ciena

EBOOK

Bridging the Digital Divide

Playbook for Community Broadband Providers

North America
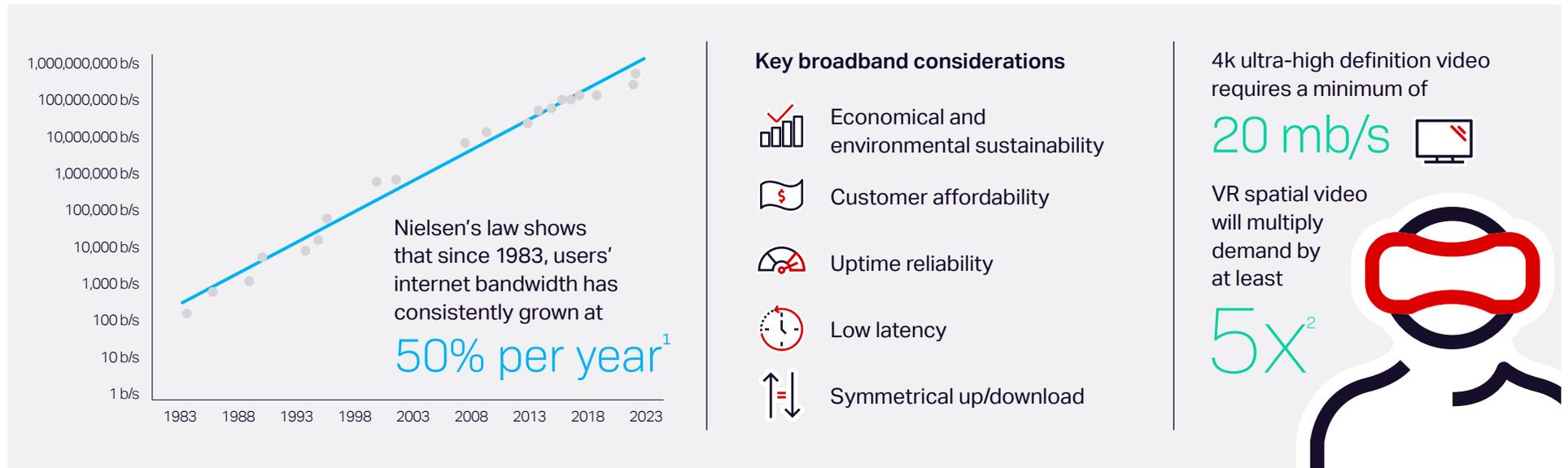
Table of contents

A pivotal moment in broadband history

Broadband is a necessity for the way we live, work, and play, which is why high-speed connectivity for everyone is so vital for the benefit of the greater good for all citizens. New public funding and private investments have made internet access for remote and underserved communities a major priority for broadband service providers.

It's time to build meaningful connections for everyone, with infrastructure that can keep up with the demands of today and adapt to the landscape of the future.

Broadband providers have a duty to get deployment right while also accounting for future application demands. As consumer reliance on broadband increases, networks must adapt for the capacity needed for cloud gaming, virtual reality, streaming, and video conferencing. Low latency, symmetrical up and down speeds, and long-term reliability without sacrificing financial sustainability or customer affordability are aspects that should not be ignored.

Nielsen's law shows that since 1983, users' internet bandwidth has consistently grown at

50% per year[1]

Key broadband considerations

- Economical and environmental sustainability
- Customer affordability
- Uptime reliability
- Low latency
- Symmetrical up/download

4k ultra-high definition video requires a minimum of

20 mb/s

VR spatial video will multiply demand by at least

5x[2]

1 Nielsen Norman Group, "Nielsen's Law of Internet Bandwidth", Jakob Nielsen, Apr. 4, 1998, updated Jan. 23, 2023, https://www.nngroup.com/articles/law-of-bandwidth

2 Scoop Independt News, "Download Weekly: Apple Vision Pro: Fast fibre's killer app", Bill Bennet, Jun. 11, 2023, https://www.scoop.co.nz/stories/HL2306/S00017/download-weekly-apple-vision-pro-fast-fibres-killer-app.htm#:~:text=Low%20latency%20essential,least%20a%20steady%20100%20mbps.

