

SCTE Cable Next-Gen Broadband Technology Plans & Strategies 2022

SURVEY REPORT 2022

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Table of Contents

- 3** Survey Demographics
- 4** The Evolution of Fiber Skills
- 7** Network Virtualization Strategy and Plans
- 9** Network Automation and AI Strategies and Plans
- 13** Virtualized DAA and I-CCAP Plans and Strategy
- 15** Fiber Utilization Plans and Strategies
- 17** 10G and PON Plans

Introduction

Author: Alan Breznick

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Light Reading



Facing heightened competition from fiber, wireless, and other broadband service providers, as well as quarterly broadband subscriber losses for the first time in its history, the cable industry now finds itself standing at a crossroads. Should it move ahead with its legacy hybrid fiber-coax (HFC) architecture and next-generation versions of DOCSIS technology? Or should it junk HFC and DOCSIS and embrace all-fiber networks and next-gen versions of PON technology? Or should it cobble together some combination of both strategies? Or should it just pursue other options?

As it weighs its long-term course of action, the cable industry is coping by urgently developing and deploying a wide range of next-gen broadband technologies, platforms, and services to maintain its competitive position in both the short and long term. From DOCSIS 4.0 to distributed access architecture (DAA) to FTTX to XGS-PON to Wi-Fi 6 to automation to network virtualization to optical multiplexing to artificial intelligence (AI) and beyond, cable operators and their technology partners are currently exploring every possible avenue for boosting the industry's prospects.

Although few, if any, cable companies are investigating all these options at the same time, most are examining multiple technologies, platforms, and services as they search for the magic formula to survive and thrive in an intensely competitive environment over the next decade. As a result, they are seeking to create proofs-of-concept, conduct lab tests, run field trials, build equipment, develop business models, and plan their next steps.

As they go through this arduous process, service providers face critical questions about where they should invest precious time, money, staff, energy, and other resources. Which new technologies, platforms, and services make the most sense now and in the future? How much should they invest in each one? What challenges does each option present, and how can service providers overcome them?

Seeking answers to these and other critical questions facing the cable industry, Heavy Reading has teamed up once again with SCTE, as well as three major industry vendors—Harmonic, Red Hat, and VIAVI—to survey cable operators and other wireline providers worldwide

about their next-gen broadband technology plans and strategies. In this fifth annual report, the results of that comprehensive 26-question survey are presented, delving into many of the next-gen technologies, platforms, and services that operators are exploring and discussing what it all means.

Like the 2021 study, this latest survey goes well beyond Heavy Reading's first three fiber-centric reports to focus on a wide array of new technologies, solutions, and platforms that industry decision makers are weighing. This year's list includes FTTX, PON, DAA, converged cable access platform (CCAP), network virtualization, automation, AI, and others.

This report presents the results and key takeaways of that survey, analyzes the findings, and discusses the implications. It also draws some conclusions about what the findings mean for the industry's future, both short and long term.

Survey Demographics

This Heavy Reading report is based on a web-based survey of cable and converged network operators worldwide conducted during October 2022. Respondents were drawn from the network operator list of the Light Reading readership database. After reviewing responses, 154 were deemed qualified participants and were counted in the results. To qualify, respondents had to work for a verifiable network operator and be directly involved in network planning, network

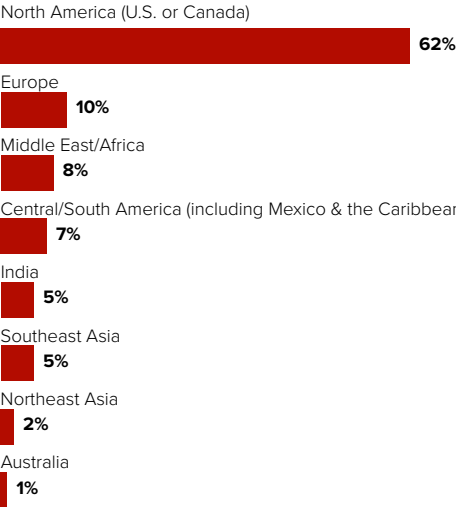
operations, network engineering, IT operations, business strategy and development, or some related area. Additional screening was conducted to remove incomplete surveys and bad responses. The full survey demographics are detailed in **Figure 1**.

Note: Numbers in figures throughout this report may not total 100 due to rounding.

Figure 1: Survey Response Demographics

By Region

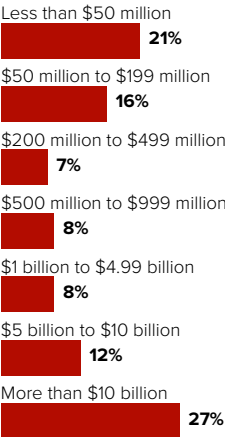
Where is your organization located?



Notes: n=154
Source: Omdia | © 2022 Omdia

By Revenue

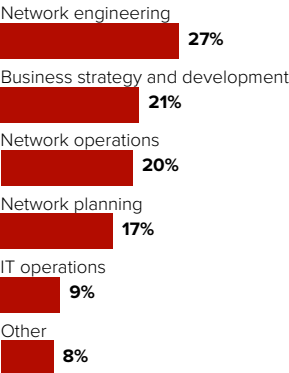
What is your organization's annual revenue?



Notes: n=154
Source: Omdia | © 2022 Omdia

By Job Function

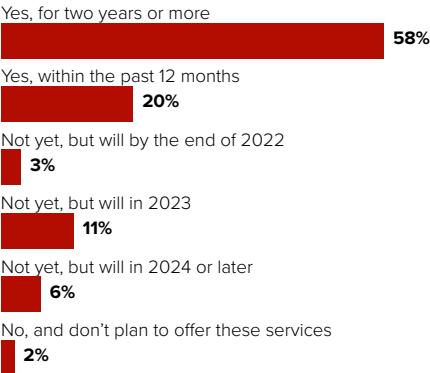
What is the focus of your job responsibilities?



Notes: n=154
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By Service Offering

Has your organization started offering fiber-based or other next-gen broadband services?



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The Evolution of Fiber Skills

Author: Steve Harris

VP, Global Market, Development,
Office of the CEO, **SCTE**



SCTE

Telecommunication operators continue to increase their fiber buildout strategies with capital expenditures dedicated to new and existing fiber optic deployments. Operators are building and expanding fiber optic architectures in the areas of fiber deep networks (FD), optical distribution networks (ODN), Ethernet networks and access networks using multiple forms of distributed access architectures (DAA).

