APPLICATION NOTE

Broadband for cable MSOs

Cable companies, also known as multiple system operators (MSOs), perform an essential role in providing broadband services, mainly in North America. For decades, they have been the leading broadband service provider for many cities and communities—and they helped navigate the challenges created by the COVID-19 pandemic. Now, in a moment where access to broadband connectivity is recognized as a key driver of socioeconomic improvement, cable MSOs are in a prime position to use their extensive delivering broadband service to underserved communities.

Nevertheless, this opportunity comes with challenges. New applications require more from networks, and market dynamics are bringing new players to regions previously dominated by cable MSOs, thereby significantly increasing competition.

Additionally, cable MSOs have a strong position providing broadband connectivity for small and medium-sized businesses (SMBs) in many regions. They also have significant investments in implementing a converged interconnect network (CIN) and moving fiber deeper into the network. These two factors create an excellent opportunity for cable MSOs to target large enterprise markets, expanding their addressable market and creating new revenue opportunities.

Cable MSOs must rethink their broadband network infrastructure by adopting a more flexible, scalable, and sustainable broadband solution to protect their competitive edge while providing the flexibility to grow their core business as they expand into new markets.

Highlights

- The strong 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
- Competition from service providers using different access technologies like passive optical network (PON) and 5G-based fixed wireless access (FWA) is growing fast, mainly in densely populated areas
- For many years, cable MSOs invested in Data Over Cable Service Interface Specification (DOCSIS) technology to provide broadband services over cable's hybrid fiber coax (HFC) networks
- DOCSIS cannot provide the same scalability, performance, and symmetry as PON or the cost and flexibility of 5G FWA
- Cable MSOs are looking to augment their existing DOCSIS network capacity to support the latest customer demands while using fiber-based access for greenfield and when competition requires
- Ciena supports cable MSOs in implementing broadband networks as the market continues to evolve

Rethinking network strategy for new-market success

The last several years saw a drastic shift in how and where people work, play, and learn. "Everything-from-home" behavior necessitated by the global pandemic shed light on the importance of reliable and affordable broadband connectivity services to help support individuals, families, and communities in achieving financial, social, and educational goals. It also accelerated the development of cloud-based applications with more strict network requirements. Aspects like high bandwidth, low latency, symmetry, and reliability have always been desirable—and they are now more important than ever.

Cable MSOs are invested in deploying and expanding HFC-based networks, using the multiple integrations of DOCSIS technology to provide customers with the latest residential applications and services. They are also investing in moving fiber deeper into the network and implementing a distributed access architecture (DAA) to keep up with competition and new application requirements.

Competition continues to grow, even in areas where cable MSOs have historically been the dominant or sometimes only provider. Communications service providers (CSPs) are investing in fiber-based access technology like PON, and mobile network operators (MNOs) are using 5G FWA to provide residential services in both new and served areas. This competition is causing cable MSOs to lose customers while reducing average revenue per user, which was already impacted by the "cord-cutting" trend. Complicating matters further, the continued investment cable MSOs are making to update their DOCSIS-based networks is often not enough to compete with fiber's scalability, reliability, and performance or with the low cost and flexibility of FWA implementations.

Despite all the challenges, cable MSOs have an established brand, strong customer relationships, and deep operational expertise in broadband services. The once-in-a-generation public and private investments in broadband networks happening over the next five years provide the perfect opportunity to rethink network strategies and evolution of the existing infrastructure with the potential to create a highly competitive broadband service offering.

Supporting new applications and helping to ensure equitable access will define the winners and losers in the broadband market. Ciena is ready to help cable MSOs evolve their CIN strategy by implementing a flexible, scalable, and sustainable infrastructure that can support their existing DOCSIS-based network while providing access to the latest PON technology like XGS-PON.

Why Ciena for broadband access

- **Flexible:** Allows providers 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:** Accelerate sustainability goals with smallest-footprint and lowest-power consumption over traditional architectures

Broadband solution

Ciena's broadband solution is designed to deliver the flexibility, scalability, and openness that cable MSOs require. This solution also helps operators implement a sustainable network and remain competitive while supporting the important mission to close the gap in broadband accessibility, protecting their network investment and maintaining a competitive edge well into the future.

This solution uses the power of Ciena's portfolio, including routing and switching products with XGS-PON pluggable technology, market-leading optical networking technology, Ciena's Navigator Network Control Suite™ (Navigator NCS), Blue Planet® Intelligent Automation Portfolio, and Ciena Services.

The broadband solution allows end-customers to access applications including for telemedicine, remote working and learning, cloud gaming, and ultra-high-definition video streaming. It enables network operators to enhance their offerings to deliver new capabilities when required by the metaverse and augmented reality/virtual reality applications—without the need to rip and replace existing network infrastructure.

