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EXECUTIVE INSIGHTS WITH **Janelle Allison**

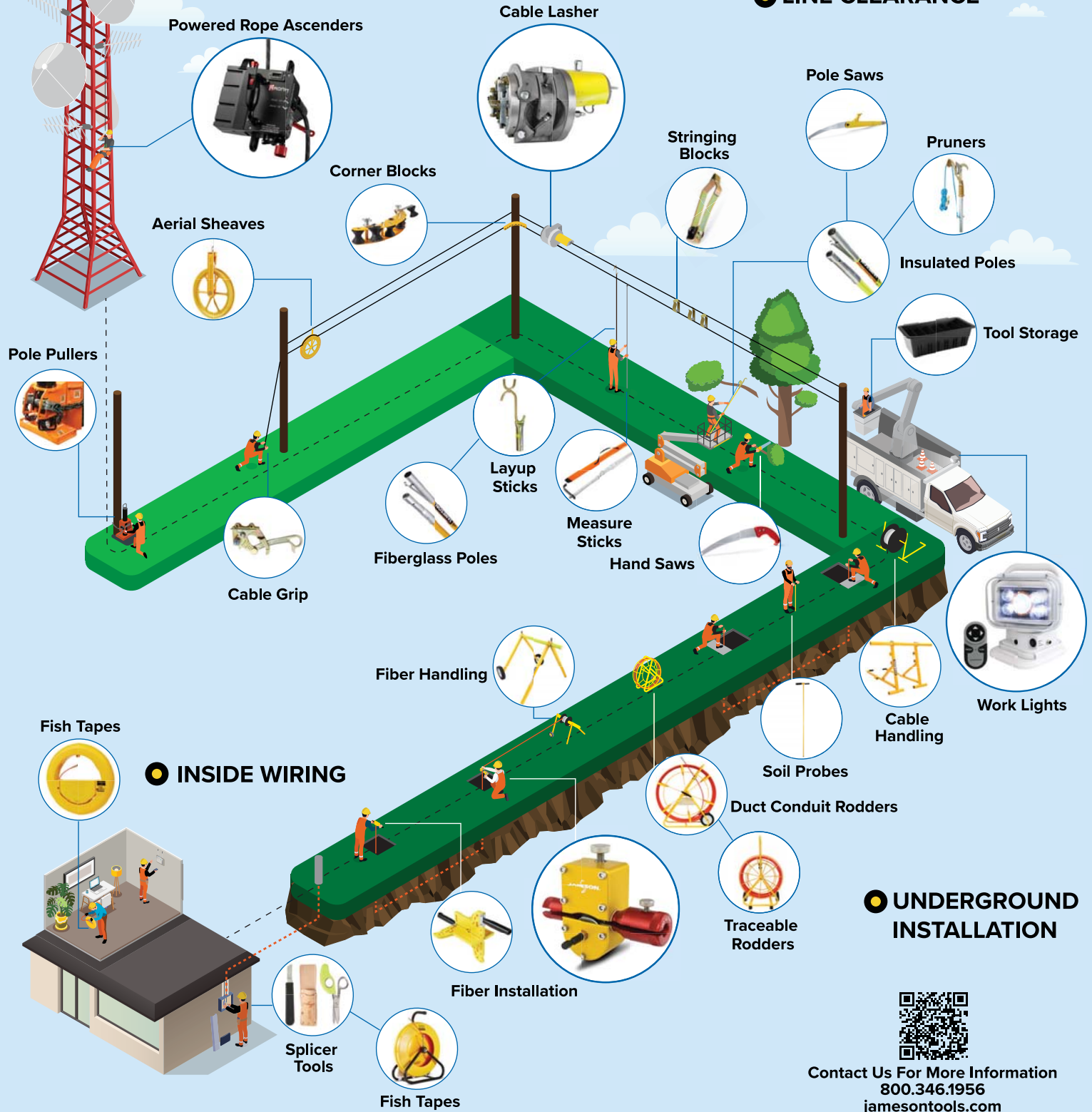
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2025

I CAN'T MAKE SPECIFIC predictions about 2025 in broadband, so I won't try. BEAD is going to be a complex process, and there will be questions about what it means for broadband service providers (BSPs) in the short and long term, of course.

The goal of the telecommunications industry has been, and always will be, to connect people. Broadband internet will need to reach more people, and the BSPs will deploy the networks that will make that happen.

Will we all be living in smart cities, riding around in self-driving taxis connected to AI-powered 6G networks in 2025? No, we won't. But the groundwork continues to be laid for that to happen perhaps one day.

Or for it not to happen. We don't know what technologies will become truly commonplace. But we know that the broadband networks will drive whatever it is that enables humans and organizations to fulfill their purpose.

Big Tech ambitions will come and go and pivot and change. Telecom is constant. Telecom wakes up every day knowing exactly what its purpose is and what it needs to do. That's a strong position to be in.

One thing everyone seems to agree on is that fiber is the technology that will enable the future. That's why you will see big developments in the fiber race in 2025. The big players want to secure a dominant position with fiber for the long term (for some, even if that means wholesale). And every BSP hopes to provide for their customers the speed and quality that fiber can bring.

Last year in my editor's note for the year-end issue, I wrote remember that and "think about what you are proud of, what you would have done differently, and how you can apply that wisdom to 2024." So, I ask you, did you do work you were proud of this year?

For 2025, I'll leave you with this: don't do work you're not proud of, and don't do work that doesn't fulfill your purpose. Doing your best, doing work you are genuinely proud of, is literally all you can do, and all you *need* to do, to move the industry forward.



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Visit www.isemag.com/contribute for more information on submitting an article to ISE Magazine in print, digital, and online.

The Other Fiber Optic Workforce(s)

OVER THE LAST couple of years, there have been lots of discussions about the fiber optic workforce. Government funding programs like BEAD, promising billions of dollars for building broadband, had many people worrying about whether a workforce existed that could build these networks. The expressed preference for fiber-to-the-home (FTTH) would depend on a skilled workforce of fiber optic technicians. Many of the people discussing this were not really familiar with the fiber optic workforce and produced some highly inaccurate estimates of the personnel needed.

Here at FOA, since we started almost 30 years ago to develop a fiber optic workforce capable of building the internet and were familiar with the people doing the work, we were not worried. We had even been working with the U.S. Department of Labor Bureau of Labor Statistics (BLS) to define a new job category, Telecommunications Technician, to encompass fiber and wireless techs. BLS had census statistics that helped define the current workforce and provide realistic estimates of what was needed.

What we did learn was that a big future problem was not just expanding the fiber optic technician workforce, it was replacing the techs retiring, the same problem faced by every other trade. What BEAD did do was create awareness at the state level, and FOA has seen a big increase in fiber optic training at community college levels. We think the new state programs coming online now will be highly effective in providing the technicians we need for the future.

But BEAD raised another new issue that also is a workforce education problem. The BEAD funding is to be channeled through state broadband agencies. Since few states had a broadband agency, many had to be created just for the BEAD programs. Early on, we found that many of the people being hired to work in these agencies were new to fiber optics, so I wrote a new FOA book just for them, *The FOA Guide To Fiber Broadband*. It became a best seller on Amazon, and we had people taking boxes of these books to meetings and giving them away.



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All this discussion made us realize that the fiber optic “industry” depends on many other people than just the technicians building the networks.

Besides the technicians that design, build and operate the fiber optic networks the world uses for communications, there are many other professionals that are also essential for the success of the fiber optic and cabling industries. Some of these professionals are on the supply side; they are involved in the manufacturing, marketing, sales, and distribution of fiber optic products. Others are on the user side; they plan and manage the projects that include fiber optics or supervise the workers in the field.

What all these workers share is a need for understanding the technology and applications of fiber optics. That knowledge makes their jobs easier and enhances their ability to interact with others involved in their projects. That makes them and their projects more successful.

The need for knowledge at the state broadband agencies is obvious. These people will be making decisions about how billions of dollars are going to be spent and how successful the programs will be. On the supplier side, technical knowledge has always been a concern.



Over the years, I've done many training sessions for manufacturers and distributors about new fiber optic technology. It's different than training technicians; there is more focus on the products and applications and less focus on the hands-on skills.

For the technician workforce building networks, FOA had defined the knowledge, skills and abilities (KSAs) a tech needed to be considered competent, and we created the CFOT® certification to provide a credential to those accomplished technicians. The fact that we are momentarily celebrating our 100,000th CFOT® validates that program.

But FOA has been asked many times about a credential for other professionals in fiber optics. Certification is not a solution when you realize that, unlike technicians, the job functions of all these other professionals covers such a broad range of responsibilities.

We think we do have a solution, however. A credential that recognizes an indi-

vidual's knowledge of fiber optics and their experience in the industry, no matter what the job: the "FOA Badge in Fiber Optics."

What's a "Badge?" Badges are a 21st century innovation of the high-tech industry, online digital credentials created to recognize achievements in technical fields, compatible with the online platforms users depend on for communication today, like LinkedIn, Facebook, etc. A badge may be achieved by demonstrating knowledge and experience and is evidence the badge holder may use to show their achievements.

Badges are the modern way professionals convey their verified knowledge, expertise and professionalism to their employers, colleagues, and others they work with. Employers, coworkers, customers, essentially everyone the badge holder interacts with in their work, can easily validate their credentials with a single click. Badges let them stand out from those who do not have similar

verified knowledge, experience and achievements.

For all the professionals working in the fiber optic field, FOA now offers the FOA Badge in Fiber Optics. The FOA Badge in Fiber Optics recognizes the knowledge and experience they have and provides an online Digital Badge, a personal web page and certificate, shareable on social media like LinkedIn and Facebook. To earn the FOA Badge in Fiber Optics, you must have experience working in a job that involves fiber optics and pass an online test. There is a free online preparation course at Fiber U.

Here is the FOA way to recognize all the professionals who are essential to the success of our industry. Here is a way to recognize professionalism in fiber optics no matter what the individual's job.

Learn more at the FOA Badge website: www.foa.org/Badge_FO.html. ■

Jim Hayes is a VDV writer and educator and President of The Fiber Optic Association (FOA).