U.S. and Canada public stimuli programs

Reliable internet is as essential to daily life as landline telephone service was only a few decades ago. However, deployment and cost considerations have made it difficult to reach unserved and underserved communities — including low-income populations, Tribal communities, and rural or remote areas.

The U.S. and Canadian governments have introduced economic stimulus packages designed to meet the growing need for dependable internet access in areas where service is lacking—and are advancing projects that enhance equitable, affordable broadband connectivity.

At a glance:

		2023	2024	2025	2026	2027	2028	2029	2030
U.S.	Broadband Equity Access and Deployment (BEAD) Program	$42.5B	States funded June 2023	Funding requests	Approval and implementation					100% reach
	Digital Equity Act	$2.75B								
	Tribal Broadband Connectivity Program (TBCP)	$3B								
	Enabling Middle-Mile Broadband Infrastructure Program	$1B				Funding window closed 5-year implementation plan				
Canada	Universal Broadband Fund	CAD$3.25B				98% reach				100% reach
	Provincial funding	CAD$7.68B								

Broadband Equity Access and Deployment (BEAD) Program

Goal: Ensuring all people in the United States have access to affordable, reliable, high-speed internet service by 2030

Funding: $42.5 billion[1]

What to know: Funding to states and territories for distribution to broadband offices, network operators, municipalities, and other entities began in June 2023. State broadband offices had until the end of 2023 to submit their initial proposals describing how they plan to run their grant programs, with review and approval happening on a rolling basis. States and territories will be permitted to request access to at least 20% of their allocated funds.

25% match of the total award amount and a letter of credit are required to secure funding.

Funding allocation

June 30, 2023: National Telecommunications and Information Administration allocates funds to states for distribution

December 1, 2023: Deadline for states to submit initial proposals of how grant funds will be used and managed

Broadband providers work with state broadband offices to submit applications and deploy funds

BEAD allocation by state (in $M)
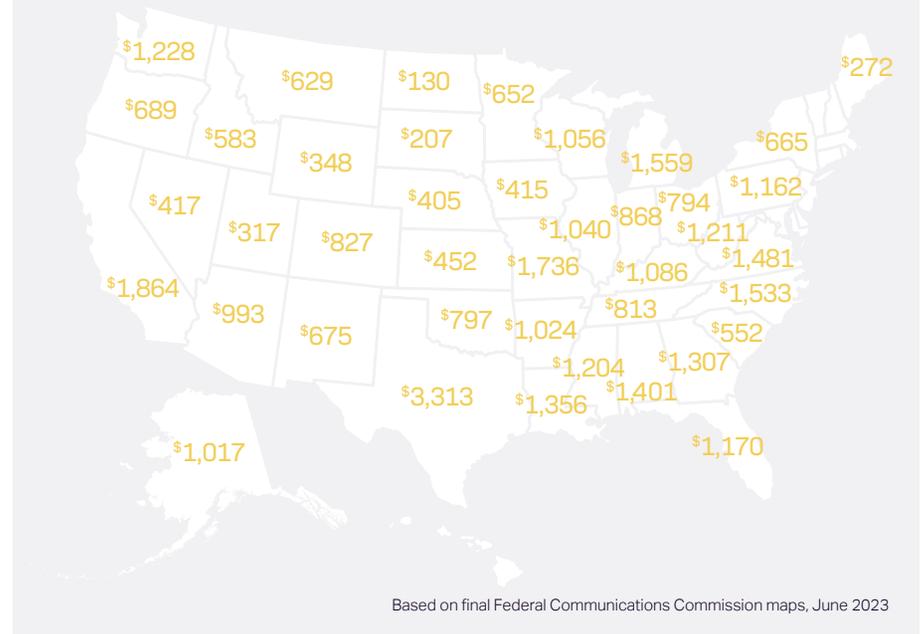
Based on final Federal Communications Commission maps, June 2023