Cable MSOs are moving fiber deeper into the network, closer to end-users, implementing a DAA

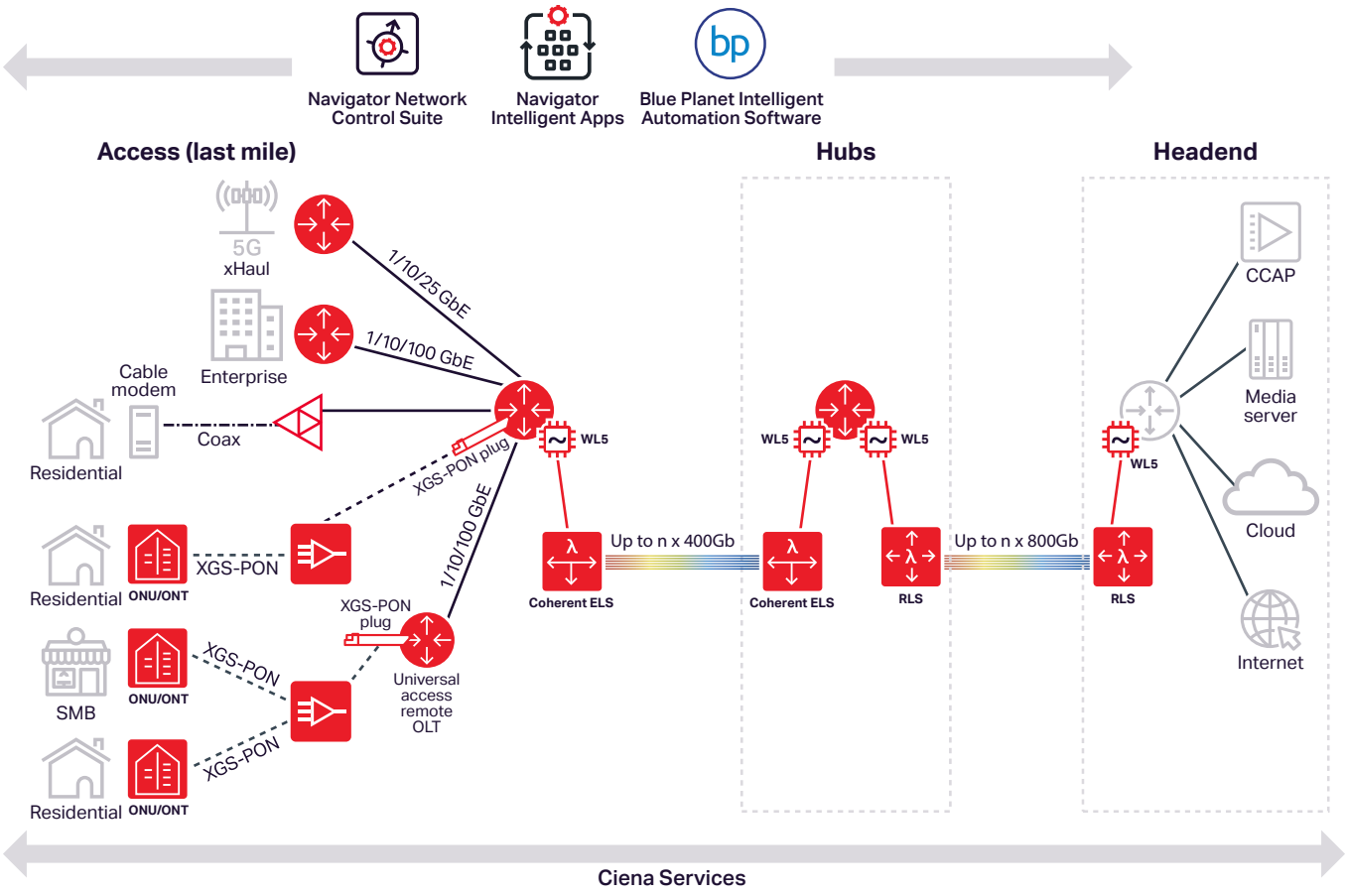

Figure 1. Ciena's broadband solution

by virtualizing and distributing the converged cable access platform and adopting a device providing both remote media access control and physical layer device (R-MAC/PHY) or simply a remote-PHY (R-PHY) in the access. This is part of how DOCSIS technology is evolving to support new applications that require increased capacity and scalability in the network.