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Have Your Security Thrive in '25

Introducing the 10 Layers of Defense

EVERY DAY, articles on cybersecurity give quick advice—two or three things “you must do.” Just this fall, CISA published “Four Easy Ways to Protect Your Business!” All great and many are aligned with this article.

However, there is no single source providing a simple and comprehensive plan of action that builds defenses for the entire organization, one step-at-a-time, significantly reducing risk. This is exactly the intention of this article.

Here, we have organized the most important best practices in 10 defensive layers. Simply, if one layer is breached, then there's another immediately behind it. In addition, we follow the two principles of Zero Trust “Never Trust, Always Verify” and “Assume Breach.”

Cybersecurity lives in the world of “you're only as strong as your weakest link.” So, while 10 layers of defense are required, there's no escaping that many actions are involved as each weak link is strengthened. What this approach brings is a sense of order and reduced stress, all at very little external cost! Okay, enough preamble, let's start with the first and most important layer.

1ST Executive Commitment

All good defense is built on a solid structure and a broad foundation. So, the first layer of defense is exactly that—a written security policy encompassing the whole organization. Commitment and realization that cybersecurity is not just an IT issue and means having executive-level responsibility for cybersecurity. As defenses mature, an ongoing, measurable plan reflects the requirements of your business, systems, and networks. These documents will

be central to both regulatory compliance and competitive positioning.

2ND Asset Curation

Protecting all assets: data, systems and software is critical. Encryption is key for critical customer data, intellectual property, etc., mitigating theft. Automated updates of software, network devices, and end-user systems minimize human errors and accelerate fixing newly discovered attacks. Segmenting and hiding network and data elements nullifies attacks. If they can't find it, they can't break it.

Backups are often the threat actors' primary target. Key to asset management is backing up data, software, user and system information and disconnecting it from the rest of the system to eliminate outside access. This prevents actors from corrupting even encrypted data. Defense and resilience to attacks on mission critical data is never complete until the backups are restored and content verified as valid.

3RD System Access

Next, ensure defense from illicit user access. Anyone inside or outside the organization must use multi-factor authentication/passkeys, and strong passwords. Human resources must vet employees and contractors, building and executing ongoing training to guard against insider threats and social engineering of staff. Users must only be given sufficient privilege to undertake their assigned tasks.

4TH Policy Management

Identity, authentication, privilege, and access control management in line with policy, with authorized users only permitted to access systems from approved



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devices and locations, at allowed times. This goes for all third-party contractors, devices, and software.

5TH Organizational Integrity

Strengthening departmental and external vulnerabilities: best practices across every area of the organization, outsourced and contractors. It's often overlooked that every organization uses third parties and their software. It must fall upon the executive responsible for security to oversee all manner of third parties who have access to sensitive information. For example, recruiting companies, CPA, web hosting companies, legal firms, external network service providers, etc. must all be verified. No potential weak link may be trusted—ever.

6TH Supply Chain Management

Supply Chain Security: even the largest companies are guilty of not collaborating to validate their supply chains' products or services. Suppliers and customers have a shared responsibility. “Never Trust, Always Verify” operates this defense so that responsibility can be delegated not abdicated. See cybyr.com/delegation for the details.

7TH Basic Software Protection

It was important to first establish best practices for defensive measures. Beyond backups, these required no additional outside spend. Now we can turn to defenses which are likely already included

via software subscriptions. i.e., basic anti-phishing, anti-malware, firewalls, VPN, a password manager, and low-cost identity managers. This essential software is the necessary next layer of defense.

8TH Breach Defense

So far, the defenses listed have primarily been to guard against attacks to the “system” and its users. Now it’s time to apply the Zero Trust principle “Assume Breach.” Even if, for whatever reason, the previous layers of defense have been breached, then it’s vital to detect and remove threats that are already in your system or the network. Most ransomware attacks are of this advanced, complex nature and are fully explained at cybyr.com/cyberpedia. When penetration occurs, malware looks for weakness, lying in wait until signaled by its host, and then uses illicit software to move to areas of weakness and begin the attack. Use of Threat Detection and Response software is beyond the scope of this article, but implementation is covered on my Virtual CSO page: cybyr.com/vcso.

9TH Monitoring & Measurement

Monitoring of everything above should be automated and is a critical element of the defense. Both software and procedures must report when people or processes are not within policy, when people, transactions or systems are blocked, anomalies occur, and when overall risk improves or as a regular audit.

10TH Vigilance

None of these defenses are one-offs. Awareness to new threats, ongoing adaptation of policies, techniques, improvements and compliance to new regulations, and careful adoption of GenAI will be a constant part of your defense. Part of our role is to highlight the most noteworthy² of the thousands of news items each month and more than 400 cybersecurity terms³ as they evolve.

Each advance is measured as risk decreases and new recommendations are implemented. Sharing these ideas is

important but implementing them with you is why we created our Virtual CSO service described at cybyr.com/vcso. The intention of this article was to create an implementable structure to reduce your risks across your organization at very limited cost. We hope that has been achieved so you can look forward to a secure 2025. This story continues at cybyr.com/10layers.

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Mark Fishburn is CEO of cybyr.com and a provider of strategic network, cybersecurity, and marketing services.



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Janelle visits the GPC Operations Team members and collaborates on-site.



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LIVE INSIGHTS WITH

Jelle Allison

Chief Service Delivery Officer,
Great Plains Communications (GPC)

BY SHARON VOLLMAN

As Chief Service Delivery Officer, Janelle is responsible for Customer Service, the NOC, Service Operations and Project Management at GPC.

Janelle's approach aligns with a great quote by Peter Drucker, a well-known writer on business management theory and practice. He once said, "Culture eats strategy for breakfast," meaning that while a well-crafted strategy is essential, a customer-centric culture truly drives success. As a positive leader, Janelle practices that theory, knowing the best business plans can falter without the right culture.

Learn how she cultivates a culture where empathy, responsiveness, and collaboration thrive—enabling her team to follow proven strategies, exceed customer expectations, and ensure long-term loyalty and sustained business growth.

TOPIC: Evolving Expectations

ISE: How have customer expectations changed since the internet became a vital utility for home and business?

Janelle Allison: The internet has become a utility that is as vital as electricity, water, and gas. Customers need bandwidth for everything they do daily, whether banking, online learning, telehealth, running a business or staying connected to the world around them. It allows them to live where they want and work in the profession they desire, even remotely. The rising dependence on the internet, in turn, requires a robust and consistent connection—always on to meet customer needs and expectations.



Internet providers must deliver an outstanding customer experience, including high speed, reliability, and knowledgeable support. We realize that not every customer can fit into a box. We need to think outside the box to meet them where they are. That is what first-class customer experience is all about.

TOPIC: Transforming Best Practices

ISE: How has GPC evolved its customer service practices to help keep up with these changing customer expectations?

Allison: GPC has customers in densely populated areas and some of the most remote locations in the Midwest. We are a 114-year-old company that started by providing telephones to some of the most remote locations in Nebraska and Indiana. We continue to build fiber out to rural locations in partnership with the available state and federal government programs. We have expanded our reach to urban markets to bring all customers, regardless of location, the bandwidth and services that provide access to top-tier technology and connectivity.

Additionally, customers want to have options for signing up for services. Some want to enroll online without human interaction, while others still want to call and talk to someone who can guide

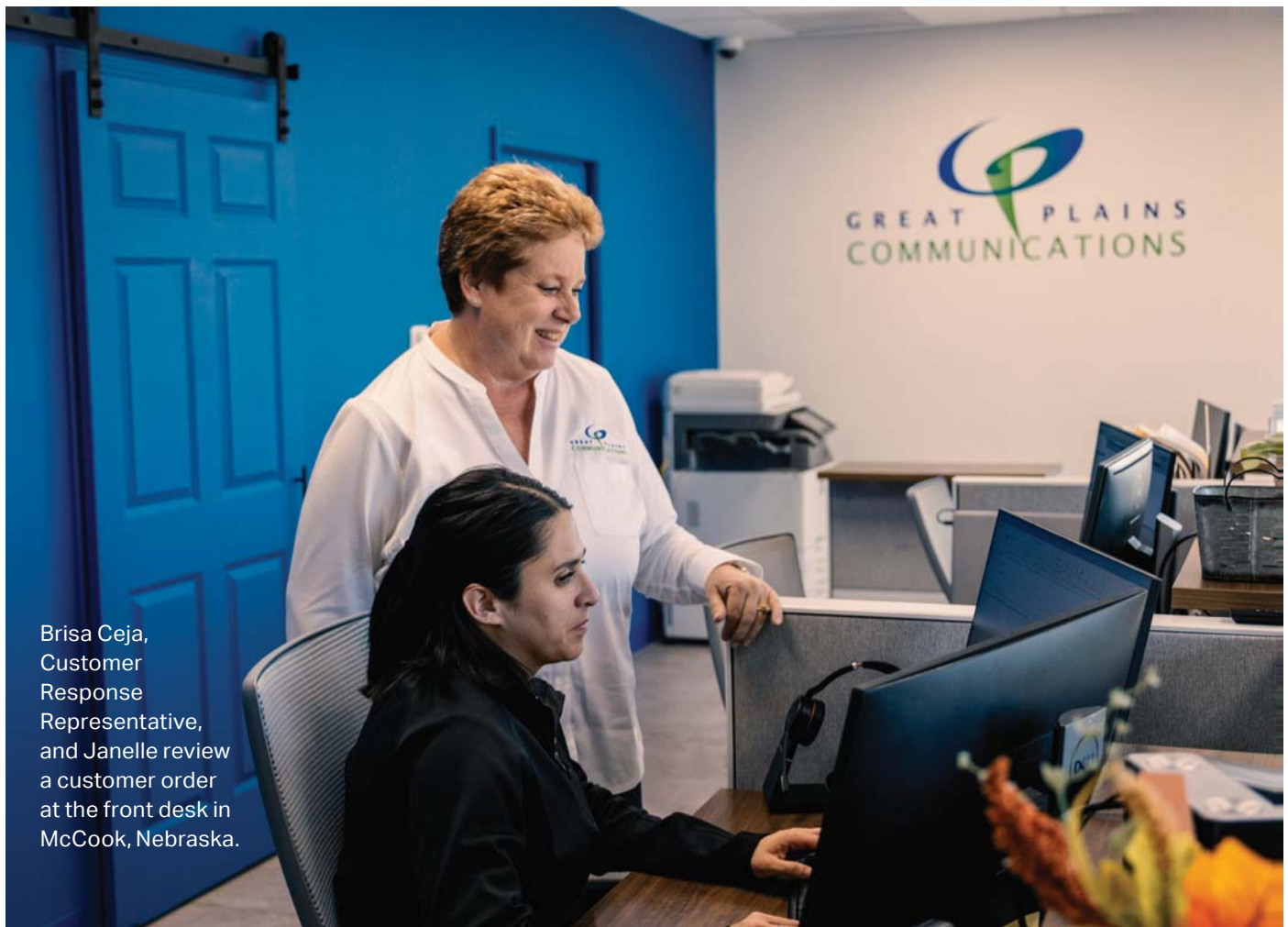
them through the decision-making process. To ensure we can serve the needs of all customers, we have embarked on a digital transformation process that includes enhancements to our current online user experience.

