Decoding the 10G Opportunity

Service providers set the pace for 10G broadband and beyond.

By Sean Buckley / *Broadband Communities*

GPON and DOCSIS 3.1 are the go-to gigabit broadband technologies for residential and business services today. But it's clear that telco and cable operators see 10 Gbps and its variants as the next speed target for consumers and businesses.

The 10G race will be driven by diverse players. Already, Fibrant offers 10G in Salisbury, North Carolina, and Chattanooga's EPB customers can purchase a premium-priced 10G service.

More recently, Lumos Networks launched four FTTP profiles – 2, 4, 8 and 10 Gbps – to rural Virginia customers. It anticipates increasing speed profiles based on ADTRAN's software-defined access (SD-Access) architecture.

"The 10G network is an evolution into what we see as a demand for more and more speed profiles and broadband capability," says Diego Anderson, senior vice president and general manager of Lumos Networks. "And the great thing about this product is, it's symmetrical."

WHO NEEDS 10G?

The initial use of 10G will be for business and wholesale services. Initially, most service providers will offer residential customers 2–5 Gbps profiles. This is largely because most consumer electronic devices don't support connections higher than 1 Gbps today. However, service providers will offer 10G to consumers who desire such speeds for a higher premium price.

Broadband Trends said in a study that "deployment of 10G PON for residential applications is not expected until 2020 for the majority of operators."

AT&T has hinted that its 10G drive will focus on small-business services and wireless backhaul.

"What we tried to develop was something that can be used for consumers – not that consumers would need more than a gigabit – but with that same PON you have the capacity to [serve] small business," says Eddy Barker, assistant vice president of access architecture and design for AT&T. "You could also use it for mobile backhaul capabilities."

Although businesses will be the likely target for 10G FTTP, Frog is preparing a residential 10G product at the Walsh Ranch in Fort Worth, Texas. The XGS-PON network will support 2 Gbps with an automatic upgrade path to 10G.

"I get people who ask, 'Ten gigs? Isn't that excessive?'" said Michael Voll, CEO of Frog, during the Great Communities session at the 2019 **BROADBAND COMMUNITIES** Summit. "There's a kid somewhere who is going to blow away the creativity and the innovation of Steve Jobs, who will change lives, and I don't want to be living in a community where I don't have 10G."

NEXT-GEN PON RISING UP

Service providers deploying 10G FTTP have new methods that build on the existing PON family of network standards. By 2024, analyst firm Ovum forecasts, next-gen PON will represent 72 percent of total PON equipment revenues.

Ovum predicts sales of next-gen GPON optical network terminals (ONTs/ONUs) will grow at a CAGR (2019–2024) of 190 percent and sales of legacy GPON ONTs/ONUs will decline at a CAGR (2019–2024) of 11 percent.

PON ONT/ONU port (unit) forecast by type
(Source: Ovum)
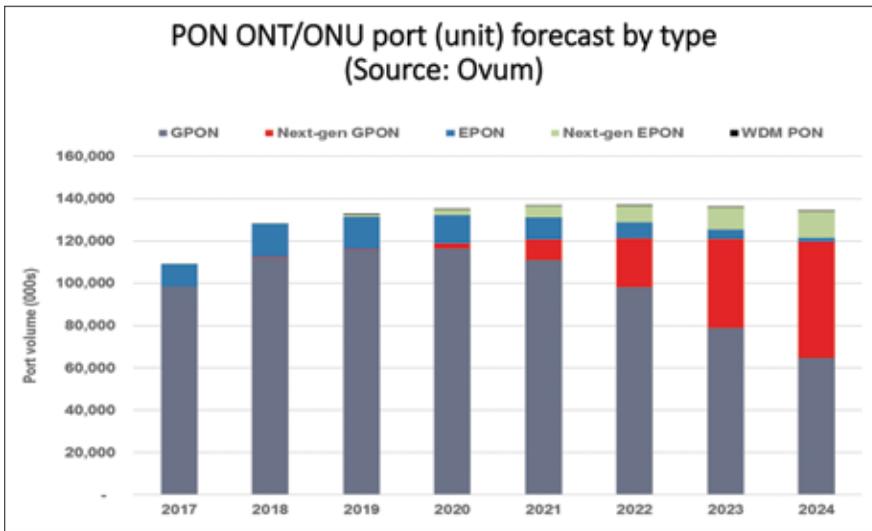
According to Ovum, sales of next-generation PON equipment will increase rapidly.

Julie Kunstler, principal analyst at Ovum, says 10G GPON deployments in China, Japan and Korea and in cable "have started and will pick up momentum in the second half of this year and into the first half of next year."