FD architectures allow operators to push analog fiber optics closer to the subscriber, while reducing active devices and coaxial cable in the access network. The ODN architecture is used for various passive optical networks (PON), the most popular being the centralized split architecture. Several years ago, both small and large North American providers shared that fiber to the home (FTTH) PONs will be significant parts of their ecosystems going forward.

Popular versions of xPON technologies used in an ODN are the IEEE Ethernet PON (E-PON) and ITU gigabit PON (G-PON). Today, we are seeing more 10G forms of PON with 10G E-PON and 10G XGS-PON. DAA allow operators to provide more digital optics in the access network. Operators are now distributing layers of the telecommunication network between their facility and access networks. In DAA, operators are able to relocate physical (PHY) layer and media access control (MAC) layer components within the access net-

work, pushing the edge closer to the subscriber. An approach called remote PHY (R-PHY) relocates the PHY layer of the converged cable access platform (CCAP). The second approach for DAA is remote MACPHY that relocates the MAC and PHY layer of the CCAP. DAA has additional benefits as it uses dense multiplexed digital fiber and a roadmap to virtualize the layers of the network.

Operators have embarked on virtual converged cable access platform (vCCAP) designs as well. Optical fiber has been providing tremendous paybacks in our hybrid fiber coaxial (HFC) access networks for a few decades now, recently offering 1 Gbps Internet communications and beyond. When cable announced the 10G platform offering 10 Gbps connections, the technologies and architectures that would be used included several of the above.

The 10G platform is a partnership between CableLabs, SCTE®, a subsidiary of CableLabs, and NCTA. It offers increased reliability, lower latency, expanded capacity, agility, improved security and symmetrical networks. In addition, 10G edge computing allows processing at the aggregation node in the access network. For example, in PONs, 10G platforms are supported by 10G PONs. DAA networks may leverage 10G over a digital multiplexed fiber, or perhaps in the near future via a coherent digital fiber link.

New fiber optic technologies, fiber optic architectures and the 10G platform provide operators with options to deploy next generation access networks (NGAN). NGANs allow operators to deploy best-in-class residential services over fiber optics, enabling rich Smart Home experiences and telemedicine connections. In addition, operators use fiber and NGANs to offer premium business services, to include Ethernet, software defined wide area networks (SD-WAN), cloud, virtualization, and mobile services.

These optical networks mentioned will require significant construction and support, using qualified labor. There are operational practices and industry standards that must be followed to optimize and prioritize network performance when it comes fiber technology. The SCTE Construction Engineering Professional (CEP) program enables the workforce to get certified to be ready for the future of optical network construction. A recent Light Reading survey cited a lack of skills, knowledge and abilities around emerging fiber optic technologies. Proper education reduces network downtime/network degradation caused by human error factor (HEF).

Understanding proper best practices and implementation for maintaining key performance indicators (KPIs), optimizing automation (e.g., PNM), security management techniques and improving network uptime are critical in today's networks.

At SCTE, we have been strategic in staying ahead of the curve in terms of the ever-changing technical access networks requirements of telecommunication operations and the engineering workforce. Working with industry experts, SCTE has developed a line-up of fiber optic and construction courses that drive business results and reduce HEF in the network. In addition, SCTE offers the top industry credentials globally, certifying the competencies of expert telecommunication professionals (SCTE.org/certification). The SCTE standards (SCTE.org/standards) program is the only ANSI accredited platform for developing technical specifications, along with driving return on investment (ROI) in our training and certification programs.

The SCTE fiber optic education curriculum is a comprehensive solution of technical courses driving business results in the marketplace. SCTE offers curricula that support each of the areas mentioned earlier, including Optical Construction and Fiber Splicer Specialist. The SCTE Broadband Fiber Installation curriculum allows learners to become proficient in FD, FTTH, PONs and ODNs. SCTE's Business Class Service Specialist (BCSS) addresses the industry requirement for workforce proficiency in Ethernet/ IP performance management and fault management. The Society's Broadband Transport Specialist (BTS) and Fiber Restoration courses allow support personal to gain

the skills, knowledge, and abilities to support and manage optics in an access network. The BTS course prepares individuals for three professional certifications, while the DAA curriculum enables operators to easily migrate support personal from an HFC access network to a NGAN.

Among SCTE offerings are certifications that recognize individuals as experts in telecommunications. The SCTE Broadband Fiber Installer ([Broadband Fiber Installer - ONLINE EXAM — SCTE](#)) professional certification was designed to measure a person's skills, knowledge and abilities in FD, FTTH, PONs

and ODNs. For those who support business services, the SCTE Business Class Service Specialist ([Business Class Services Specialist V2 - ONLINE EXAM — SCTE](#)) professional certification is designed to measure expertise in Ethernet solutions, VoIP and IP addressing over optical networks. Finally, the SCTE Broadband Transport Specialist ([Broadband Transport Specialist - ONLINE EXAM — SCTE](#)) was recently updated with new industry recommended practices.

Since our BTS course covers the competencies desired by several professional certification authorities, SCTE simplifies earning cre-

denentials. The credentials are the SCTE BTS, the Electronics Technicians Association (ETA) Fiber Optics Installer (FOI) and Fiber Optic Association (FOA) Certified Fiber Optic Technician (CFOT).

Our SCTE standards group was instrumental in early FTTH networks with creation of SCTE 174, Radio Frequency over Glass (RfOG), as well as the new Generic Access Platform (GAP) standard, enabling an aggregation node of the future. SCTE GAP defines standardized interfaces that support plug-in modules within the aggregation node housing. The plug-in modules may be used for xPON, mobility, DAA or

even Smart Cities under the SCTE Explorer initiative, a growing standards program that is designed to work across industries to identify applications that will benefit from the 10G platform.

To learn more about fiber optic networks and telecommunications be sure to join us at Cable-Tec Expo® 2023 which will take place October 16-19 in Denver, CO. (<https://expo.scte.org/>) Also be on the lookout for 10G, optical construction best practices and vendors sharing the latest in optical performance management.



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Network Virtualization Strategy and Plans

The first main section of the Heavy Reading study looked at the industry's emerging network virtualization strategy. The intent was to determine where the industry stands now with various aspects of virtualizing its HFC networks and where it seems to be heading in the future.