TOPIC: CE and Digital Transformation

ISE: What customer experience efforts are you making to ensure GPC is delivering the highest standard of customer service against the competition?

Allison: GPC is in the middle of a digital transformation that will create efficiencies and tools to streamline the customer experience. We strive to make it easy for customers to sign up and do business with us in a way that fits into their busy lives. This will allow us to serve the customer more quickly and communicate through methods they use every day.

While we use technology to create efficiencies, reduce time-lines and provide multiple communication methods for our customers, our employees' availability and responsiveness across the company make us different. We pride ourselves on having a high-performing network and high-performing people; when we say that, we mean it.



Brisa Ceja, Customer Response Representative, and Janelle review a customer order at the front desk in McCook, Nebraska.

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Janelle walks through a customer fiber installation with Jared Tighe, Outside Plant (OSP) Engineering Technician.

TOPIC: Motivating Your Team

ISE: How do you motivate and empower employees to improve customer experience and continue elevating GPC in this business area?

Allison: We started a program a little over a year ago called the “WOW” program. We ask our customers how we are doing through our technicians and phone representatives as they interact with them, in addition to regular customer surveys for new customer installations and resolved trouble tickets. This program is not about the run-of-the-mill good customer service moments (that is our GPC standard operating procedure); these are examples of employees going above and beyond to deliver excellence in customer experience. We track these monthly, quarterly and annually and share them company-wide to recognize the efforts of employees receiving WOW customer shout-outs and to encourage others to do the same. The program has been a success and continues to grow.

TOPIC: AI and Automation

ISE: What tools and processes do you engage to streamline business practices?

Allison: Automation and the new AI options will allow us to

continue to find ways to do things better and more efficiently. We aim to utilize these new tools while monitoring the customer experience. We don’t want to sacrifice the human aspect of the customer experience while creating automation and efficiency. Our goal is to achieve the right balance.

TOPIC: The Faces of GPC

ISE: What hiring challenges are you finding when seeking new employees and retaining current ones?

Allison: The role of our customer-facing employees hasn’t changed dramatically. These people are the face of the company because they are the ones the customer interacts with daily. We want outgoing, helpful employees passionate about the customer experience and what we do for our customers.

We seek individuals who are a little more technical or have the capacity to understand the technical aspect of our company to adequately understand the customer’s communication challenges and help them solve issues by providing the right products and services to meet their needs. Additionally, we need to ensure we are constantly promoting our customer support as something the customer needs for the long haul as they continue to navigate the ever-changing world of technology.

TOPIC: Culture

ISE: As a person who has been in the industry and with GPC for several years, what do you think is a constant strength that has been present that still resonates with your customer and employee base today?

Allison: A constant strength for GPC is the culture, both the internal culture created by our employees and how that resonates with our customers in the form of a positive customer experience. We care. Our employees live, work and participate in the communities they serve. We aren't just passing through or there to make a sale. We are proud of the quality of our communication services and our genuine passion to serve customers by caring for them daily. We are here to partner with our customers and communities to make a difference and improve lives by providing high-quality service and support.

TOPIC: Advice

ISE: What one piece of advice would you give to a person who is just entering the customer experience industry?

Allison: Products come and go, price sensitivity comes and goes, but the customer experience and how you treat your customers will always be essential and a true differentiator for companies that want to stand the test of time. Be dedicated to your customers.

TOPIC: Nurturing Network Technician Talent

ISE: Network technicians are often the company's first and last face. That means you need talented individuals with strong problem-solving and customer-facing skills. Share how you nurture both.

Allison: This is two-fold: hire the right people and have the right programs and culture to support the customer experience. We employ technicians who live and work in the places they serve, many of them starting as summer interns while they are going to school. GPC encourages a high level of participation in the community, with many of our employees' coaching sports, volunteering with the fire department and even serving as mayor

“Products come and go, price sensitivity comes and goes, but the customer experience and how you treat your customers will always be essential and a true differentiator for companies that want to stand the test of time. Be dedicated to your customers.”



Janelle, Brian Orwig, OSP Project Engineer (center), and Travis Radnor, Sr. Director of Governmental Policy and Market Analysis (left), discussing fiber expansion plans in Kearney, Nebraska.



Janelle regularly conducts face-to-face meetings with technicians across the Midwest.

of their respective towns. We are part of the community, active and highly visible.

Additionally, our programs prioritize the customer experience, especially through our WOW program, highlighting employees providing exceptional customer experiences. We reward points to the employee, who can then redeem those to purchase items or gift cards. Overall, it is all about maintaining a positive culture within the company, inspiring employees to encourage each other, being passionate about putting the customer first and holding ourselves accountable to do what we say we will.

Our internal Culture Committee meets with, surveys and talks to employees about our company culture and what we can do better. This team has direct access to executive leadership, and we believe this makes us different.

TOPIC: Women in Telecom (WiT)

ISE: Being a woman in the C-Suite is a gift and a challenge. Share what you recommend for women who want to wear your shoes soon.

Allison: We should concentrate on elevating our knowledge, skills and abilities and taking care of our areas of responsibility. We need to work to understand the big picture, how our team fits and what we can do to contribute to the overall success of the company. Have confidence in what we know, work to be heard and don't apologize for pushing forward, working hard and getting things done. It is about how good we are at what we do that should matter.

TOPIC: Out-of-the-Box Thinking

ISE: How has the GPC team colored outside the lines to do business differently and better for its employees?

Allison: We challenge our employees to bring new ideas and enhancements to the jobs they do every day—a new approach or efficiency that helps the business. They are in the trenches with the best information to see what works and what doesn't. We need their ideas, and we need to hear their ideas. If it doesn't work, we'll make a change. Everyone's voice matters, so encouraging collaboration is essential. ■

Janelle Allison joined Great Plains Communications in 2005 and currently serves as the Chief Service Delivery Officer. She oversees several areas of the business including the GPC Customer Response Center, Network Operations Center, Field Operations and Project Management to ensure a superior customer experience. She is responsible for managing GPC's service delivery to ensure the development of strategic plans aligns with the accountability of performance and adheres to corporate values. Allison is also responsible for the attainment of operational, strategic and financial goals. She is a Certified Public Accountant with over 30 years of accounting, finance, operations and leadership experience in the financial and telecommunications industries. To learn more about GPC, visit gpc.com. Follow them on LinkedIn: [linkedin.com/company/great-plains-communications](https://www.linkedin.com/company/great-plains-communications), Facebook: [facebook.com/GreatPlainsCommunications](https://www.facebook.com/GreatPlainsCommunications) and X @GPC_updates.



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THOUGHT LEADERSHIP



IN 20 24



A look back at what telecom leaders had to say about industry challenges and opportunities this year.

BY JOE GILLARD



Our job at ISE Magazine is curation of expertise—a task that still requires a human touch. For our end-of-year issue, we have hand-selected a “best of” selection of our thought leadership content, with snippets from our Executive Insights interviews, as well as Tech Talks and Q&As over the course of 2024.

“Thought leader” is a designation reserved for individuals who have achieved a reputation within their areas of expertise as a source of guidance, judgment, and inspiration. The individuals in the following pages have earned that distinction. Now, we’re sharing some of their thoughts with you, to wrap up the year.

These are words of wisdom from telecom thought leaders about the issues that are important to everyone in this industry. While each individual here has a unique background and role to play, they wholly understand the complexities of the industry, and most importantly, the challenges that you are facing right now, as the year comes to a close.

So, I hope these become takeaways that inspire you to act, think, collaborate, and lead in new ways. Grab your highlighter and dive in.

TOPIC: FWA and FTTP

ISE: Share your perspective about the interplay between these two technologies when working to deliver gigabit speeds to serve hard-to-reach customers.

Jennifer Prather, CEO, Totelcom Communications, LLC:

Totelcom utilizes every tool available to serve our hardest-to-reach customers, including fixed wireless technologies. Every type of service technology has pros and cons.

In our experience, fixed wireless has been a tool to enter a new market quicker and more cost-effectively before deploying fiber, and we also utilize it to serve some of our most remote customers. Providing a quality fixed wireless experience still takes a lot of fiber. The backhaul and capacity needs of some of those most remote consumers, including energy production/monitoring and agriculture production, continue to challenge fixed wireless.

Even with the deployment of next-gen fixed wireless, our goal remains to get wired connectivity to all these customers eventually—because of some of the cons of the service. Namely, the ongoing maintenance has proven to be greater in time and expense than a wired fiber optic network. Even with the purported reduced next-gen line of site requirements, weather can still interfere with the service. We must replace units at network access points and customer locations that take direct lightning strikes or intense wind bursts each spring. Depending on when these outages occur, it can also limit our ability to address them until the weather has passed.