---

1   Statescoop, "Here's How Much Every State Is Getting from BEAD Grant Program", Lindsay McKenzie, June 26, 2023, https://statescoop.com/heres-how-much-every-state-is-getting-from-bead-grant-program

Provider requirements to receive BEAD funding

- Minimum 25% contribution towards project's total cost
- Letter of credit certifying a bank will reimburse the federal government 25% of program awards in the event of a default
- Broadband speeds of at least 100/20 Mb/s (requirements may vary between in some states)
- Latency low enough for 'reasonably foreseeable, real-time, interactive applications'
- Need to comply with Build America, Buy America Act (BABA) requirements
- 48 outage hours per year or less
- Regular conduit access points for fiber projects
- Begin providing service within four years of grant date, unless extended by the state
- Offer at least one low-cost broadband option
- Provide broadband service to each customer served by the project that desires it
- Provide public notice of service and launch a public awareness campaign
- Provide wholesale access if provider is no longer able to offer broadband service
- Cover areas with 80% or more in unserved or underserved households, or connect anchor institutions lacking 1 Gb/s symmetrical
- Commit to detailed reporting requirements which include lists of serviceable locations, a description of the facilities, and details on the services offered
- Compliance with state-specific program requirements and rules

Connectivity for all—Ciena's commitment to BABA

At Ciena, innovation and collaboration are key pillars of our mission, driving our commitment to the expansive reach of broadband and the principles of open architecture. The growth and prosperity of America is inextricably linked to equitable access to superior broadband connectivity that has evolved from a convenience to an essential modern utility.

Our ethos of empowerment and inclusivity informs our strategic direction and resonates with foundational programs like the Broadband, Equity, Access, and Deployment (BEAD) and the Build America, Buy America (BABA) Act.

Get an overview of these programs and learn how our operations and values reflect a deep commitment to ensuring our work advances the cause of connectivity while meeting the mandates of BABA.
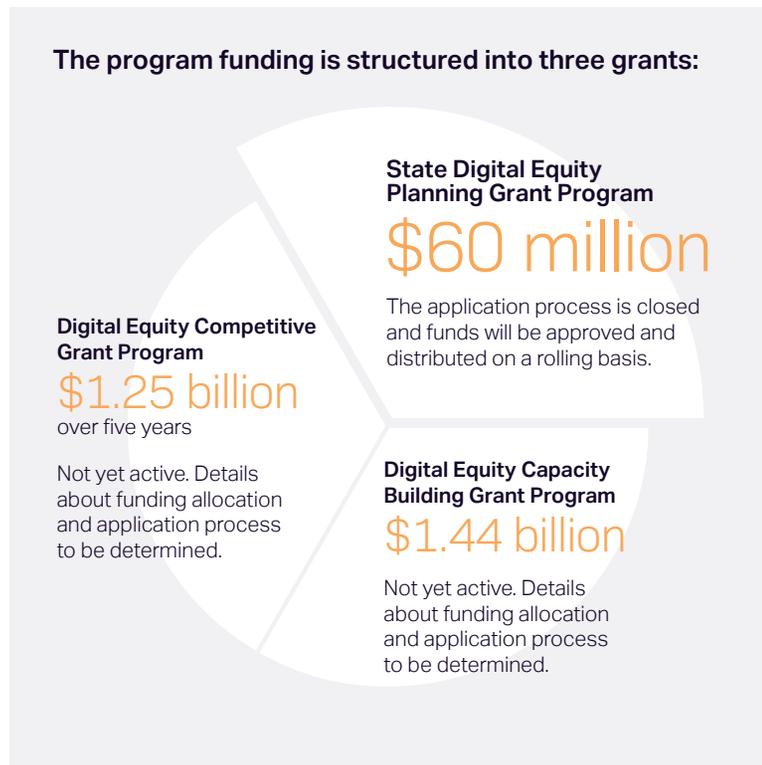
Digital Equity Act

Goal: Fostering digital equity, closing the digital divide, and advancing digital literacy through eligible entities, including state governments and agencies, nonprofit groups, Native/Indigenous organizations, and recognized Tribal governments

Funding: $2.75 billion

What to know:

The program funding is structured into three grants:

State Digital Equity Planning Grant Program

$60 million

The application process is closed and funds will be approved and distributed on a rolling basis.