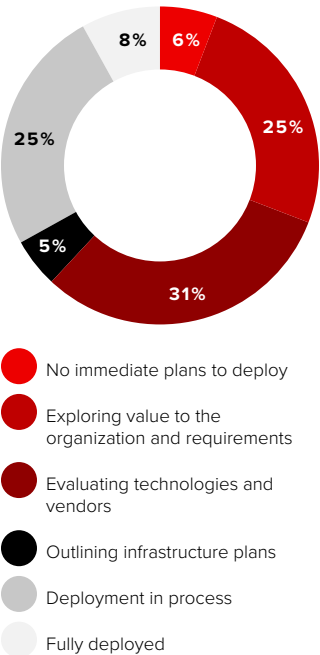
Key Takeaways

- Most broadband providers are still in the early evaluation stages, with nearly one-third (31%) now evaluating technologies and vendors and one-quarter (25%) evaluating the value to their organization and the requirements.
- More than three-fifths of respondents (63%) said their organization is using open-source networking today, while another 18% said they plan to use it in the future.
- The network edge ranked as the highest priority network segment for virtualization, narrowly edging out the access network.
- Nearly two-fifths of operators (39%) intend to use network equipment providers to implement their virtualization strategies, making that the lead choice.

Virtualizing the Cable HFC Network

The survey started out by asking about the state of the industry's deployment of software-based network functions technology. The responses indicate that most operators are still in the early evaluation stages, with nearly one-third (31%) now evaluating technologies and vendors and one-quarter (25%) evaluating the value to their organization and the requirements, as can be gleaned from **Figure 2**.

Figure 2: State of software-based network functions deployment
Which best describes the state of your organization's software-based network functions deployment?



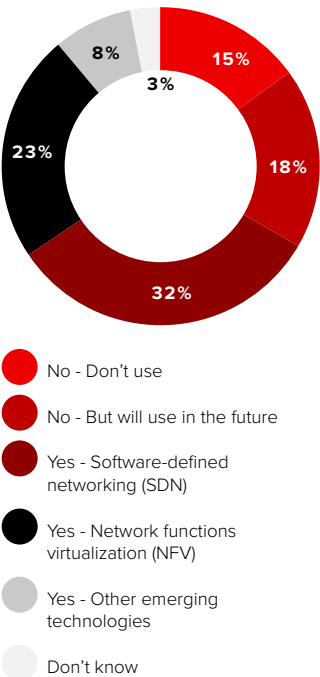
Notes: n=154
Source: © 2023 Heavy Reading

Notably, some 25% of operators have software-based network functions deployments in progress now, while another 8% say they have already deployed the technology completely. So the industry is starting to move ahead with network virtualization after years of studies, trials, and caution.

The study then set its sights on the use of open-source networking technology. Participants were asked if their company is using open-source networking and, if so, in which primary areas of their operations.

More than three-fifths of respondents (63%) confirmed that their organization is using open-source networking today, while another 18% said they plan to use it in the future. As for the primary areas for open-source networking, almost one-third of participants (32%) said their companies use software-defined networking, making that the lead choice. Network functions virtualization followed in second place, drawing votes from 23% of respondents, as can be seen in **Figure 3**.

Figure 3: Use of open-source networking
Does your organization use open-source networking, and in what primary area?



Notes: n=154
Source: © 2023 Heavy Reading

Which infrastructure segments have the highest priority for virtualization? That is where the study focused its lens next.

Significantly, the network edge ranked as the highest priority segment, narrowly edging out the access network, as can be seen in **Figure 4**. The cable headend placed a strong third, followed by the customer premise and the PHY layer.

Figure 4: Highest priority infrastructure segments for virtualization

Responses	Score	Rank
Edge	504	1
Access network	493	2
Headend	472	3
Customer Premise	374	4
PHY	317	5

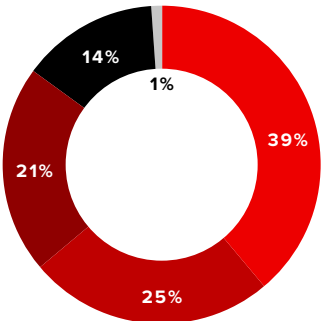
Notes: n=154
Source: © 2023 Heavy Reading

These numbers provide insight into the level of commitment that broadband providers currently have for virtualizing various network segments. The next logical question is to analyze how they plan to carry out their virtualization strategies. The study pivoted to that query.

In some encouraging news for industry vendors, nearly two-fifths of operators (39%) intend to partner with technology providers to implement their network evolution strategies, making that the lead choice. As depicted in **Figure 5**, one-quarter of respondents (25%) intend to rely on in-house resources, while another 21% plan to leverage systems integrators.

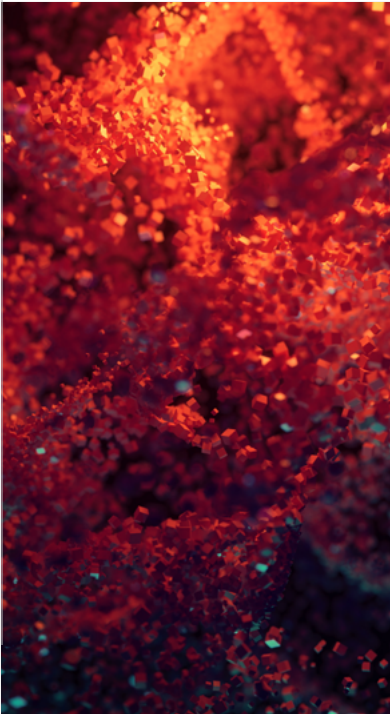
Figure 5: Implementation of network virtualization strategy

How will you implement your network virtualization strategy?



- Use network equipment provider
- Use in-house resources
- Use system integrators
- Have not determined
- Other

Notes: n=154
Source: © 2023 Heavy Reading



To conclude this section, the Heavy Reading study asked operators about the advantages or values that network virtualization has to offer. Multiple answers were permitted for this question.

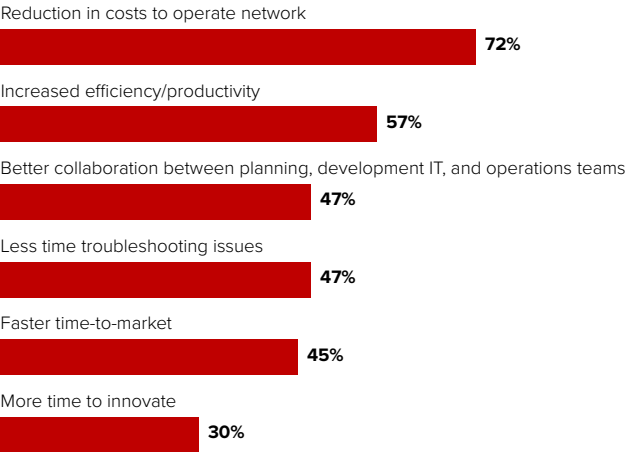
By far, the lead benefit of virtualization was a reduction in costs to operate the network, with nearly three-quarters of survey participants (72%) checking that box. Increasing efficiency/pro-

ductivity came in a strong second, logging votes from 57% of the survey sample, as can be viewed in **Figure 6**.