However, 10G PON deployments have been slow because of provider requirements.

"The Chinese operators wanted a combo GPON and 10G PON optical module, which makes upgrades easier because they don't have to add new ports or chassis to upgrade to 10G GPON," Kunstler says.

She adds that the adoption of combo PON devices outside China depends on "how much GPON a provider has already deployed and how space constrained [its] central offices are."

TELCOS SQUARE OFF ON XGS-PON, NG-PON2
As telcos move into the 10G race with trials and deployments, they remain divided on XGS-PON and NGPON2.

Verizon, which has trialed solutions from ADTRAN and Calix in its lab and with select customers, launched its first office application of NG-PON2 in Tampa, Florida, last year. It plans to extend the deployment to more customers.

The telco claims NG-PON2 allows it to offer business and residential services on one fiber by supporting multiple wavelengths.

AT&T advocates XGS-PON, running trials in its fiber footprint, which now passes 12 million premises with fiber.

Likewise, Frontier is on the XGS-PON path. Leveraging Nokia's 7360 XGS-PON solution, Frontier's phased rollout of XGS-PON services will initially focus on the greater Dallas/Fort Worth area of Texas before expanding to the rest of the state, along with Florida and California.

Building on its existing Fios network, Frontier will invest about $50 million to support 10G fiber-based business and backhaul services.

"In 2019, we will be implementing 10 gigabit capability systemwide for commercial customers and expanding 5G wireless backhaul capacity," said Dan McCarthy, CEO of Frontier, during its fourth-quarter earnings call. "As we upgrade the network to 10 gigabits, you'll see us pull more and more commercial units."

Broadband Trends found most operators are expected to take a "step-wise migration path" in their 10G PON evolution, with NG-PON2 adoption not expected until 2020 or later.

"When we did our survey, the bulk of the respondents were going from GPON to XGS-PON, another subsegment will go on to NG-PON2, and a small segment will go directly to NG-PON2," says Teresa Mastrangelo, principal of Broadband Trends. "XGS-

PON allows them to position the network for 10G without changing their customer-premises equipment."

CABLE'S 10G DANCE
Telcos aren't the only segment serious about 10G. Led by the National Cable Telecommunications Association (NCTA), CableLabs and Cable Europe, the cable industry unveiled its 10G plans during the January CES trade show.

What's compelling about cable's 10G drive is that it uses the existing hybrid fiber coax (HFC) network, which passes 85 percent of U.S. homes. Unlike the cable 1 Gbps products, which typically have slow upload speeds, the planned 10G product is symmetrical.

Comcast, Charter, Cox, Mediacom and Midco joined Rogers, Shaw, Vodafone, Taiwan Broadband Communications, Telecom Argentina and Liberty Global in support of the NCTA/CableLabs 10G initiative.

Cable's 10G plan claims not only faster speeds but also lower latency and better security. Having taken on large-scale 1 Gbps deployments, Charter and Comcast have set a 10G path.

Charter Spectrum completed its DOCSIS 3.1 build in the fourth quarter 2018, expanding 1 Gbps throughout its footprint. Tom Rutledge, CEO of Charter, said during its fourth-quarter earnings call that the DOCSIS 3.1 rollout puts the company on a rapid 10G migration path and addresses 5G wireless threats.

"We have a pathway to 10 gig symmetrical now spaced out that we announced at CES as an industry," Rutledge said. "We just went to 1 gig in 2018 and rolled that out across our footprint. And that's faster than the 5G fixed wireless deployments that have been spoken about so publicly."

Likewise, Comcast offers gigabit service to nearly 100 percent of its footprint. The MSO increased its residential internet customer base by 1.1 million customers in 2018.

Not content to follow the crowd, Altice USA is migrating to DOCSIS 3.1 but favors FTTH.

Dexter Goei, CEO of Altice USA, told investors during its fourth-quarter earnings call that although it supports cable's 10G initiative, it considers GPON a priority.

"As part of the whole CableLabs experience, we're part of that," Goei said. "But we are more focused on our fiber-to-the-home GPON technology than coax[-based] 10G technology."

Kunstler says cable operators in the United States and Japan deploy 10G GPON and 10G EPON mainly in newer developments. "Cable operators in what I call greenfield situations are looking at 10G EPON," says Kunstler, adding that "most cable operators will drive fiber deeper into the network with distributed access architecture and DOCSIS 3.1 upgrades."