Digital Equity Competitive Grant Program

$1.25 billion

over five years

Not yet active. Details about funding allocation and application process to be determined.

Digital Equity Capacity Building Grant Program

$1.44 billion

Not yet active. Details about funding allocation and application process to be determined.

Tribal Broadband Connectivity Program (TBCP)

Goal: Helping Tribal governments deploy broadband on Tribal lands

Funding: $3 billion

What to know: $1.78 billion has already been awarded to 191 Tribal entities. A second round of funding opened in July 2023 for an additional $980 million in funding, with between $1–50M available to eligible applicants deploying high-speed internet infrastructure.

Enabling Middle-Mile Broadband Infrastructure Program

Goal: Expanding middle-mile infrastructure and reducing the cost of connecting unserved/underserved areas

Funding: $1 billion

What to know: Application process is closed. Grant distribution began in March 2023. Grant recipients have a five-year implementation timeline.

Other U.S. programs

- **Broadband Infrastructure Program** — $288 million directed at state-provider partnerships
- **Connecting Minority Communities** — $268 million funding for broadband service, equipment, and training at historically underserved minority educational institutions

Helping your customers afford broadband

The Affordable Connectivity Program (ACP), managed by the NTIA, is a $14.2B program that provides subsidies to qualifying low-income individuals to make home internet service and device purchases more affordable. This program replaced the Emergency Broadband Benefit (EBB) Program.

Universal Broadband Fund (Canada)

Goal: Covering 98% of Canadians by 2026, with complete nationwide broadband coverage achieved by 2030

Funding: CAD 3.25 billion

What to know: The program supplies funds to providers who have the ability to design, build, and run broadband infrastructure in new markets through entities that cover certain regions. Applicants must make a business case to justify funding. As of July 2023, $645M has been allocated to 92 recipients. The program includes up to $750 million for large-scale, high-impact projects.
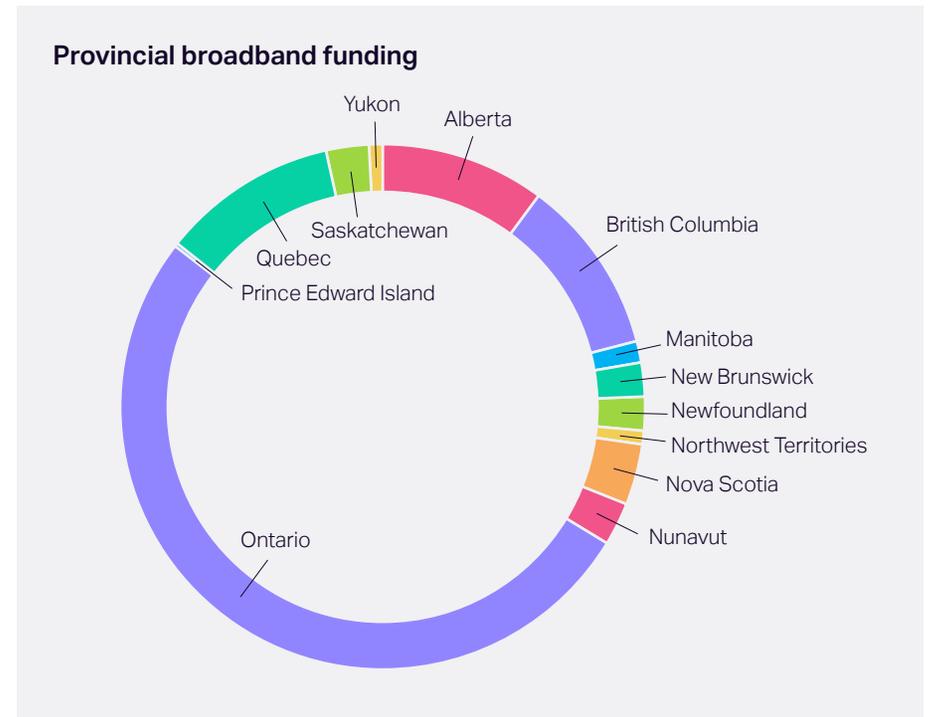
Provincial funding (Canada)