What we need from our vendor partners is high-quality software code, timely delivery of new features and functionality, and a strong sense of urgency to address any software bugs and defects when they arise.

—Diana Scudder, Verizon



I also worry about the long-term viability and capacity of spectrum as more wireless tech emerges for the end consumer. Any wireless product, including next-gen fixed wireless and 5G, requires robust wired networks for backhaul between the wireless access points and the core network. This requires fiber to be already branched out to a certain extent, likely close enough to the end consumer to mitigate the cost differential of wired end-user access over a long-term feasibility calculation.

Long-term service plans to consumers must consider all these factors, and with the current funding environment promoting dollars for fiber deployment, it’s a time to try to get as much fiber out as possible and limit our reliance on spectrum-based technologies.

TOPIC: Workforce Retention

ISE: What is the telecom industry missing in recruiting/retaining younger professionals? What is the company doing in this area?

Michael Wynschenk, CEO, Hunter Communications: Young professionals want to be engaged, they want to be developed, and they want to have exposure to leaders in the business. They want to be mentored.

Members of our leadership team host immersion meetings to address business challenges. This is where management and employees work together to create better results for the business and our customers. Employees are at the decision-making table and find the experience and exposure invaluable.

In 2022, we launched our “Get Ready” Program, which helps facilitate career progression through employee training and mentorship. This program has matured from where department heads nominated employees to where employees participate in an application process. Our inaugural class saw seven out of 10 participants “graduate” and promoted to next-level roles. We are currently preparing to complete the training for the second graduating class.

Our Construction department utilizes a formal apprenticeship program, where individuals with little experience can grow from a ground hand into an aerial lineman. There are eight different tiers that a construction employee needs to complete, with the possibility of program completion in as little as two years. Since its inception, we have promoted 17 employees through this program.

TOPIC: Vendor Collaboration

ISE: What three things do you need from your vendor partners?

Diana Scudder, Vice President, Virtual Network Operations & Engineering, Verizon: What we need from our vendor

partners is high-quality software code, timely delivery of new features and functionality, and a strong sense of urgency to address any software bugs and defects when they arise. One of the most important ways to ensure quality assurance of new code is for our vendor partners to configure their labs to match our production environment. Additionally, it is imperative that thorough regression testing be performed before delivery.

TOPIC: Emotional Intelligence

ISE: As you work through network obstacles, what have you learned about yourself and others that surprised you?

Todd Zeiler, Vice President of Wireless Construction & Engineering, AT&T: One of my leaders once said, “If I could hire based on self-awareness alone, that would be enough for me to build a strong team.” Since hearing that, I’ve been extra aware of the need to grow that trait as a leader, both in and outside work. We all are created with inherited strengths and are gifted in some areas more than others. I’ve learned that our strengths can also be our potential downfalls.

Out-front and upfront leaders can be a huge inspiration but can also struggle with pride. Individual contributors with deep knowledge of a particular subject make significant contributions to the advancement of society but can also need help collaborating and sharing ideas. The best leaders are self-aware and are emotionally the most intelligent. I’ll never forget that life is 10% what happens to you and 90% how you react.

TOPIC: Permitting and Easements

ISE: There’s been much debate in DC about permitting and other approval processes that can result in significant deployment delays and cost increases. What would help solve these challenges?

Jason Williams, CEO, Blackfoot Communications: We ran into permitting problems early in our FTTP deployment and continue to run into permitting issues today. On the federal side, we have supported the idea of a “shot clock,” meaning, for example, that if we submit a complete permit application to a federal agency, the permit will be deemed granted within 45 or 60 days if that agency doesn’t act on it. Another option would be to require a streamlined permitting process for areas that have already been disturbed—i.e., areas where we have an existing network and we’re just reinforcing what we already have.

Railroad crossing permits are also an ongoing issue. A few years ago, we had modest success negotiating with the Montana-based division of a larger national railroad to establish some

processes and timeframes. That helped a little, but it was voluntary, and whenever there are personnel changes at the railroads, it seems like we start over again.

TOPIC: Telecom Trends

ISE: How do you see emerging technologies such as 5G, IoT, and edge computing shaping the telecom landscape across rural America in the coming years?

Jennifer Prather: Rural America is primed for use cases and an excellent place to test emerging tech. We have lots of open space, energy, and hardworking individuals in rural areas. We need to be connected to things that previously required a physical connection but can now be done remotely, such as healthcare, education, and commerce. Access to robust and reliable internet connectivity allows our rural areas to grow. With the arrival of remote work at a more universal level, consumers can choose to live in a more remote or rural area. Their arrival, in turn, requires us to do our job well. We must keep our service reliable, robust, and growing with them—or they won’t stay.

Edge computing is an opportunity for rural carriers because we already have empty real estate with robust air conditioning, backup power, and resilient large-capacity networks in our old switch remote locations. All these emerging technologies require larger data capacity, only furthering the need for robust, resilient, and future-proof connections in rural America. To be ready for whatever comes next, we need fiber deployed and ready.

TOPIC: Community Connections

ISE: To celebrate your May 2023 expansion into Chiloquin, Oregon, you hosted a Community Pizza Party at the Chiloquin Community Center. You also run campaigns to reduce cyberbullying and offer scholarships to students across your service area. Share two other ways you strengthen community connections in telehealth, developing a homegrown workforce and digital inclusion.

Michael Wynschenk: The pandemic saw a boom in the use of telemedicine like nothing we’ve ever seen before. According to the *Journal of American Medical Association*, there were less than 1 million telemedicine visits nationwide in 2019. That number skyrocketed to over 50 million during the pandemic. The Pacific Northwest utilizes telemedicine almost twice as much as other regions in the country.

At Hunter, we provide symmetrical fiber internet service to our residential customers, vital for a strong video connection during

“ One of my leaders once said, ‘If I could hire based on self-awareness alone, that would be enough for me to build a strong team.’ Since hearing that, I’ve been extra aware of the need to grow that trait as a leader, both in and outside work. —Todd Zeiler, AT&T ”

a telemedicine appointment. We also provide fiber optic service to most of the region's larger hospitals and medical facilities, including Asante and Three Rivers Medical Center. Upload speeds at the home and the medical facility are imperative for doctors to communicate clearly and accurately diagnose medical conditions.

While Hunter participates in ACP, we have also created special pricing programs for Veterans and active military personnel, teachers, and parents. In December, we launched the Hunter Family Safety Bundle, which includes our symmetrical fiber optic internet and our Hunter Shield Suite of Internet security products, enabling parents to monitor cyberbullying while building trust and helping their children maintain privacy. This aligns with our values of providing fast, reliable, affordable, and safe internet.

TOPIC: The Elephant in the Room

ISE: What is our industry NOT addressing that it should in terms of network evolution and broadband for all?

Scott Mispagel, SVP, National Engineering & Operations, Frontier Communications: Permitting. When permitting is delayed, it affects the timeline, resources, and budget for fiber deployment. This ultimately impacts people's ability to access the best broadband connectivity available. While work is being done in this area, we need to come together as an industry to address these challenges and implement solutions that will help deliver this critical infrastructure more efficiently to communities across the country.

TOPIC: Advice

ISE: What would you tell emerging leaders as they try to make a difference in the industry AND propel their careers to the next level?

Diana Scudder: My recommendation for emerging leaders is not to be afraid to take risks. Leaders need to get comfortable with being uncomfortable. They must become experts at change management. First, by embracing change themselves. Next, by helping lead their team through change.

Technology is changing and evolving at such a rapid and unprecedented rate. Industry leaders must embrace new technologies and innovation, such as artificial intelligence.

Finally, leaders must also create a safe environment for their employees to feel empowered to share ideas, try, fail, learn, iterate, and grow. Leaders must remember that some of the most innovative and creative solutions are developed by frontline teams.



Rural America is primed for use cases and an excellent place to test emerging tech. We have lots of open space, energy, and hardworking individuals in rural areas.

—Jennifer Prather,
Totalcom Communications



TOPIC: The Future

ISE: What emerging or disruptive broadband technology excites you the most? Why?

Todd Zeiler: While Open RAN usually gets the attention of the newspaper's front page, the service management and orchestration (SMO) platform is the foundation of creativity. While "open network management" might not do justice to the full scope of SMO, let's offer that label as a starting point. While SMO will offer the traditional configuration, fault, and performance management of a multi-vendor environment, I would provide the real win is potentially an "app store" for wireless networks. The "SMO app store" will invite the brightest minds of mobile network engineers, wireless vendor partners, and, ultimately, the creativity of the brightest third-party developers to drive automation, innovation, and out-of-the-box ideation for revenue-generating applications.

TOPIC: Data Centers

ISE: What network challenges are unique to data centers and what challenges are ahead for them?

Michael Crook, Market Development Manager, Corning Optical Communications: Data centers are confronted with unique challenges due to the rise of generative AI. One of these challenges is time. The speed at which data centers need to be built or expanded is increasing rapidly. Hyperscale data centers are swiftly adapting their architectures to accommodate more fiber for AI applications. Now, more than ever, they require pre-connectorized solutions for denser, faster, and simpler deployments.

Additionally, space within data centers and the size of components are also significant challenges. Compared to traditional data centers that primarily use a Central Processing Unit (CPU) based network, AI requires a second backend network built on Graphical Processing Units (GPUs) which allows an application like a chatbot to learn from a set of data and then create new data based on what it learned.

These GPUs not only connect to the front-end network but also interconnect, creating the dense neural network required for Gen AI. In fact, these large GPU clusters can require over 10 times more optical fiber in the same space than legacy server racks, leading to a need for smaller and denser solutions to fit more fiber into existing spaces.

Data centers also face the challenge of future-proofing their networks and accounting for scalable growth. As AI continues to evolve, the backend networks will also need to adapt and grow. We see fiber connections scaling up as data rates per GPU scales up—meaning more and more fiber optic connects needed to build larger AI clusters. ■

LIMITLESS OPPORTUNITY



ESS AHEAD

Exclusive highlights from
the executive panel discussion
at ISE EXPO 2024
with six telecom leaders.