Two other answers—better collaboration among planning, development IT, and operations teams and less time troubleshooting issues—tied for third place with 47%. Faster time-to-market also scored well, attracting votes from 45% of operators.

Figure 6: Advantages of network virtualization

What values/advantages are you able to identify from your network virtualization?



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Executive Summary

Service providers are racing to the edge to take advantage of infrastructure and 5G investments while meeting customer experience expectations. Red Hat and its global partner ecosystem offer a comprehensive open hybrid cloud platform that helps providers innovate faster, bringing new, secure, scalable services to the most remote locations, applying data-driven insights to increase innovation, while delivering operational consistency for IT Ops and developers. Red Hat is the world's leading provider of commercial open source software solutions, using a community-powered approach to deliver reliable and high performing Linux, hybrid cloud, container, and Kubernetes technologies. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500. [Explore Red Hat telecommunications, media and entertainment solutions.](#)



Network Automation and AI Strategies and Plans

In this next section, the Heavy Reading study zeroed in on the cable industry’s network automation and AI strategies and plans, which are inherently tied to its network virtualization strategies and plans. The study sought to find out how operators expect to use and develop AI and automation.

Key Takeaways

- Many operators have already automated several use cases, with provisioning, customer service requests (33%), and order management/billing leading the way.
- The access network and the edge seem to be the highest early priorities for leveraging AI today, slightly outpacing the headend and customer premises.
- Chatbots are clearly the most popular AI application right now, with nearly one-third of operators (31%) making use of them currently and another 28% planning to leverage them over the next 12 months.
- One-quarter of respondents (25%) said their companies are crafting AI technology internally, making that the lead development strategy for the industry today.

Great Expectations for AI and Automation?

First, survey participants were asked when they expect to automate various use cases for network automation. The study gave them a choice of six different use cases and three different timeframes.

A few intriguing results emerged. First, as shown in **Figure 7**, many operators have already automated several use cases. Provisioning led the pack with 37%, closely followed by customer service requests (33%) and order management/billing (32%).

Second, if they have not done so already, large numbers of operators plan to automate all three of those functions in the next 12 months. Plus, large numbers intend to automate the three other functions listed here: maintenance and upgrades, deployment, and closed-loop remediation.

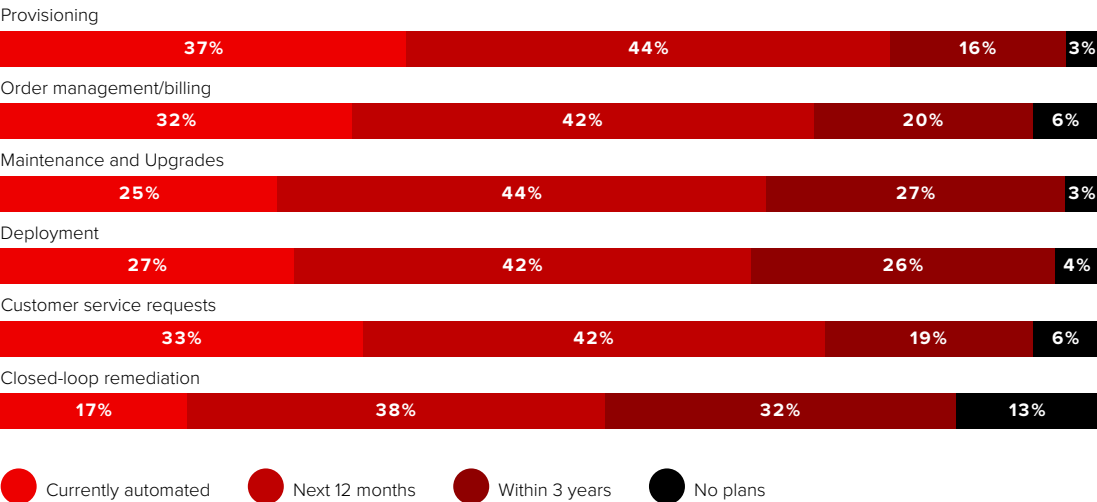
Third, the study shows that network automation will accelerate over the next two years. By the end of 2025, all but closed-loop retention could be automated by at least 84% of operators. If that all actually comes to pass, it would represent a staggering shift for the

industry in a relatively short period of time.

Moving on from network automation, the Heavy Reading study shifted focus to the closely related subject of AI. The survey sought to determine how operators believe they will use, develop, and benefit from the technology.

The first AI question asked providers how they expect to use the technology in their network infrastructure. Five different infrastructure areas—PHY, headend, edge, customer premise, and access network—were targeted.

Figure 7: Expectations for Automation Use Cases?
When do you expect to automate the following use cases?



Notes: n=154 | Source: © 2023 Heavy Reading

What emerged here is that the access network and the edge seem to be the highest priorities for leveraging AI today, slightly outpacing the headend and customer premise. Over the next 12 months, though, the access network is expected to pull ahead of the other segments, followed by the edge. Notably, the PHY trails the other four areas over all the various timeframes, as can be seen in **Figure 8**.

Next, the survey asked providers how they are using AI in various areas of their business now, as well as how they expect to leverage the technology over the next three years. The trends are quite revealing.

One thing that stands out here is that chatbots are clearly the most popular AI application today, with nearly one-third of operators (31%)

making use of it currently and another 28% planning to leverage it over the next 12 months. That means nearly three-fifths of providers (59%) intend to utilize chatbots by the end of 2023.