Cable MSOs can achieve the capacity, optimization, and add efficiency needed to evolve their CIN infrastructure—using a combination of Ciena's routers, intelligent flexible photonics infrastructure, market-leading WaveLogic™ 5 coherent optical technology, and Navigator NCS. By aggregating and supporting multiple services at the hubs, Ciena's routing and switching products deliver unmatched scalability and flexibility to cable MSOs by providing traffic using multiple 100/200/400GbE network-to-network interfaces.

On the broadband access network, Ciena's routing and switching products integrate XGS-PON technology, offering symmetrical 10GbE connectivity over shared fiber. The broadband solution allows cable MSOs to complement their DOCSIS-based services, using XGS-PON only when required or implementing a gradual migration to fiber-based access.

Ciena Services also provides customers with the expertise to plan, design, deploy, manage, maintain, and support their residential networks, as well as train their technical staff.

Innovative broadband architecture for cable MSOs

Ciena's broadband solution allows the convergence of hub and fiber-to-the-home access functionality by integrating XGS-PON micro–optical line terminal (uOLT) pluggables in Ciena's routing and switching products, enabling the offering of multiple services over shared fiber for residential as well as small and medium-sized enterprises (SMEs).

Flexibility and scalability are hallmarks of 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 qualified Ethernet ports in a host switch or router into a fully functional OLT on a port-by-port basis (no dedicated chassis required).

Scaling can occur in increments as small as one port/one uOLT and scale up based on traffic demand. This means cable MSOs only need to deploy the capacity required to serve current demand while having the ability to add additional uOLTs as traffic grows for true modularity and pay-as-you-grow economics.

The pluggable uOLT model easily allows a move to higher speeds (25GS-PON uOLT) without major disruption, which 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, which is an important consideration as technology continues to evolve. Ciena's routing and switching products are ready to support 25GS-PON when the market demands,

Ciena's scalable and flexible broadband solution allows network operators to use existing infrastructure and easily deploy and expand XGS-PON offerings without the need to replace existing network equipment or significantly incur upfront costs.

The broadband solution uses Ciena's access and universal aggregation to support multiple services in addition to XGS-PON. Network operators can offer enterprise business services over IP or dedicated Ethernet and mobile wholesale services with xHaul transport capabilities. Moreover, the highly optimized footprint will reduce energy and space requirements as they sustainably expand to address market and revenue opportunities. Ciena's extensive offering of routers includes hardened and weatherproof products that 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.

From the end-user side, our broadband solution offers a family of optical network units (ONUs), so end-users benefit from multi-Gb/s connectivity, including for residential, multiple dwelling units, and SMB/SME. Realizing that operators may have existing ONU relationships, and with a focus on openness, the solution supports the ONU management control interface so operators can deploy third-party ONUs.

Ciena's broadband solution allows cable MSOs to create the best possible network infrastructure by choosing preferred suppliers that complement Ciena's network elements. This helps operators maintain their competitive edge.

Deploying broadband: More than just network element deployment

Cable MSOs want to deliver the best quality of experience to their customers while increasing operational efficiencies. Broadband network planning, infrastructure commissioning, service fulfillment, and service assurance can be complex as networks have grown.

With Navigator NCS included with the broadband solution, operators can scale the network—simplifying operations, reducing cost, and delivering the agility and resiliency their customers expect. It provides cable MSOs with the ability to manage and orchestrate their multi-layered network from end to end—including headend, hubs, and other equipment when delivering broadband, enterprise, or mobile wholesale services using a common and integrated platform.

Full support for cable MSOs

To expand broadband access to underserved communities requires planning, deployment, management, and support along with specialized skillsets, tools, and deep institutional knowledge for this emerging technology. While some MSOs may have the requisite capabilities, others may not. Ciena offers a full suite of professional support services, as well as learning and marketing services. Ciena Services collaborates with you to ensure your network keeps pace with ever-evolving business needs so you can deliver exceptional customer experiences. Ciena Services includes the following offerings, available individually or as a package: Consulting Service, Implementation Service, Systems Integration Services, Maintenance Service, Managed Services, Optimization Service, and Learning Service.

Sustainability at the forefront

Investing in infrastructure to close the digital divide needs to consider how the architectural choices being made can positively impact the environment and deliver the highest level of sustainability. 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.

Combining Ciena's routing, optical, and PON innovations 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% reduction in footprint and 63% reduction in power consumption. This is just one example, and when applied to 100,000 homes passed at 50% market share (12 sites) using a 64 OLT split, 84,400 kWh can be avoided annually, resulting in 59.8 metric tons of CO2e circumvented. A higher market share rate or homes passed would yield much larger sustainability results.[1]

1 OMDIA, "Pluggable PON and Ciena – promoting sustainable access," Julie Kunstler and Jaimie Lenderman, April 2024

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