BY JANICE OLIVA

At ISE EXPO this year, I once again had the honor of hosting our executive panel discussion. Six executive leaders in the telecom industry joined me for a live discussion that leveraged the collective wisdom of these individuals and got to the heart of what's facing the industry as a whole right now.

In the following pages, ISE Magazine shares with our readers insights from these executives pertaining to AI and machine learning in the telecom world, the BEAD program, where the industry is headed, and more. They also share some thoughts about leadership and productivity that they've learned over the course of their successful careers.



“I think that AI/ML will infiltrate more and more of our value chain, and our adoption of data-driven approaches, going paperless end to end, will be accelerated more broadly.”

Paul Sulisz

Divisional President,
Commercial Services
Group, Congruex



A panel such as this is a rare opportunity to hear from a group of telecom leaders gathered together to talk about what’s on their mind. I hope you find their words insightful, thought-provoking, and inspiring.

TOPIC: AI and the Network

ISE: The AI Network Intelligence market is forecasted to grow 40% by 2029. By 2035, it could improve construction profitability by 71%. Many providers use AI to tame network complexity, reduce OpEx, and enhance network performance management. What are you seeing in the market related to the impact of AI in network operations?

Kevin Morgan, Clearfield: When it comes to fiber networks, one of the biggest operator challenges to keep up with is cross connect assignments and inventory records within a fiber distribution hub (FDH) cabinet. We are encouraged to see AI applications being developed to help alleviate these issues.

Think of this as an improvement best practice. A technician arrives at a job site to connect fiber to a customer’s premises. Besides the drop cable, terminal, and entrance cable for the home, the technician needs to travel to a cross connect cabinet to activate the passive optical network (PON) splitter in centralized split configuration. With AI, the technician can open the cabinet, take a picture and let AI create an accurate inventory of the available fibers.

That way, the service tech can gain confidence in successfully turning up a customer on time.

Paul Sulisz, Congruex: We have access to more and more data, and the relationships within those data sets are becoming more complex. The best way to tame that data overload and make meaningful decisions on our operations—and to optimize our operations in real-time or near real-time—is to use AI.

Randall René, Esri: The AI Network Intelligence market is experiencing a significant transformation, with forecasts indicating a 40% growth by 2029 and potential improvements in construction profitability

by 71% by 2035. At Esri, we observe that many telecommunications providers are seeking, and increasingly, leveraging, AI to manage network complexity, maximize capital expenditures (CapEx), reduce operational expenditures (OpEx), and enhance network performance and management.

AI’s ability to analyze vast amounts of data quickly and accurately is a game changer. For instance, AI-driven predictive maintenance can preemptively identify potential network failures, allowing for proactive measures rather than reactive responses. This not only reduces downtime but also lowers maintenance costs. Additionally, AI is instrumental in optimizing network traffic, ensuring efficient data flow and minimizing congestion, which is crucial as data consumption continues to surge.

Kevin Czaicki, Millennium: AI is reshaping the industry and changing how we build and manage networks. Construction of networks is increasing efficiency, and sustainability. In construction, real-time AI sensors and cameras enhance safety protocols and quality control, while predictive analytics streamline planning and resource management.

Autonomous construction equipment and collaborative AI tools will also optimize operations. In network management, think about any repetitive tasks. AI tackles complexity and boosts performance, ensuring resilience and efficient handling of growing demands.

Kirk Smith, UniTek: The noticeable impact AI appears to be having in the immediate timeframe regarding UniTek is twofold. The first being related to the procurement process, and the second involving the design, engineering, permitting, and utility-locating processes. Many providers are outsourcing RFP/bidding procedures to third party admins who are beginning to utilize AI/ML in the process of project-bidding/pricing negotiations. And while the impact of AI in the design, engineering, permitting, and utility locating space is limited today, I expect the technology to have a meaningful impact on these processes of network build-out within the next one to three years.

Going forward, I expect AI/ML applications

to quickly begin to drive efficiencies throughout the project management process. This application is available in a limited form today, but I expect this will change drastically over the coming few years.

Charles Harlow, Vitruvi Software: The rapid acceleration of AI and its accessibility has been astonishing. In 2014, the world saw the advent of fringe developers devising AI-driven cameras being utilized for diabetic retinopathy. Today, in 2024, we're seeing the same groundbreaking technology, and similar advances in lidar imagery—in sync with satellite, drones and mobile phones—being used to automate processes that have traditionally been labor intensive.

We see strong and pointed effort has been made on the preconstruction engineering tasks that have historically been accomplished with multiple team members, contractors, and service-oriented groups. One example being make ready validation. Traditionally a manual pole by pole, attachment by attachment endeavor. This, by comparison, can now be breezed through with the help of AI to accurately gather pole attachment heights, label photographs accordingly, convert imagery to GIS or CAD based data, identify safety concerns, and more. Subsequently, this same technology

can be utilized for the completion of projects or tasks to ensure compliance with an organization or municipal's standards.

TOPIC: BEAD Funding

ISE: Share your opinion on how the Broadband Equity, Access, and Deployment (BEAD) process is going and how state Broadband Development Offices (BDOs) will impact funding allocations.

Morgan, Clearfield: The process is taking way too long. We are approaching 1,000 days since Congress appropriated funding for BEAD and we are still a long way from that money hitting the street for shovel ready projects to the areas that need broadband the most. It seems everyone is waiting for final NTIA-approved maps that define project areas. Until the project area locations are approved by the state and the NTIA, the Subgrantee Selection Process clock does not start. The states cannot confirm deals with any specific carrier until they have plans in place to cover 100% of BEAD homes.

In our discussions with state BDOs, we know they are very active in preparing the necessary paperwork required by the NTIA. There are a lot of back-and-forth negotiations with the NTIA especially when it



“BDOs may be tempted to hit the EASY button in order to meet deadlines rather than develop the most comprehensive coverage plans.”

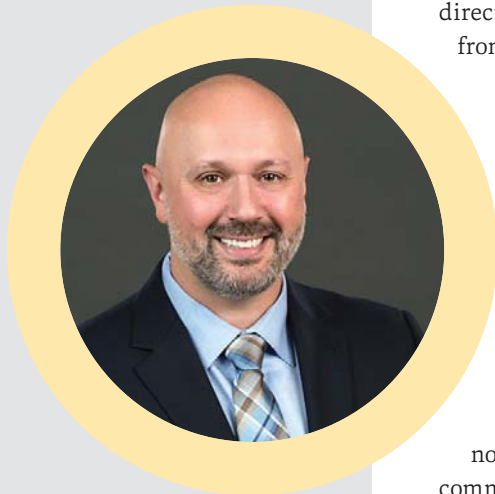
Kevin Morgan
Chief Marketing Officer,
Clearfield



“As network demands grow, so does the need for energy-efficient solutions. We see a significant push towards greener technologies and practices within the industry, driven by both regulatory pressures and corporate social responsibility.”

Randall René

Director – Telecommunications Industry Solutions, Esri



comes to serving the most challenging locations. Given these constraints, BDOs may be tempted to hit the EASY button in order to meet deadlines rather than develop the most comprehensive coverage plans.

Sulisz, Congruex: I think it’s going as expected.

What we are undertaking is complex, and it’s critical that private industry continue to partner with the government at all levels to ensure we get the most out of this opportunity. There is clearly a significant private money injection into broadband buildouts around the country currently, and the race to plant flags continues to accelerate. So, where relevant, how we incorporate BEAD into the existing rollouts and plans must evolve to ensure the timing enables our builds.

René, Esri: I believe the BEAD program represents a pivotal moment for the telecommunications industry. The process is gradually unfolding, and we’re witnessing a collaborative effort between state BDOs and service providers to ensure equitable funding allocation. These state BDOs play a critical role in assessing local needs and challenges, thus ensuring that funds are directed to areas that will benefit the most from enhanced connectivity.

Esri’s location intelligence tools are proving invaluable in this setting. By providing detailed, granular data on broadband coverage and underserved areas, our solutions help state BDOs make informed decisions about where to allocate resources. This ensures that investments are targeted effectively, allowing regions to bridge the digital divide while fostering economic growth in previously underserved communities.

Czaicki, Millennium: As expected, it is the government. It will be better to discuss this when there are more updates from the states.

Smith, UniTek: BEAD is moving ahead at a much slower than originally anticipated rate due to, what I see as the typical communication issues between industry and

government regulatory and funding organizations. My view is that BEAD isn’t likely to have a major impact on our piece of the broadband industry until mid-2025 or later.

BDOs within each state could serve to help organize efforts from state to state as well as speed up the process within their given states if they’re able to find efficient ways to proactively prepare individual awards and disburse funds in a timely manner so the carriers can begin the process of choosing the appropriate partners and building the networks.

Harlow, Vitruvi Software: BEAD has been a main talking point for many months now. It appears the industry is gearing up for a long wait before actual funding occurs. Sentiment with most, not all states, is that we’re well into the five-year BEAD process and still haven’t seen a broad swath of awards or allocations of funds. The five-year action plans were meant for just that, five years. Without an extension period added to the BEAD programs in general, there is a lack of clarity as to what happens to the funds beyond that point. One other topic that often comes up would be permitting.

Permitting will be the largest throttling factor to the BEAD project in general. We’ve seen post-pandemic permitting offices are having issues with large volumes of work. A great example being an operator forecasting 200,000’ in a market and only being allowed 35-50,000’ per week due to permits not being approved on time. This affects an operators take rate, time to construct, the number of crews in market, so on and so forth.

The state’s BDOs have been the tip of the spear to spread BEAD communication to the rural areas and organizations who will be directly impacted by BEAD. This communication will be key to help build the relationships needed to help with permitting woes our industry is currently facing.

TOPIC: Crystal Ball for the ICT/Telecom Landscape

ISE: What’s next for our industry?

Morgan, Clearfield: Smart Cities fit neatly into my crystal ball. As we evolve with data and the emergence of things like Web 3 technologies such as blockchain, artificial

intelligence (AI), and machine learning (ML), we can now start to think of these as new “tools” for smart cities. All these tools are going to help us interact with the built environments for a safer, more secure setting of better-inspired spaces. Fiber optic networks are the foundational necessity that enable these tools.