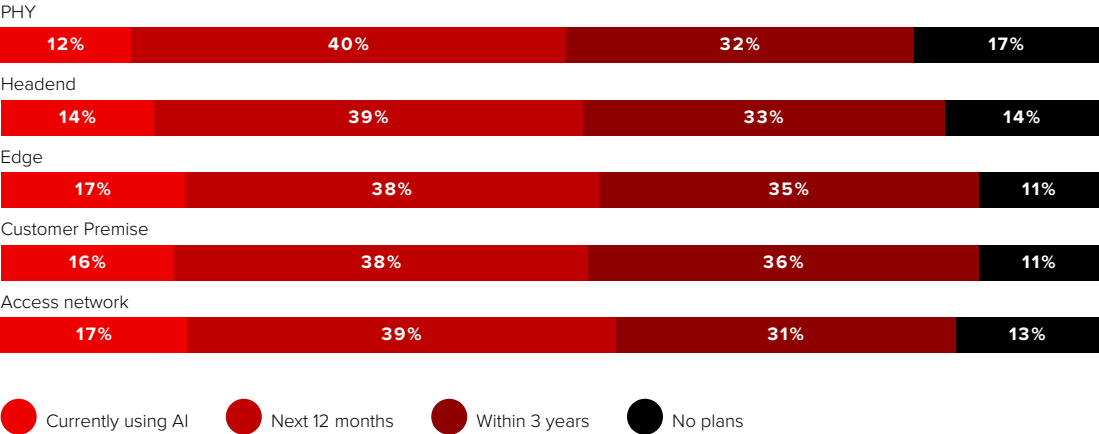
The deployment of AI seems likely to surge in other business areas more dramatically, however, over the next few years. For instance, an impressive 45% of respondents

expect to tap into AI to boost network operations over the next year, and another 24% plan to do so over the following two years. In addition, 38% expect to leverage AI for security purposes over the next year, while 37% intend to use it for network optimization, and the same number plan to use it for customer engagement and sales.

Thus, AI's day in the sun is clearly arriving. Indeed, less than one-fifth of operators (18%) say they have no plans to tap into the technology for one or more business areas over the course of the next three years, as can be seen in **Figure 9**.

Figure 8: Expectations for use of AI in Infrastructure?

When do you expect the following areas of your infrastructure to use AI?



Notes: n=152 | Source: © 2023 Heavy Reading

Figure 9: Expectations for Leveraging AI in Business

Responses	Currently using	Next 12 months	Within 3 years	No plans
Chatbots	31%	28%	28%	13%
Content creation	18%	31%	33%	18%
Customer engagement/Sales	23%	37%	32%	8%
Distribution	21%	30%	34%	15%
Internal IT	25%	33%	30%	12%
Managed Enterprise applications	19%	35%	37%	9%
Network operations	24%	45%	24%	7%
Network optimization	24%	37%	29%	9%
Remote network monitoring and management	27%	34%	29%	9%
Security	24%	38%	31%	7%

Notes: n=151 | Source: © 2023 Heavy Reading

With AI expectations in mind, the study sought information on operators' development strategies for AI. Participants were asked how their companies are developing AI today.

Notably, one-quarter of respondents (25%) said their companies are developing the technology internally, making that the lead choice. Integrating AI-specialized solutions from independent software vendors came in second with 17%, while systems integra-

tors took third with 14%, as depicted in **Figure 10**.

What these results indicate is that more than one-half of operators (56%) are now developing AI either totally by themselves or with selective help from vendors or systems integrators. At the same time, a sizable number of providers (44%) are working with Azure ML, Google's AI Platform, AWS SageMaker, or another software specialist to craft their technology.

In a follow-up question, the survey asked operators how they expect their AI development strategies to evolve over the next three years. Not too surprisingly, the results were fairly similar to those of the previous question, although some differences did emerge.

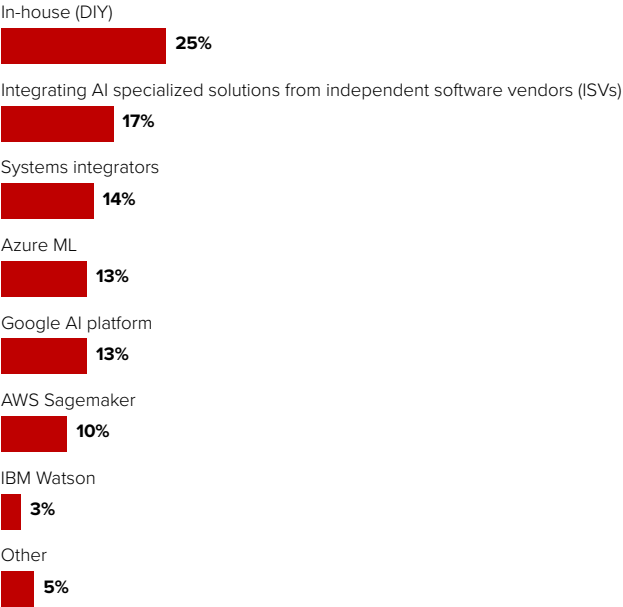
For one thing, the number of operators that expect to be developing AI in-house dropped from 25% to 21%. For another, the number that expects to use one of three big

hyperscalers (Google, Azure, and AWS) rose from 36% to 43%, as depicted in **Figure 11**.

These results suggest that providers will increasingly turn to software specialists to develop their AI uses as the technology becomes ever more complex. It will be interesting to see how those expectations continue to shift in the years ahead.

Figure 10: Development Strategies for AI

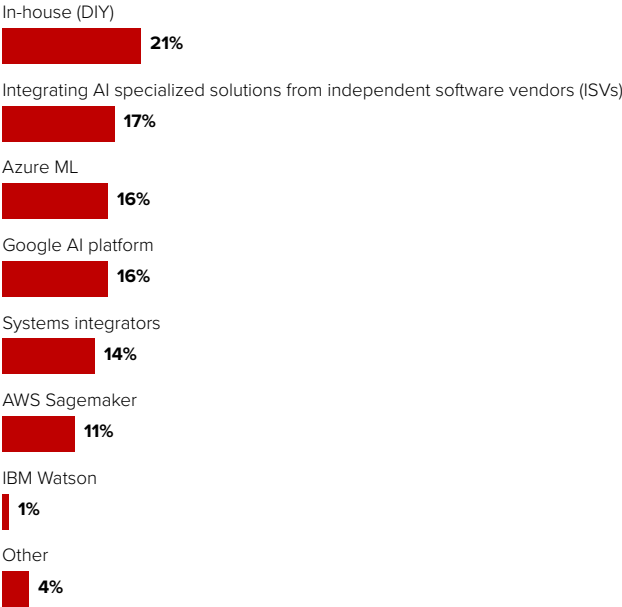
How are you developing AI today?



Notes: n=151 | Source: © 2023 Heavy Reading

Figure 11: Development Expectations for AI

How do you expect to be developing AI in three years?