FOCUS ON AUTOMATION, SOFTWARE

In tandem with migrating to 10G, service providers will benefit from the automation capabilities pioneered in the open-source community. Leveraging a software-based construct, service providers aim to virtualize last-mile network access functions. By using open hardware and software designs, telcos can save time to manage, deliver, monitor, troubleshoot and provide customer care.

Kunstler says service providers see virtualization as a means to ease PON equipment deployments. "There's definitely interest in how to use some aspects of the cloud for network functions and how to make certain upgrades from 2.5G to 10G easier," she says.

Led by AT&T, Verizon and CBTS, Cincinnati Bell's integrator division, providers are incorporating software-based network elements into their next-gen PON architectures.

AT&T has been conducting open-source PON system trials. In January 2018, AT&T completed trials of XGS-PON, leveraging Open Source Access Manager Hardware Abstraction (OSAM-HA) software in Atlanta and Dallas.

OSAM-HA was released into the Open Networking Foundation (ONF) open-source community last October. Leveraging the Open Network Automation Platform (ONAP) specification, OSAM is a vendor-agnostic operational suite for managing consumer and business broadband access network elements.

"We have continued to conduct field trials with customers, but the ONF

work is still not completely finished," Barker says. "The SEBA [SDN Enabled Broadband Access] and vOLTHA [virtual OLT Hardware Abstraction] effort has some critical features and functions that need to be completed by the [open-source] community to be fully hardened and commercialized."

Barker adds that in 2020, "SEBA will become more ready for commercial use and start being more equivalent to what traditional OLTs are capable of running on an edge cloud."

AT&T has been developing ONTs that can support GPON and XGS-PON, allowing it to maintain a consistent cost structure.

"My target is to equate the cost structure of GPON with XGS-PON, which has been a big feat with the cost of optics and the cost of silicon," Barker says. "Our goal was to get to higher capacity, match the cost structure of how we deploy XGS-PON to GPON, and have a better mix of consumer and business infrastructure services on the same PON."

CBTS unveiled its Carrier Open Infrastructure (COI) architecture. Leveraging the vOLTHA/SEBA framework, COI offers carriers open-source virtual networking functions and off-the-shelf hardware.

COI follows the central office re-architected as a data center (CORD) framework created by the ONF and is deployed on open-source hardware from the Open Compute Project. CBTS 10GB XGS-PON Access Solutions consist of two elements: CBTS 10GB XGS-PON Access and OpenONU.

Robert Lamb, program director of carrier open infrastructure at CBTS, is set on simplifying multiaccess network buildouts. "In an environment where you have G.fast, VDSL, GPON, XGS-PON, EPON and NG-PON2, you have got a large integration bill," Lamb says. "We have hidden away the complexity from the operational support system and give carriers the agility to react with the appropriate technology."

EYEING 25G AND 50G

Just as the industry looks to 10G, movement around 25G and 50G is already growing to facilitate 5G wireless fronthaul, which requires very low latency and support for bandwidth up to 25G.

Although 25G and 50G PON should begin shipping in 2023, Ovum forecasts low sales volumes – at least initially. "Operators have different opinions: Is 10G enough, or do you need to go to 25G?" Kunstler says.

Some countries, such as China, will go directly to 50G for 5G fronthaul applications.

Most Chinese operators want to go from 10G to 50G because "they want a bigger jump," Kunstler says, adding that some Chinese operators, including China Telecom, want to leverage WDM-PON.

Vendors such as Nokia have already debuted a 25G platform to support 5G fronthaul and edge cloud deployments. As a component of its Anyhaul portfolio, the platform coexists with 2.5G and 10G PON.

AT&T says it has been conducting research on 25G, which is still in the formative stages.

"AT&T has been an advocate of pushing 25 and 50 Gbps technology," Barker says. "The primary reason we have been looking at that as we look at our Ethernet capabilities and the cost of how we're doing mobile fronthaul today … [is that] it takes quite a bit of capacity. Unfortunately, XGS-PON was not going to give us enough capacity to be beneficial."

Already, industry groups such as the O-RAN Alliance are addressing these issues. The O-RAN Alliance and the Linux Foundation jointly created the O-RAN Software Community, which will provide open software aligned with the O-RAN Alliance's open architecture.

O-RAN Working Group 4 also developed Coop DBA. This merges the control plane of the RAN with the PON infrastructure to overcome the latency seen in PON architectures.

"When you coordinate these two control planes, you can look far enough ahead and schedule capacity," Barker says. "By doing that, we have the capability to use higher-speed PON circuits to carry wireless fronthaul traffic and share it amongst multiple small cell locations." ❖

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