Goal: Deploying or enhancing broadband infrastructure for rural citizens, according to specific provincial needs and requirements

Funding: Over CAD $7.5B[1] in provincial funding, matching federal and other sources

What to know: Each province and territory has committed funds to unserved or underserved residents above and beyond Universal Broadband Fund (UBF) funding, with a minimum speed of 50/10 Mb/s over a variety of access methods.

Provincial broadband funding

1 ROCK Networks, "The State of Canada's Provincial and Territorial Broadband Funding", 2023, https://www.rocknetworks.com/the-state-of-canadas-provincial-and-territorial-broadband-funding

Broadband network checklist

Rural and urban landscapes share few things in common, but their connectivity demands are the same. People want to stream their favorite shows and connect with friends and family without having to worry about buffering or poor quality, and businesses need a reliable way to connect with customers from anywhere, anytime.

Location shouldn't matter. That's why it's critical for broadband networks to work no matter where, no matter what.

Use this checklist to help find blind spots in your plan.

☐ **Planning**
Have you built your plan? Do you need consulting or engineering support?

☐ **Flexibility**
Can your broadband solution be deployed on street cabinets, utility poles and in unconditioned spaces?

☐ **Sustainability**
How much power does your equipment require?

☐ **Modularity**
Can you start small, and scale as you grow without a 'rip-and-replace' exercise? How long do you can keep serving your community well before needing a refresh?

☐ **Openness**
Does your vendor play well with others, or will you be locked into their technology?

☐ **Scalability**
Does your vendor support XGS-PON and is ready for 25GS-PON in the last mile and 400G for the middle mile?

☐ **Capacity**
How will you accommodate current demand and future growth?

   ☐ Middle mile — Have you accounted for the compounding effect of increased adoption over time and increases in individual household bandwidth consumption?

   ☐ Last mile — How will the technology you're deploying meet future demands?

☐ **Operation**
In-house or outsourced?

   ☐ Service activation — What will your service delivery intervals be? How will your team handle surges in user activations?

   ☐ Customer service — What happens when problems arise? What level of visibility will your team have?

☐ **TCO**
How much will your solution truly cost to set up and run, including capital and operation expenditures? How long is your equipment expected to last? How much manual time will it take to monitor, configure, and manage?

☐ **Monetization**
What's your go-to-market plan? How will you increase adoption? Can the same network provide additional services, like IP/Ethernet services, wholesale, or 5G xHaul?

☐ **Support**
Do you have a trusted partner who can provide resources to help with expertise and references?

Protecting your network investments in the long term

Organizations entering the broadband marketplace come from various backgrounds, with varying degrees of technical and operational expertise. A vested interest in the long-term viability of their venture and investment is something they have in common.

Planning a new network deployment (greenfield scenario)

Becoming a broadband provider can seem like a daunting challenge. Whether you've previously operated a utility and are moving into an adjacent service or you're a municipality with limited knowledge or experience, successful broadband infrastructure deployment depends on a thoughtful plan that accounts for every aspect of the operation.

Planning your network, picking the right technology platform, and building the network is just the first step. Providers need the expertise to activate, operate, and repair services, and they need an effective go-to-market plan to drive adoption and growth.

Relying on peers and experts who can help you find roadblocks and potholes on your broadband deployment journey is essential to long-term success.