Notes: n=151 | Source: © 2023 Heavy Reading



Executive Summary

Service providers are racing to the edge to take advantage of infrastructure and 5G investments while meeting customer experience expectations. Red Hat and its global partner ecosystem offer a comprehensive open hybrid cloud platform that helps providers innovate faster, bringing new, secure, scalable services to the most remote locations, applying data-driven insights to increase innovation, while delivering operational consistency for IT Ops and developers. Red Hat is the world's leading provider of commercial open source software solutions, using a community-powered approach to deliver reliable and high performing Linux, hybrid cloud, container, and Kubernetes technologies. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500. [Explore Red Hat telecommunications, media and entertainment solutions.](#)



Virtualized DAA and I-CCAP Plans and Strategy

In this section, the Heavy Reading study shifted its focus to DAA, network virtualization, and other evolutionary transformations of the cable HFC access network. The study sought to zero in on the benefits, challenges, and risks of carrying out these changes.

Key Takeaways

- Savings on power, cooling, cabling, and real estate ranked as the biggest benefit of implementing DAA and network virtualization, selected by close to two-fifths of survey participants (36%).
- One-third of respondents (33%) expect their companies to cut at least 31% of their power needs by making the switch to DAA and virtualization.
- Resources emerged as the biggest challenge for operators to adopt DAA and network virtualization, followed closely by complexity.
- Most providers no longer spend significant sums on obsolete technologies like integrated converged cable access platforms (I-CAPPs) and analog transport networks.

Distributing the Load

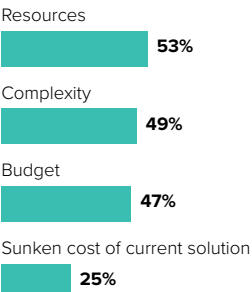
The first question tackled the challenges of implementing DAA and network virtualization. With up to two choices permitted from the four available, the survey asked providers to single out the biggest hurdles they need to overcome.

Resources led the pack, with slightly more than one-half of respondents (53%) choosing it. Complexity came in a close second with 49% support, followed by budget with 47%, as can be viewed in **Figure 12**.

Providers see all three of these issues as major challenges to overcome as they shift their HFC plant to DAA and network virtualization. Of the four choices offered to survey takers, only the sunken cost of their current solution did not score highly on the list of hurdles.

Figure 12: Biggest Challenges to Overcome for DAA and Network Virtualization

What are the biggest challenges your organization needs to overcome to adopt DAA and network virtualization?



Notes: n=154
Source: © 2023 Heavy Reading

With the challenge question out of the way, the study turned its spotlight on monetary issues. Specifically, the survey asked operators how much of their operations budget they spend on obsolete technologies such as I-CCAP and analog transport networks.

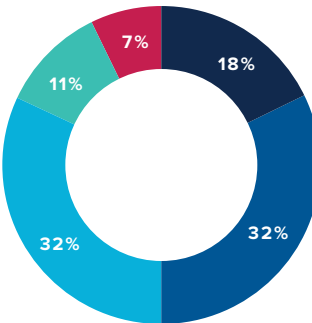
The results show that most providers no longer spend a significant portion of their operating budgets on these outdated technologies. Specifically, nearly one-third of respondents (32%) said their companies spend just 5–10% of their opex on I-CCAP and analog optical transport networks, while another 18% spend less than 5%, as can be seen in **Figure 13**.

Conversely, only 18% of respondents spend 21% or more of their opex budget on these two technologies. And a mere 7% spend more than 30% of their operating budgets.

In other words, I-CCAP and analog transport networks are clearly on their way out of cable tech circles after long runs for both, particularly for the analog networks.

Figure 13: Percentage of Opex Budget Spent on I-CCAP and Analog Optical Transport Networks

What percentage of your opex budget do you spend monthly on power for obsolete I-CCAP and analog optical transport networks?



- Less than 5%
- 5 to 10%
- 11 to 20%
- 21 to 30%
- More than 30%

Notes: n=151
Source: © 2023 Heavy Reading

Moving from financial budgets to energy budgets, the study looked at how much power operators expect to save by upgrading from I-CCAP to DAA and virtualizing network functions. The premise was that the power savings could be substantial.

As it turns out, the survey results support that premise. In fact, a solid one-third of respondents (33%) expect their companies to save at least 31% of their power needs by

making the switch to DAA and network virtualization. And remarkably enough, some 9% of the total survey sample expects to chop their power needs by 46% or more, as shown in **Figure 14**.

Plus, another 44% of operators expect to cut their energy consumption by 15–30% by implementing network virtualization and DAA. Only a bit more than one-fifth of operators (22%) think they will trim their energy use by less than 15%.

Taking one more look at obsolete technologies, the study sought to determine the most significant risk of continuing to use I-CCAP solutions in the cable HFC plant. Survey participants were asked to choose from five options.

Product end-of-life easily led the pack, with nearly one-half of respondents (48%) selecting it as the greatest risk to their business. No other choice came close to matching it, as shown in **Figure 15**.

One-fifth of operators (20%) picked the cost of operation, making that the second greatest risk. Reduced scope for product roadmaps came in third with 15%, followed by supply chain management and sustainability.

Clearly, then, operators are most concerned that aging technological solutions like I-CCAP are becoming obsolete. That helps explain why, as shown earlier, so many operators are now spending so little on I-CCAP.

Since the challenges of upgrading cable networks to DAA and virtualization were covered earlier, the study looked at the benefits of adopting the two technologies as well. The survey asked operators to identify the most important benefit of implementing network virtualization and DAA for their business.

Not too surprisingly, saving on power, cooling, cabling, and real estate was the top choice, selected by close to two-fifths of survey participants (36%). Slightly less than one-third of respondents (31%) chose obtaining a path to converge different access technologies, putting that option in second place. The other two choices lagged somewhat behind the two leaders, as displayed in **Figure 16**.

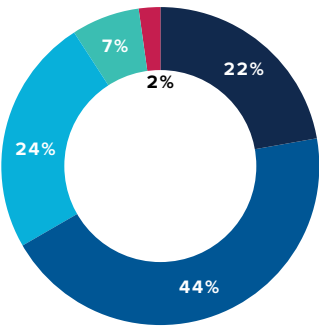
These results support the earlier findings that operators value cutting costs above just about everything else. That provides them with a strong incentive to deploy DAA and adopt virtualization as quickly as they can.

Executive Summary

Harmonic, the worldwide leader in virtualized broadband and video delivery solutions, enables media companies and service providers to deliver ultra-high-quality video streaming and broadcast services to consumers globally. The company revolutionized broadband networking via the industry’s first virtualized broadband solution, enabling cable operators to more flexibly deploy gigabit internet service to consumers’ homes and mobile devices. Whether simplifying OTT video delivery via innovative cloud and software platforms, or powering the delivery of gigabit internet cable services, Harmonic is changing the way media companies and service providers monetize live and on-demand content on every screen. More information is available at www.harmonicinc.com.