Beyond that, we at Clearfield are looking at edge computing which involves putting the components that make up a data center into a ruggedized environment closer to the end users that source the data. With this architecture in place, we can envision the Internet of Buildings where networked buildings, along with street furniture, digital signage, autonomous vehicles, drones, traffic signals, and EV charging stations are all networked over the fiber network. That is really where the aspiration starts to benefit society.

Sulisz, Congruex: I think that AI/ML will infiltrate more and more of our value chain, and our adoption of data-driven approaches, going paperless end to end, will be accelerated more broadly.

From how we accelerate through market assessments through design to handing over the keys to a built network and to operations, there are more and more applications for AI/ML that will streamline our processes and allow us to optimize in new ways.

René, Esri: Looking ahead, the ICT/telecom landscape is poised for several transformative trends. Firstly, the deployment of 5G networks will continue to accelerate, bringing unprecedented speed and connectivity. This will help enable the deployment of IoT devices, smart agriculture, smart cities, connectivity in homes, and enabling autonomous vehicles, all fundamentally changing how we live and work.

Secondly, sustainability will increase as a central focus. As network demands grow, so does the need for energy-efficient solutions. We see a significant push towards greener technologies and practices within the industry, driven by both regulatory pressures and corporate social responsibility.

Lastly, the convergence of AI, ML, and location intelligence will open new frontiers. These technologies will drive innovation

in network management, customer experience, and service delivery, making networks smarter, more resilient, and more responsive to user needs.

Czaicki, Millennium: My crystal ball is clear on consolidation, it will accelerate, and technologies will converge for the telecom landscape.

Smith, UniTek: It is my belief that the next major driver of industry opportunities within this specific segment of the broadband market will be the continuing efforts in developing more robust data center infrastructures, and the required bandwidth connections that go along with them. For hyperscalers to deliver the services required by industry participants in pushing AI and ML deeper into their service offerings, there’ll be a corresponding increased demand for additional broadband infrastructure in support of those efforts.

The data center developers are, and will continue to be, challenged to find two necessary resources, the first being available resources to power the centers and the next is building the infrastructure required to deliver the large amounts of bandwidth requirements AI/ML applications are required to have to serve their intended purposes.

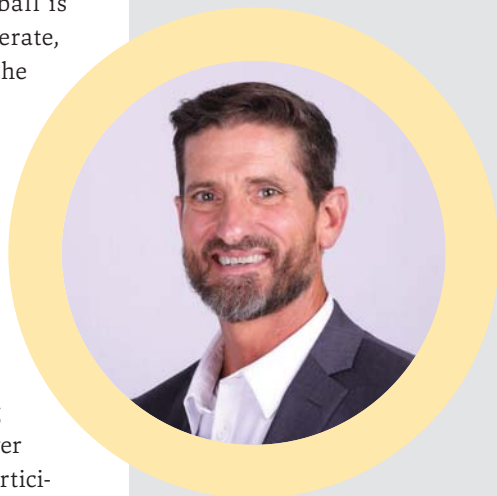
Harlow, Vitruvi Software: The explosion of PE backed - Municipal Open Access Networks. The race for hyperscalers.

TOPIC: Your Productivity Superpower

ISE: What is your superpower, and what do you wish it would be?

Morgan, Clearfield: Even though my role is Chief Marketing Officer at Clearfield, my education background is engineering. I graduated with a Bachelor of Electrical Engineering years ago. Engineers are trained to excel at problem solving. So, I would have to rank “problem solving” up there as my top superpower.

As I progressed through my career and worked my way up in management, I have



“My view is that BEAD isn’t likely to have a major impact on our piece of the broadband industry until mid-2025 or later.”

Kirk Smith
Executive VP, UniTek Global Services, Inc.



tried to develop and enhance the skill of active listening. Active listening is my desired superpower. The superpower of problem solving and active listening combines the ability to understand complex issues deeply while empathetically hearing others' perspectives.

This dual strength allows me to uncover solutions that are not only effective but also considerate of all stakeholders' needs and concerns. Whether tackling personal challenges or navigating professional hurdles, this approach ensures thoughtful, well-rounded resolutions that foster understanding and collaboration.

Sulisz, Congruex: Plan and focus on a handful of tasks that are most important, regimented in blocking out time every day to plan out those items each morning, so by the time I'm on deck, I can decipher the priority of things coming at me.

I try to manage my calendar 2-3 weeks out and block out time to think and work deeply.

René, Esri: If I had to identify my productivity superpower, it would be the ability to leverage AI tools to synthesize vast amounts of information quickly and distill it into actionable insights. This skill is particularly valuable in a rapidly evolving field like telecommunications, where staying ahead

of trends and making data-driven decisions is crucial.

However, if I could wish for an additional superpower at work, it would be the ability to instantly understand and predict market shifts with absolute accuracy. While we use sophisticated tools and analytics to forecast trends, the ability to foresee changes with complete certainty would be an invaluable asset, enabling us to navigate the future with even greater confidence and agility.

Czaicki, Millennium: My productive superpower: Empathy, lead without a title. I wish it would be: Keep it simple, stupid (K.I.S.S.).

Smith, UniTek: The ability to focus on one task at a time, while not losing track of other needs.

Flying. It would be nice to have the ability to be physically present where and when I need to be on a weekly basis without requiring an airplane to get there!

Harlow, Vitruvi Software: Making the complex – simple. A simpler way of making things simpler. ■

For more on these executives, visit isemag.com/55233959.



“AI is reshaping the industry and changing how we build and manage networks.”

Kevin Czaicki
VP of Broadband Solutions,
Millennium



“Permitting will be the largest throttling factor to the BEAD project in general.”

Charles Harlow
As-Built Consultant, Vitruvi Software



ISE EXPO 2024

ICT SOLUTIONS & EDUCATION



ISE EXPO 2024 registration at the Kay Bailey Hutchison Convention Center, Dallas, TX. Telecom professionals were geared up and ready to learn, explore solutions and network.



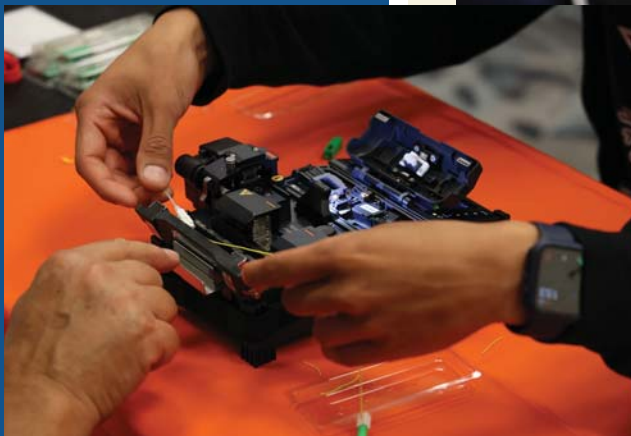
CEO reception hosted by (far right) Chris Ferrell, CEO, Endeavor Business Media. Sponsored by Hubbell Incorporated.



Janice Oliva, Endeavor Business Media, moderated the Executive Panel Discussion. Six industry-leading professionals discussed the latest ICT trends and challenges. Learn more by reading the highlights on page 22 of this issue.



A great day on the green at the 3rd annual golf tournament which took place at the Tenison Highlands Park Golf Club.



Hands-on fiber training, sponsored by SCTE, returned for its 2nd year at ISE EXPO. The program consisted of classroom sessions, small groups and hands-on activities.



Scott Mispagel, SVP, National Engineering & Operations, Frontier Communications, gave the opening keynote to a standing-room-only audience.



Frontier's new Innovation OSP Laboratory provided attendees with a real-world environment to enhance and improve the broadband customer service. Hard hats and vests sponsored by GMP/Klein Tools.

The popular Women in Telecom panel returned for its 3rd year. Leading female executives, (left to right) Katie Curtis, Jennifer Prather, Nancy White and Alexandria Martinez, shared how they succeed in their careers. Sponsored by Power & Tel. Copies of the book, *Meditations for Women Who Do Too Much*, were compliments of UniTek Global Services.



Congratulations to the 23 honorees in the 2nd annual Network Innovators' Awards program.



ISE EXPO's conference sessions were well attended. Attendees had a variety of educational options from 45 sessions and 77 speakers.



Sharon Vollman (left), ISE EXPO & ISE Magazine, moderated the closing keynote. Seated next to her (left to right) are telecom executives David Curran, VP, Network Architecture, Frontier Communications, Diana Scudder, VP, Virtual Engineering & Operations, Verizon, and Todd Zeiler, VP, Wireless Construction & Engineering, AT&T. Each delivered a 10-minute Tech Talk presentation sharing their network evolution wisdom.



Four exhibitors/sponsors (AFL, ikeGPS, Resolve Tech Solutions and Sticklers Fiber Optic Cleaners) showcased innovative products at the interactive Demo Zone.



The exhibit floor buzzed with activity as attendees visited the 200+ booths.



You're Ready for AI, But is Your Data?

Establishing a strong foundation for AI starts with high-quality network data.

BY DAVID COTTINGHAM

Fiber operators face increasing pressure to adopt emerging technologies to stay competitive as the industry evolves. A recent report by McKinsey & Company¹ emphasizes the positive impact that AI can have on the telecommunications industry in terms of growth. As put in the report, “evidence suggests that AI could be the catalyst to reignite growth after a decade of stagnation.”

AI offers significant benefits, such as self-healing infrastructure and touchless customer service. It can transform predictive maintenance by analyzing network data to foresee equipment failures, thus reducing costly downtime and optimizing resource allocation. Additionally, AI-driven algorithms can greatly enhance the performance, efficiency and reliability of fiber networks by identifying bottlenecks, suggesting capacity upgrades, and improving service quality. However, the successful deployment of AI hinges on the quality of the underlying fiber network data.