Designing a network evolution or expansion (brownfield scenario)

Operators moving into new areas need to approach broadband deployment with fresh eyes. Bringing less densely populated areas online requires broadband technology that is flexible, as a utility pole is sometimes the only space available. It should also be modular—deploying more capacity than demand can accommodate is wasteful, as is having to replace gear for upgrades.

And, an open technology that interoperates with existing deployments and different systems is key to leveraging the latest innovations and avoiding vendor lock-in.

Key considerations for deploying and operating a broadband network

Plan

- Complete a TCO analysis to ensure competitiveness
- Engineer your network to accommodate current and future demand
- Plan for rapid growth and avoid 'forklift' upgrades
- Pick vendors that offer:
  - Open architectures to avoid vendor lock-in and best-of-breed options
  - Modular — start small and grow as you grow
  - Scalable — ensure enough capacity for future growth

Build

- Deploy in phases based on demand
- Plan for delays—permitting and construction always require more than expected

Run

- Deploy end-to-end back office systems to cover order entry, provisioning, service management, and billing
- Make sure you are ready with in-house or outsourced personnel
  - Order entry
  - Service activation and provisioning
  - Customer service technicians
  - Field operations for installation and repair activities

Grow

- Launch a coordinated awareness campaign to introduce yourself to potential customers
- Inside sales teams for residential and small- and medium-sized business (SMBs), direct sales for mid-sized and large business
- Consider wholesale customers (wireless cell site backhaul, wholesale broadband access)

Improve

- Conduct customer satisfaction and network perfomance insight (NPI) surveys
- Focus on high-bar operational metrics and areas of feedback for continuous improvement
- Strengthen and protect your brand and your value to the communities you serve

Looking into OPEX traps

A lower up-front price tag does not necessarily lead to a lower lifetime cost. It's necessary to look at the broader picture to understand the total cost of ownership. Hidden costs like higher power consumption, costly subscription models, greater management complexity, and inefficient deployments can put competition readiness and financial sustainability in peril.

A modular solution that requires lower initial CAPEX, consumes less power, and allows for gradual node scaling saves power. Intuitive domain controllers and built-in automation with an open, interoperable architecture save time and require fewer hours to deploy and manage. This solution also directly affects the customer quality of experience and the business bottom line.

Ciena's disruptive broadband solution

Getting ready to meet the demands of performance applications starts with changing the way we think about what a broadband network is*.*

Services overview: full support to new and existing network operators

Ciena has the resources and knowledge needed to support a smooth rollout—from planning and deployment to operation, supporting growth, and beyond.

Creating a digital future for all requires proper planning, deployment, management, and support. Some network operators have skill and ability, others may not. Regardless, Ciena has developed a prevalidated reference architecture available to all customers that anchors an end-to-end customizable suite of professional, support, learning, and marketing services to assure commercial success, including:

- Customizable solutions anchored in reference architecture with planning, design, and integration that pre-validate Ciena and third-party components, and allow for customer preference substitutions
- Planning, design, and engineering support and resources that can help with the process, and free resources like our Middle-Mile Capacity Forecast for Residential Broadband

- Operations support system/business support system (OSS/BSS) integrations
  - Enhanced deployment capabilities, such as integrated staging, including passive and active cabinets
  - Deployment/turn-up and test
- Rollout assurance to support initial service rollout and/or self-deployment
- Learning services and the Ciena Partner Network's award-winning Marketing-as-a-Service (MaaS) program*
- 'Day 2' support, including managed services and technical support

* Newcomers to the residential broadband space and organizations whose marketing teams could use a boost can tap into the resources and tools of the Ciena Partner Network's MaaS program—included at no additional charge in most cases—to accelerate the go-to-market pathway with guidance from dedicated marketing experts who can help win business together.

Ciena's reference architecture

Open, modular, scalable. When it comes to getting the greatest performance evolving existing networks putting broadband where no infrastructure exists, these concepts will define what a future-proof footprint looks like.