Figure 14: Power Savings Expected from DAA and Virtualization

How much power savings do you expect to gain when moving from an obsolete I-CCAP solution to DAA and virtualization?

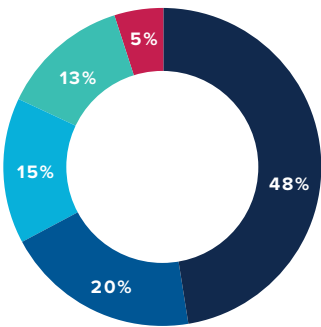


- Less than 15%
- 15 to 30%
- 31 to 45%
- 46 to 60%
- More than 60%

Notes: n=153
Source: © 2023 Heavy Reading

Figure 15: Most Significant Risk from using I-CCAP Solutions

What is the most significant risk from continued use of obsolete I-CCAP solutions?

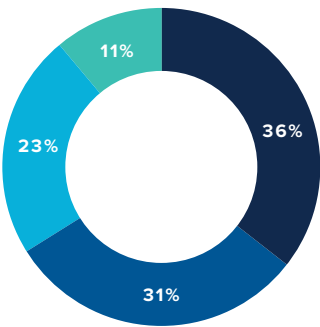


- Product end-of-life
- Cost of operation
- Reduced scope for product roadmaps
- Supply chain management
- Sustainability

Notes: n=152
Source: © 2023 Heavy Reading

Figure 16: Most Important Benefit of DAA and Virtualization

What is the most important benefit from the transition to virtualization and DAA?



- Saving on power, cooling, cabling, and real estate
- Obtaining a path to converge different access technologies
- Gaining a foundation for FMA and DOCSIS 4.0
- Having less dependency on vendor supply chains

Notes: n=152
Source: © 2023 Heavy Reading



Fiber Utilization Plans and Strategies

In this next section, the Heavy Reading study examined the fiber utilization plans and related implementation strategies of network operators. The survey asked participants about the richness of their fiber lines, the network segments where they see greater demand for more fibers, and the segments where they see greater usage of multi-fiber connectors.

Feasting on Fiber

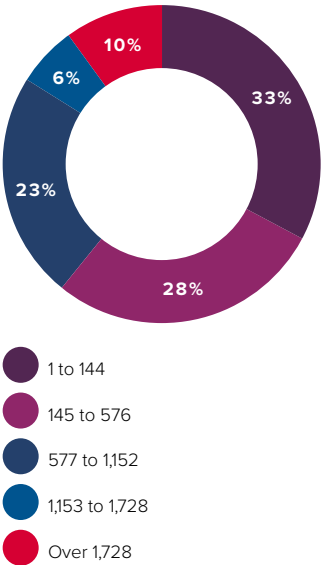
The first question focused on the typical fiber count of cables in operators' network architectures. The study asked providers how many fiber cables they typically deploy today.

At first glance, the responses seem fairly evenly spread across the spectrum. One-third of operators (33%) said their typical fiber count is 1–144. However, nearly as many, 28%, replied that their typical fiber count is 145–576, and another 23% said their typical count is 577–1,152.

However, under further analysis, it seems clear that operators are packing more fiber strands into their cables than ever before to handle the need for more bandwidth capacity. Indeed, about two-thirds of operators (67%) now boast at least 145 fibers in their cables and nearly one-half (49%) have at least 577 fibers, as shown in **Figure 17**.

Figure 17: Typical fiber count of cables

What is the typical fiber count of the cables you are deploying today?



Notes: n=150
Source: © 2023 Heavy Reading

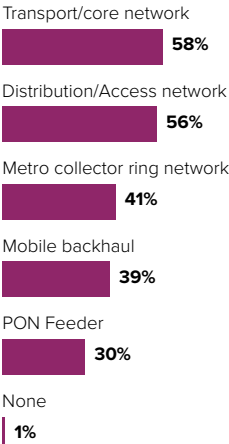
After determining the number of fibers deployed today, the study moved on to the network segments where operators see the greatest demand for more fibers. The results were quite revealing, indicating strong demand almost across the board.

The transport/core network led the way, with nearly three-fifths of operators (58%) choosing it. However, with multiple answers permitted, the distribution access network came in a very close second, with 56% of respondents selecting it, as depicted in **Figure 18**.

Other network segments also fared well. More than two-fifths of operators (41%) chose the metro collector ring network, while slightly fewer (39%) picked the mobile backhaul segment and 30% selected the PON feeder.

Figure 18: Where there is demand for more fibers

In which network segment do you see demand for more fibers per cable?



Notes: n=154
Source: © 2023 Heavy Reading

In other words, there is strong demand for more fibers across all the major network segments. Therefore, expect to see those typical fiber counts continue to soar higher in the future.

Following along the same lines, the survey next asked operators where in their networks they see a surge in usage of multi-fiber connectors. Once again, multiple answers were permitted.

In this case, the distribution/access network clearly led the way, with more than one-half of respondents (55%) checking it. No other choice came very close.

Other network segments, however, still scored fairly high on the scale. The transport/core network came in a strong second, drawing votes from 44% of survey participants. The metro collector ring took third place, generating support from 36% of operators, as can be viewed in **Figure 19**.

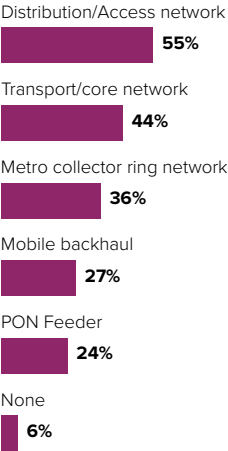
Thus, the same two network segments—the distribution/access network and the transport/core network—came out on top in the fiber demand and multi-fiber connector usage questions. Clearly, then, those are the two segments where operators most expect to boost their fiber concentrations.



Fiber Utilization Plans and Strategies

Figure 19: Where there is an Increase in Usage of Multi-fiber Connectors

Where in the network do you see an increase in usage of MPO/MTP (multi-fiber) connectors?