The Importance of Network Data Quality

For broadband operators, having a robust and accurate representation of their physical network infrastructure is

“To fully leverage AI and ML, fiber operators should begin by prioritizing strategies and technologies that create a comprehensive and accurate network model.”

vital for business success and is a critical foundation to leverage AI technology. High-quality data on asset locations, connections, and configurations is essential for operational efficiency, informed decision-making, and cost optimization.

Unfortunately, fiber network operators often encounter significant data quality challenges, such as inaccurate or incomplete asset data, inconsistent network documentation, and data silos. These issues can lead to errors in network planning, increased construction and maintenance costs, and difficulties in integrating emerging technologies like AI. The dynamic nature of fiber networks further complicates maintaining data accuracy.

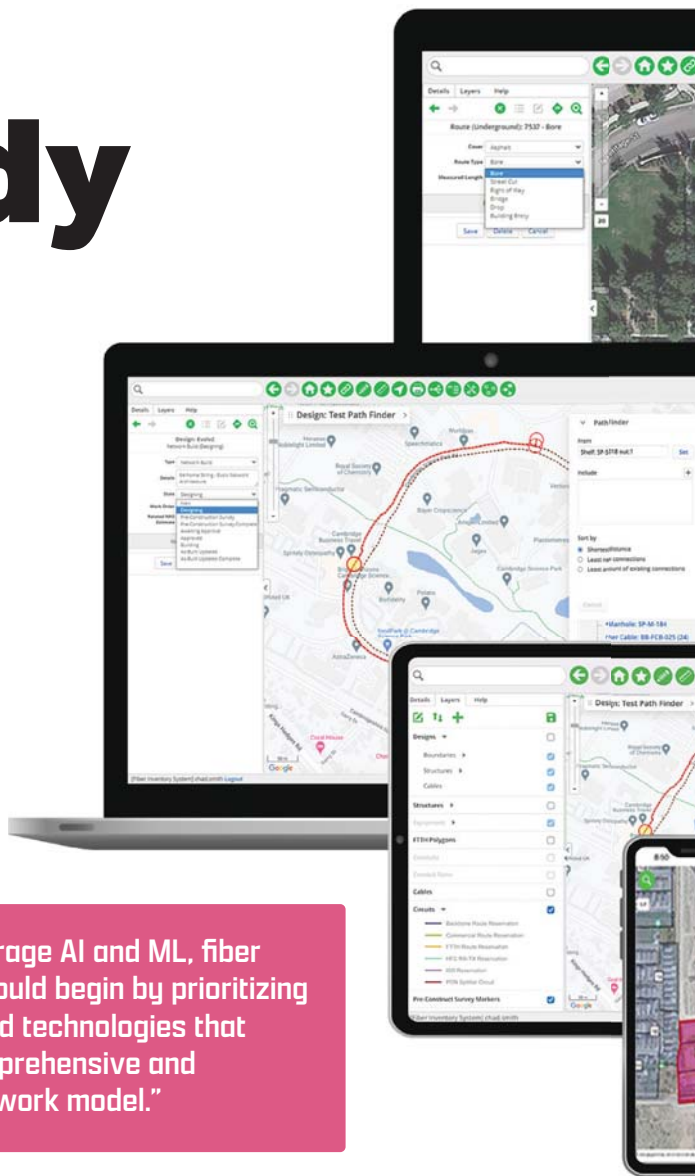
To fully leverage AI and ML, fiber operators should begin by prioritizing strategies and technologies that create

a comprehensive and accurate network model. This includes:

- **Holistic Asset Management:** Establishing a centralized repository for detailed asset information, including location, type, and connectivity.
- **Dynamic Network Documentation:** Implementing field processes for continuous data updates to reflect network changes and expansions.
- **Data Integration:** Breaking down data silos to create a unified view of the network for improved analysis and decision-making.

Optimizing the Network

A physical network is at the core of any telecom organization. Operators should efficiently plan, design, build, operate, and monetize their networks to accelerate ROI. Initially, this may involve





replacing spreadsheets and CAD drawings with fiber network documentation software. However, many larger, established broadband operators still use outdated geographic information systems and a collection of siloed applications. This may result in more agile operators with integrated life cycle management solutions optimized for fiber networks outpacing these larger incumbents.

Prioritizing an optimized fiber network model, such as a digital twin built specifically for the network, prevents the creation of a complicated and fragmented software infrastructure that is difficult to support, upgrade, and evolve. An integrated network management strategy enables operators to lay a strong foundation, so when they decide to invest in emerging AI and ML technologies, they are well-positioned to take advantage of

the business optimization benefits offered by advanced technology.

In Preparation for Emerging Technologies

To prioritize data quality and prepare for AI and ML, telecom operators should consider the following steps:

- **Assess Data Health:** Examine the accuracy and completeness of network data to pinpoint any issues impacting operations.
- **Integrate Data Management:** Combine separate data systems into a single, integrated platform for efficient network management.
- **Establish Data Standards:** Create clear rules for data handling to ensure accuracy, consistency, and speedy updates.
- **Partner for Success:** Collaborate with technology experts to optimize network data collection and management.

- **Continuously Improve Data Quality:** Regularly review and enhance data quality through ongoing updates and process refinements.

Picking the Right Partners for the Journey

Working with a primary technology vendor who understands the operator's fiber network model and life cycle requirements often proves more efficient than working with multiple vendors. Establishing robust relationships with a select few vendors creates a strong foundation for the long-term management of the fiber network.

This strategy facilitates seamless integration of essential software components and ensures strategic alignment among all stakeholders involved, simplifying management, delivering significant ROI, and setting the business up for future success.

As the telecommunications industry evolves, the landscape of network data management will also transform. Advanced data analytics, sophisticated data governance frameworks, and robust data privacy measures will play crucial roles in shaping future network operations.

AI and ML will be central to these advancements, driving predictive analytics, automated data quality improvements, and optimized network performance. By embracing these technologies and best practices, telecom operators can extract greater value from their network data, streamline operations, and secure a competitive advantage in the rapidly changing telecommunications market. ■

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RISING THREATS

Why ISPs must act now to protect against cyberattacks.

BY JASON MALMQUIST

The recent ransomware attack on Frontier Communications serves as a critical reminder for Internet Service Providers (ISPs) of the escalating cyber threats pervading the landscape. As cyberattacks continue to rise in frequency and sophistication, it is no longer a question of whether ISPs will be targeted, but when.

Unfortunately, many ISPs remain dangerously unprepared. Instead, the focus on network expansion, spurred by the Broadband, Equity, Access & Deployment (BEAD) initiative, private equity, and M&A activity has prompted ISPs to prioritize building infrastructure and growing their customer base. As important as that may be, it leaves gaps in cybersecurity measures, leaving networks vulnerable to increasingly bold and organized cybercriminals.

Cybersecurity isn't just a checklist of tools and protocols; it's a culture that must permeate every level of an organization. This culture ensures that all employees, from those in the engineering department to those in customer service, understand the critical importance of security in their day-to-day roles. The Frontier incident is a wake-up call, especially for smaller providers, who often would lack the resources to recover from a debilitating breach.

The Culture of Security: A Balancing Act

To secure a network, ISPs need to create a culture of cybersecurity awareness and vigilance. This means training employees continuously and embedding security protocols into every aspect of the business. It's an ongoing process; cybersecurity isn't a "set it and forget it" task. It's about ensuring that employees are equipped with the knowledge and tools to stop attacks before they turn into full-blown crises. As with disaster recovery, the goal here is prevention: stopping problems at the front door

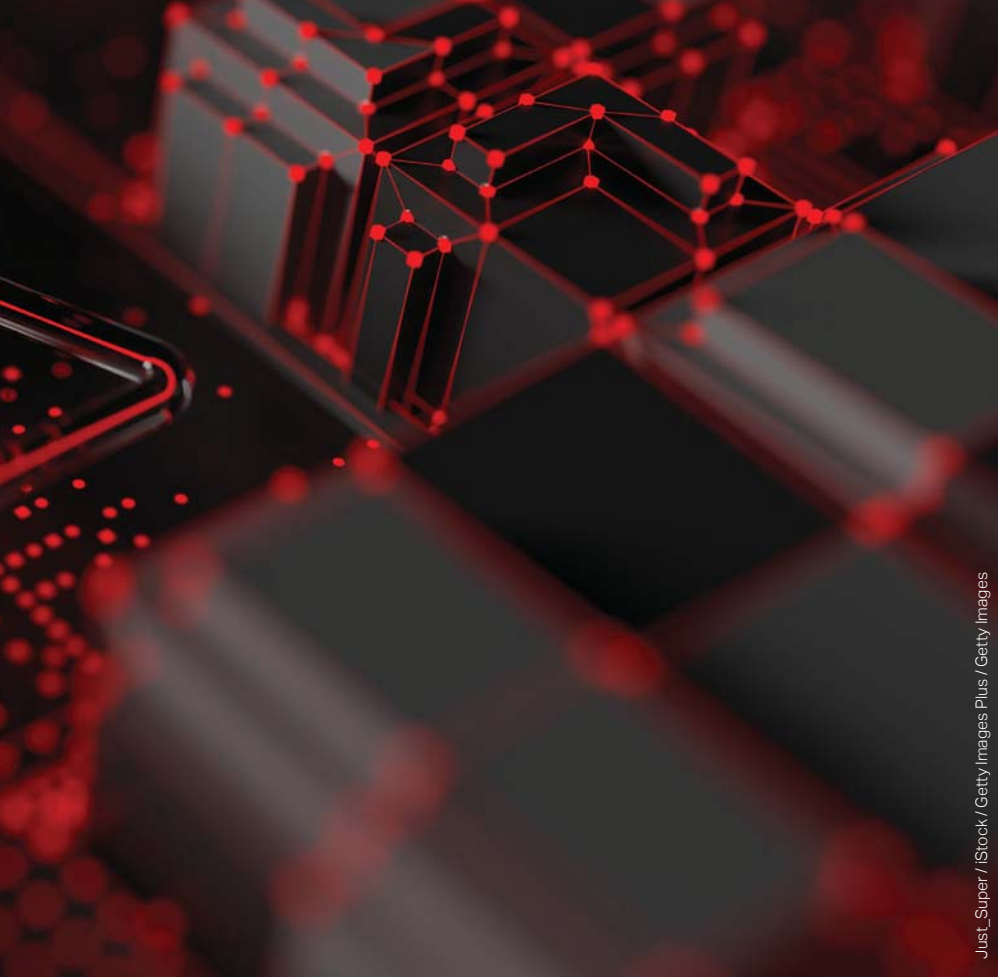
rather than finding them upstairs, after the damage is done.