It's impossible to predict how broadband networks will evolve in the future. Laying the groundwork for effective broadband architecture that works as well in a decade as it does today requires open design. Investing in solutions that support integrations from other vendors ensures long-term viability and the flexibility needed to work with even the most demanding performance requirements.

It's not just about hardware. Virtualization and disaggregation are a vital part of providing low-latency services and cost-effective delivery. Simplification is essential—virtual broadband network gateways (vBNG) and a control and user plane separation (CUPS) model are the backbone that defines what a truly disruptive plan looks like.

While the technological components are important, nothing takes priority over sustainability. Environmental and economic stewardship cannot be treated as an afterthought. The investments of today will last well into the future—everything involved with designing and building the new infrastructure must be carried out with that perspective in mind. Systems that can handle the long haul should be optimized for power and space saving, with rugged and weather-resistant construction that can maintain reliability and performance in even the harshest conditions.
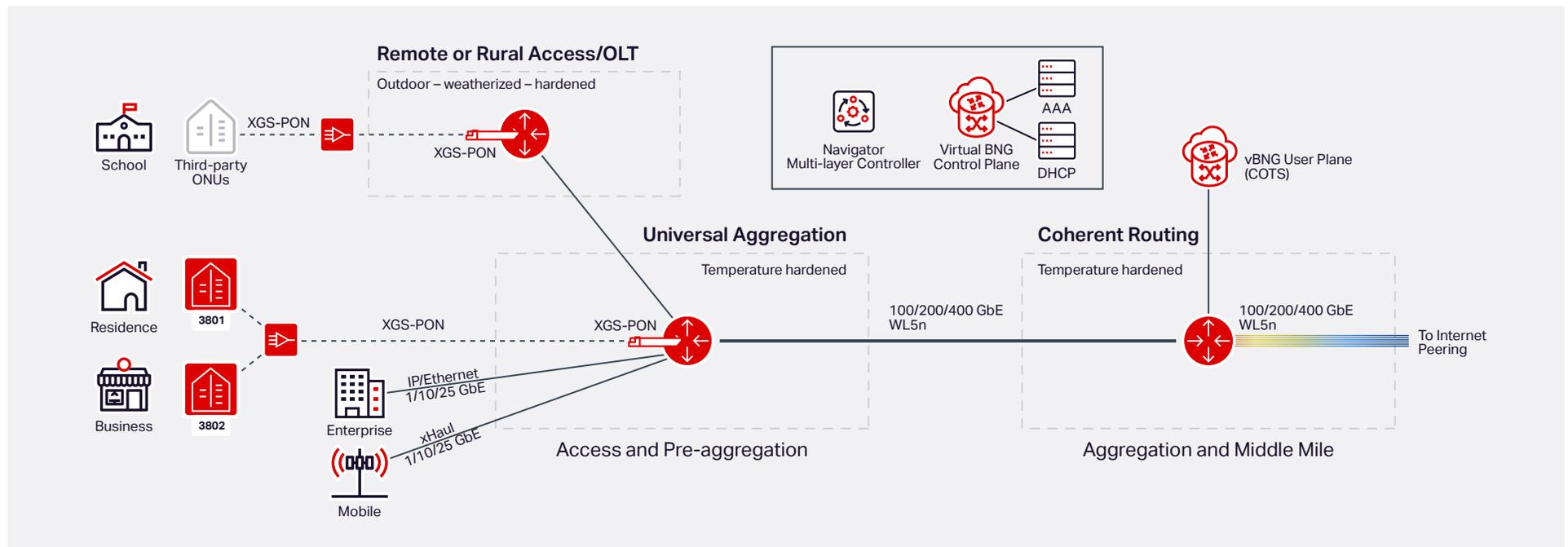
Key component overview

Ciena's broadband solution includes the following key architectural components:

Universal Access and Aggregation routers/ µOLT Host

Ciena's routing and switching platforms provide unmatchable scalability and flexibility by aggregating fiber-to-the-home (FTTH) or middle-mile traffic using multiple 100, 200, or 400GbE network-to-network interfaces (NNI), powered by market-leading WaveLogic™ coherent optical pluggables to support both existing and future bandwidth requirements.