Notes: n=154
Source: © 2023 Heavy Reading

Executive Summary

VIAVI (NASDAQ: VIAV) is a global provider of network test, monitoring, and assurance solutions for communications service providers, hyperscalers, equipment manufacturers, enterprises, government, and avionics. VIAVI is also a leader in light management technologies for 3D sensing, anti-counterfeiting, consumer electronics, industrial, automotive, government, and aerospace applications. Together with our customers and partners we are **United in Possibility**, finding innovative ways to solve real-world problems. Learn more about VIAVI at www.viavisolutions.com. Follow us on [VIAVI Perspectives](#), [LinkedIn](#), [Twitter](#), [YouTube](#) and [Facebook](#).



10G and PON Plans

In this concluding section, the study looked at operators’ strategies for deploying next-gen PON technology and 10G broadband services. Heavy Reading sought to determine how providers plan to upgrade their networks for 10G services, which PON architectures they are considering, and what flavors of PON they are exploring.

Key Takeaways

- Nearly four-fifths of operators (79%) plan to stick with DOCSIS 3.1 on their HFC plant and upgrade the network from that point.
- The largest portion of the survey sample (29%) plan to carry out spectrum mid-splits and/or high-splits and then assess whether to upgrade to DOCSIS 4.0 or switch to FTTH and next-gen PON.
- More than one-half of survey participants (56%) said they are planning or weighing whether to deploy traditional balanced splitters with dual-split or cascaded splitters for their PON architectures.
- The two next-gen versions of PON—10G EPON and XCS-PON—emerged as the favorite choices for deploying 10G PON service, with more than two-fifths of survey participants (43%) choosing to switch to them and drop lower levels of PON.

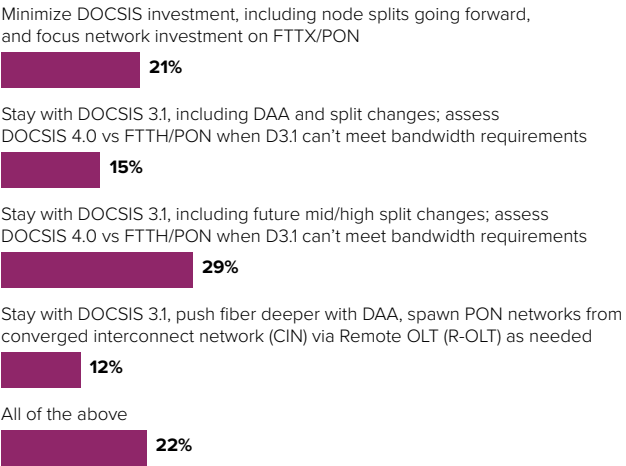
Tackling the 10G Challenge

The first question in this section focused on the next technology inflection point for operators, as well as their direction for 10G services. Operators were queried about their plans for moving ahead with a series of broadband-enabling platforms and technologies, including DOCSIS 3.1, DOCSIS 4.0, DAA, FTTH, and next-gen PON.

With so many options available to operators, a clear consensus around one complete course of action did not emerge. However, what the results do reveal is that most operators plan to stick with DOCSIS 3.1 on their HFC plant and build from there. Only about one-fifth of respondents (21%) indicated that they plan to minimize their investment in DOCSIS technology and focus instead on building FTTP networks for PON.

The largest portion of the sample (29%) plan to carry out spectrum mid-splits and/or high-splits and then assess whether to upgrade their networks to DOCSIS 4.0 or switch to FTTH and PON if DOCSIS 3.1 can no longer meet their bandwidth needs. Another 15% intend to implement a largely similar strategy, just adding DAA to the mix, as can be seen in **Figure 20**.

Figure 20: Next Technology Inflection Point and Direction for 10G Services
What is your next technology inflection point and direction for 10G services?



Notes: n=145 | Source: © 2023 Heavy Reading

Further, 12% of operators aim to push fiber deeper into their networks and add PON to the mix. Finally, 22% plan to pursue all the upgrade options outlined in this question.

Operators are clearly moving ahead with a range of network upgrade plans. The big question is what the balance between DOCSIS and PON will look like down the road.

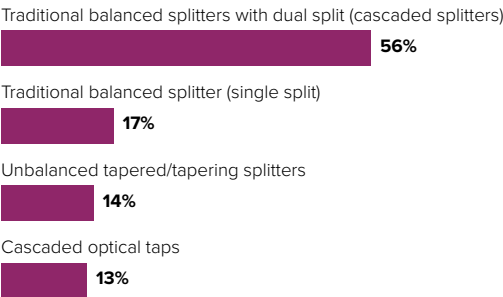
Next, the study delved deeper into the PON architectures that providers are deploying or considering. Four choices were offered.

Traditional balanced splitters with dual-split or cascaded splitters dominated here, with more than one-half of survey participants (56%) choosing that option. None of the other three choices came close to matching it, as can be seen in **Figure 21**.

10G and PON Plans

Figure 21: Main PON Architecture Deploying or Considering

What is the main PON architecture you are deploying or considering?



Notes: n=145 | Source: © 2023 Heavy Reading

Traditional balanced splitters with a single split came in second at 17%, followed by unbalanced tapered/ tapering splitters and cascaded optical taps. Thus, dual-split PON architectures appear to be the way forward for most of the industry.

Finally, the study concluded this section and the survey itself by questioning operators about their plans for deploying 10G PON services. Specifically, the survey asked participants whether they intended to proceed with GPON, EPON, 10G EPON, XCS-PON, or some combination of the four PON standards.

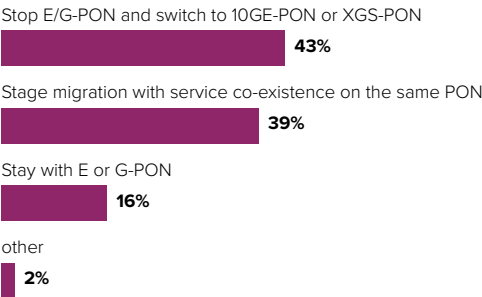
The two next-gen versions of PON—10G EPON and XCS-PON emerged as the favorites here, with more than two-fifths of survey

participants (43%) choosing to switch to them and drop the lower levels of PON. A staged migration to the higher PON orders with service coexistence on the same PON came in a close second, with 39% of respondents selecting it. Only 16% of providers said they planned to stay with their current EPON or GPON service, as shown in **Figure 22**.

These findings confirm that operators do not plan to sit still with the lower PON orders as consumers and businesses demand more bandwidth capacity from their broadband providers. With 10G services as the target for now, operators intend to upgrade on the PON side of their plant, just as they intend to upgrade on the DOCSIS side of their plant.

Figure 22: Plans for Deploying 10G PON Services

How do you plan to deploy 10G PON services?



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Executive Summary

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