demand requires, and achieve greater sustainability with the smallest-footprint, lowest-power technology.

It begins with Ciena's micro-OLT (uOLT), 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), while other ports can be used for other services (Ethernet, IP, TDM, OLT, and so on).

This capability brings unmatched flexibility to PON deployment with the ability to deploy out of a central office, street cabinet, or an outdoor site such as on a pole or strand. RSPs and ISPs can cost-effectively deploy 10G PON surgically or at scale in all types of networks. Freed from the constraints of OLT sizing determined by a chassis-based or pizza-box form factor, PON can be deployed where needed, when needed, and in the increment needed to maximize revenue and broadband penetration.

Ciena's broadband solution is complemented by a full family of host routers and switches. This includes outdoor weatherized options, enabling PON deployment anywhere in the access network, including remote rural locations. Scaling can occur in increments as small as one port/one uOLT and scale up based on traffic demand. This enables a pay-as-you-grow economic model.

Additionally, the fixed broadband 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 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 (QoS), 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 virtual Broadband Network Gateway (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 in the network where traffic demands dictate and then scale gracefully to meet growing demand.

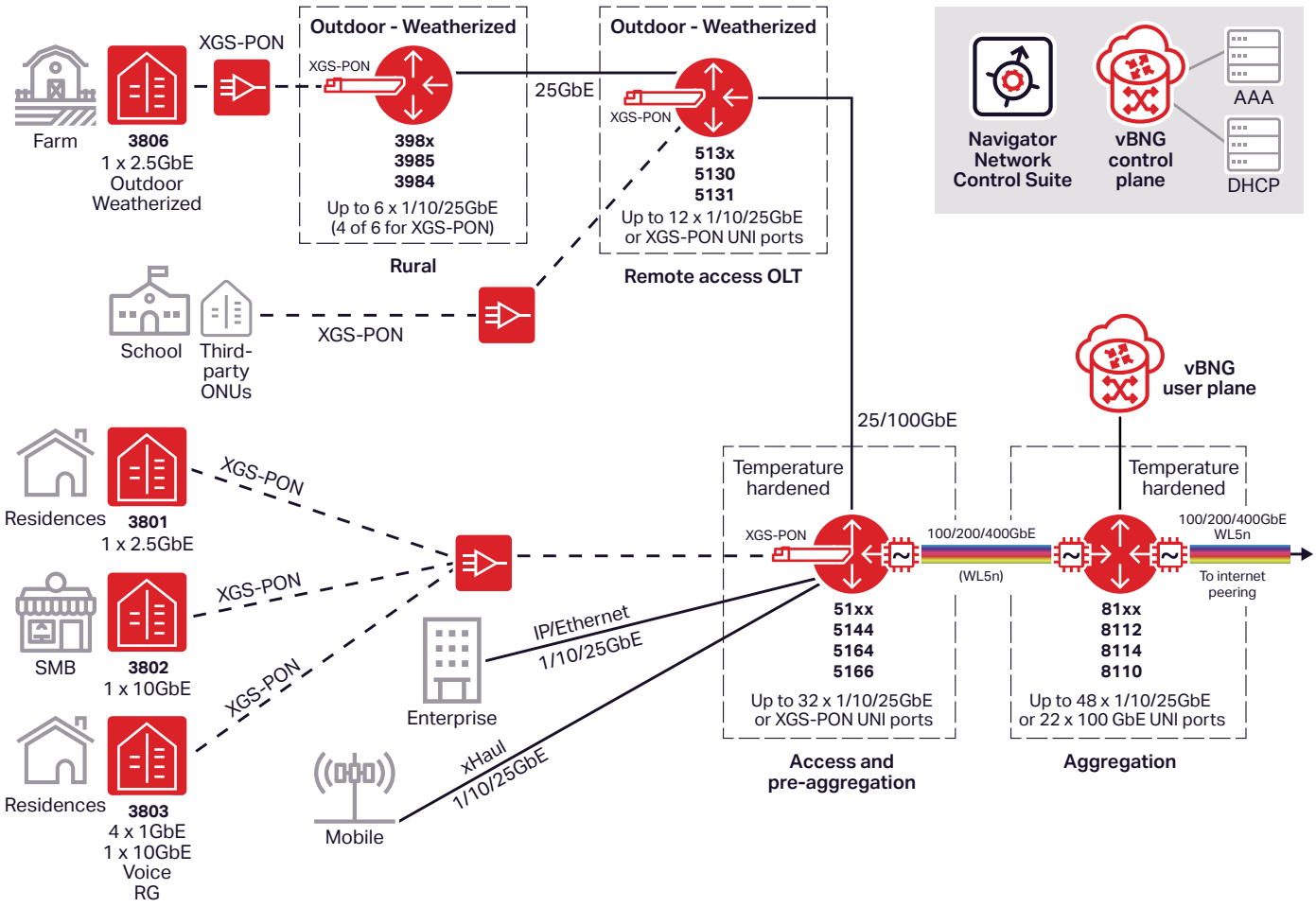

Figure 1. Ciena's broadband solution for access networks

Operators can accelerate their sustainability goals and reduce environmental impacts with Ciena's broadband solution, which was designed with sustainability in mind. For example, since no fixed chassis is required, pluggable uOLTs can be deployed in a qualified router (a port at a time) and only use power, cooling, and space when needed. Since converged router/switch ports can be used for all services (Ethernet, IP, TDM, OLT, and so on), there is an efficient use of power, cooling, and space spread across multiple services. Fewer boxes, smaller footprint, less power and cooling—better sustainability.

Management and control are critical. Service providers want to operate and scale their broadband networks in a cost-effective and sustainable way. However, they are often encumbered with multiple legacy element management systems (EMSs) or controllers that require manual coordination of IP and optical operational workflows, resulting in long lead times and suboptimal network designs. With Ciena's Navigator Network Control Suite™ (Navigator NCS), providers 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 experience quality.

Ciena offers a highly scalable broadband solution that can easily ramp from tens to hundreds of XGS-PON ports without sacrificing previous investments, replacing existing network equipment, or requiring significant upfront costs.

Ciena's routing and switching portfolio capabilities are used to support multiple service options in addition to residential broadband, enabling new revenue streams. Providers can then offer enterprise business services over IP or dedicated Ethernet and mobile wholesale services with 4G/5G xHaul transport capabilities. Moreover, the highly optimized footprint reduces energy and space requirements to expand the addressable market and revenue opportunities.

Hardened and weatherproof platforms provide additional flexibility, with the ability to move OLTs closer to end-users for improved performance.

Host routing platforms for PON **Explore options**

Full set of services to support new or existing RSPs and ISPs

Many RSPs and ISPs may not be set up to execute complex IT deployments. That's where Ciena Services' extensive experience, processes, and economies of scale can help with 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. These services are designed to be flexible—they are available individually or can be packaged together—and consist of consulting, implementation, systems integration, maintenance, managed services, optimization, and learning.

Marketing as a Service (MaaS) is 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.

RSP and ISP network operators should avoid legacy approaches because they do not offer the flexibility, scalability, or adaptability required to succeed in a rural community while sustainably supporting new and emerging application requirements. Ciena uses an innovative broadband architecture combined with proven expertise in deploying ultra–high-capacity networks to help providers serve their communities and thrive in the broadband market.

Ciena's universal aggregation and access approach **Learn more**