This allows the convergence of last/ middle-mile or FTTH/metro aggregation functionality by integrating XGS-PON micro-optical line terminal (µOLT)

5164

pluggables in Ciena's routing and switching platforms, offering shared fiber broadband services for residential as well as small and medium enterprises (SMEs). Ciena offers one of the best XGS-PON port density per rack unit (RU) and the lowest energy consumption per port for typical deployments, while allowing customers to buy only the XGS-PON pluggables required, when required, in a pay-as-you-go business model. As the market evolves, Ciena's routing and switching platforms are ready to support 25GS-PON plugs when applications require it and when they are available in the future.

XGS-PON uOLT Pluggable

Ciena's µOLTs are designed to accommodate the flexible deployment of 128 households at a time for scale-as-you-grow convenience. These pluggable OLTs plug directly into Ciena routers to give broadband providers the greatest flexibility to adapt to uncertain and growing demand.

µOLT Pluggable

Premises equipment (Ciena's 38XX series) ONT/ONU

For end-users, Ciena's broadband solution offers a family of optical network units (ONUs), allowing end-users to benefit from multi-Gb/s connectivity while providing increased choice by being open to support other vendors' ONUs using open ONU management and control interface (OMCI).


3801

Virtual Broadband Network Gateway (vBNG)

Ciena's virtual Broadband Network Gateway (vBNG) is transforming the network edge with its ability to deliver network functions in software through its cloud-native, fully virtualized architecture. It provides operators with the agility, reliability, and scalability required to deliver high-value broadband services to residential and enterprise customers.

Navigator Multi-layer Controller (Navigator MC)

Broadband connectivity demands continue to increase rapidly. Networking technology is advancing at top speed to keep pace, and Broadband, IP and optical architectures are converging. Now is the time to go beyond legacy network management systems (NMS) and industry software-defined networking (SDN) practices and take network operations to a new level with multi-layer intelligent network control, offered by Ciena's Navigator MC.
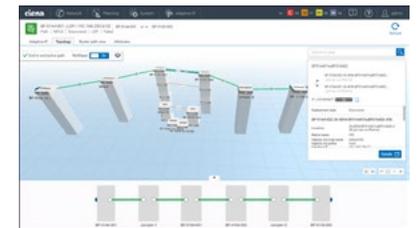
Ciena broadband solution is Build America, Buy America (BABA) compliant.

Connectivity for all—Ciena's commitment to BABA

At Ciena, innovation and collaboration are key pillars of our mission, driving our commitment to the expansive reach of broadband and the principles of open architecture. The growth and prosperity of America is inextricably linked to equitable access to superior broadband connectivity that has evolved from a convenience to an essential modern utility.

Our ethos of empowerment and inclusivity informs our strategic direction and resonates with foundational programs like the Broadband, Equity, Access, and Deployment (BEAD) and the Build America, Buy America (BABA) Act.

Get an overview of these programs and learn how our operations and values reflect a deep commitment to ensuring our work advances the cause of connectivity while meeting the mandates of BABA.

Was this content useful?

About Ciena

Ciena (NYSE: CIEN) is a global leader in networking systems, services, and software. We build the most adaptive networks in the industry, enabling customers to anticipate and meet ever-increasing digital demands. For three-plus decades, Ciena has brought our humanity to our relentless pursuit of innovation. Prioritizing collaborative relationships with our customers, partners, and communities, we create flexible, open, and sustainable networks that better serve all users—today and into the future. For updates on Ciena, follow us on LinkedIn, Twitter, the Ciena Insights blog, or visit www.ciena.com.

For updated information about the government programs described here, please refer to the agencies that administer them. The products and services described here are available only to participants in the Ciena Partner Network (CPN). For more information about CPN, contact cienapartnernetwork@ciena.com.

ciena.