Building this culture requires balancing security measures with the needs of the workforce. For example, engineers often want flexibility, like having administrative access to their local systems. All well and good, but unchecked access can create vulnerabilities. Therefore, ISPs must find a way to balance the operational needs of employees with stringent security protocols.

If employees cannot do their jobs efficiently, it negatively impacts customers. At the same time, if security isn't taken seriously, a breach can bring the entire operation down.

The Reality of Cyber Threats

Today's cyber threats extend far beyond simple viruses or malware. Using well-coordinated attacks, cybercriminals now operate like professional organizations, with the resources and expertise to penetrate even the most secure networks. These groups often target critical



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infrastructure, knowing that the disruption of internet services impacts both businesses and consumers.

Human error also comes into play; it is a significant vulnerability. According to the 2024 Verizon Data Breach Report,¹ many breaches occur because of simple mistakes: a misconfiguration, a lost device, or an employee falling for a phishing email or mobile phone scam. This underscores the need for continuous training and reinforcement of security best practices. Employees are the first line of defense, and without the right training, even the most advanced security systems can be infiltrated.

Smaller ISPs, especially those in rural or underserved areas, are at special risk. Regional telcos often lack the IT staff and resources to mount a robust defense, making them attractive targets for cybercriminals seeking the path of least resistance.

Common Cyber Threats Facing ISPs

Cybercriminals deploy a variety of tactics to breach ISP networks, often

combining multiple methods in sophisticated attacks:

Ransomware Attacks: Cybercriminals infiltrate networks, encrypt critical data, and demand a ransom for its release. What may begin with a seemingly minor com-

“ISPs must find a way to balance the operational needs of employees with stringent security protocols.”

promise, such as a hacked email account, can quickly escalate into full-scale network outages. According to industry reports, \$449.1 million was paid to ransomware groups in the first half of 2023 alone.

Data Theft: In addition to encrypting data, attackers often steal sensitive information and threaten to release it unless a ransom is paid. The pressure to comply is intense but paying a ransom not only funds further criminal activity but

also fails to guarantee the safe return of stolen data.

Phishing and Social Engineering: A leading cause of cybersecurity breaches, cybercriminals craft convincing emails or messages designed to trick employees into clicking malicious links or sharing sensitive information, thus granting attackers access to the network.

Measures to Protect Against Cyberattacks

To combat these evolving threats, ISPs must implement a robust cybersecurity strategy. The following measures are essential for protecting networks and customer data:

Multi-Factor Authentication (MFA): MFA requires users to verify their identity using multiple methods, significantly reducing the risk of unauthorized access even if log in credentials are compromised.

Endpoint Detection and Response (EDR): Advanced EDR tools leverage artificial intelligence to detect and respond to suspicious network activity in real time, stopping threats before they escalate.

Security Operations Center (SOC): A SOC provides 24/7 monitoring of network activities, enabling immediate responses to potential security breaches. ISPs should consider having a U.S.-based SOC to meet local regulatory requirements.

Employee Training: Human error is a chief cause of cyberattacks. Regular, comprehensive training on recognizing phishing attempts and understanding cybersecurity protocols is critical. Conducting phishing simulations can further strengthen employee awareness.

Incident Response Plan: Every ISP must have a well-developed incident response plan, outlining the steps to take during a cyberattack. This plan should include immediate shutdown procedures, communication strategies, and recovery protocols to minimize damage.

Advanced Network Security Tools: Leveraging AI-driven security tools can help ISPs detect and block emerging threats. Regular security assessments ensure that defenses are updated to meet new challenges.

Secure Access Controls: Implementing strict access controls, including network segmentation and role-based permissions, helps limit the impact of a breach by containing the spread of an attack.

Cyber Resiliency and the Importance of Backups

Cyber resiliency is key to surviving and thriving in the face of cyber threats. At its core, cyber resiliency is the ability

to quickly recover from an attack, and that's where backups play a critical role. A strong backup system ensures that essential data can be restored swiftly, minimizing downtime and reducing the impact of the breach.

However, backups alone are not enough. Cyber resiliency also requires a proactive incident response plan that contains damage and accelerates recovery. Integrating robust backups with a well-coordinated

disaster recovery strategy is essential to ensuring business continuity and protecting against costly interruptions.

The Intersection of Response and Prevention

Cybersecurity is unique in that any failure is seen as negligence. If an attack happens, it means the right protections were not in place. This is why it is critical to have systems that catch threats before they evolve into full-scale breaches. Just like airbags and seatbelts in a car, multiple layers of security can help prevent a total disaster.

The key is not just having tools, but ensuring that the entire organization—from executives to frontline employees—understands the importance of cybersecurity. It's an ecosystem that requires constant attention and updates. ISPs must continuously monitor, train, and invest in cybersecurity to stay ahead of evolving threats.

Act Now or Face the Consequences

The time to act is now. The Frontier ransomware attack was a warning, and the next target could be you. A lax approach to security can lead to catastrophic consequences, especially for smaller providers with limited resources. Building a culture of security, investing in employee training, and implementing a robust disaster recovery plan are not just best practices—they are essential for survival in today's digital landscape. ■

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Data Center INTERCONNECT

Addressing the deluge of bandwidth from AI/ML evolutions.

BY TIM DOIRON

As the deadline for this article was fast approaching, I was tempted to ask Microsoft's Copilot or ChatGPT to take a crack at it. While I didn't accept their help this time, we are experimenting with AI assistance in multiple areas of our marketing work, including some early-phase writing. If you attended this year's Mobile World Congress OFC or ECOC events, you know that AI was everywhere.

So, let's go back to the subtitle of this article. What is a deluge? Does it really exist, and if so, how should we address it? In the Merriam-Webster dictionary, deluge is defined as "an overwhelming amount." During the early days of COVID-19, research indicated that every part of the network—from residential broadband to metro, long-haul, subsea, and data center interconnect (DCI)—was growing more than 40% annually.

But if you fast-forward to today, my latest discussions with operators indicate that DCI capacity demand has accelerated up to 50% annually, while other parts of the network have slowed to 20-30%. In effect, traffic demand is bifurcating—with DCI red hot and other parts of the network still growing but at a slower pace. Any traffic that doubles in less than two years qualifies as a deluge in my book. So, yes, DCI traffic is a deluge.

But is DCI's accelerated growth driven by AI? The short answer is yes, some of it is, but we are still in the very early days of AI/ML and in particular generative AI. Let me explain. Right now, the biggest impact

of AI/ML is happening inside the data center vs. outside.

Generative AI runs on high-performance accelerated GPUs, not standard servers with CPUs. GPUs consume more power, use very large data sets or parameters, and work in parallel to accomplish their complex tasks—especially during training.

This parallelism is key as it requires coordination and the sharing of vast amounts of information. Low latency is critical as an intermediate result from one GPU may serve as an input to the calculations of others—thus halting computation if not delivered rapidly.

Parallelism and sharing of large data sets are why GPU clusters are interconnected with high-speed optics and optical fabrics. Meta recently announced two 24,000 GPU AI clusters¹. Avoiding GPU connectivity bottlenecks is why we see short distance 400G optical interconnects today rapidly giving way to 800G and 1.6T over the next several years.

So, while AI/ML's effect on data center interconnect growth is modest when compared to inside the data center, it will increase with time. With more applications, more people taking advantage of AI/ML capabilities (think about medical imaging analysis for disease detection),



and generative AI creating new images and videos (consider collaboration with artists or marketing/branding), the north-south traffic to/from data centers will continue to grow.

And we know that data centers don't exist in a vacuum. They need connectivity with other data centers—data centers that are increasingly modular and distributed to reduce their impact on local real estate and the power grid and to be closer to end users for latency-sensitive applications. One estimate holds that 9% of all data center traffic is east-west—meaning DCI or connectivity to other data centers. Thus, with more data centers coming online, many of them distributed, and more AI/ML traffic to/from data centers, AI/ML will help DCI to sustain its hot growth rate for years to come.

So, how do we address increasing data center modularity and distribution while also supporting the DCI deluge that is already here and will be sustained in

part by accelerating AI/ML utilization? The answer is fourfold: stackable compact modular platforms, innovations in coherent optical engines, increases in fiber spectrum, and the introduction of new transmission mediums like hollow-core fiber.

Right Size

Today's compact modular optical platforms enable operators to start with a 1RU, 2RU, or 3RU chassis and stack them as needed, matching cost to capacity while minimizing complexity. The latest compact modular platforms are also designed to support mixing and matching of both optical line system and transponder or optical engine sleds. This approach is key to minimizing costs in smaller DCI deployments—enabling both line system and transponder functions to be combined into a single chassis instead of multiple units required with a dedicated per-function design approach.

Speed Up

Leading coherent optical engines are evolving in two directions simultaneously: 1) smaller, lower-power pluggables that can reach 1,000 km or more and 2) embedded, sled-based optical engines with sophisticated transmission schemes that maximize capacity-reach and spectral efficiency.

A wide variety of 400G coherent pluggables are available today, including 400ZR, which supports fixed DCI applications up to 120 km. 400G ZR+ pluggables offer more advanced functionality, including increased programmability and better optical performance for metro-regional and some long-distance connectivity. 800G coherent pluggables are under development for delivery in early 2025. This latest generation of coherent pluggables expands capacity-reach significantly. With such capabilities in small QSFP-DD packages, IP over DWDM (IPoDWDM) is being realized in metro DCI applications with pluggables being deployed directly into routers and switches.

This brings us to embedded optical engines. While today's 800G embedded engines deliver enormous value for DCI applications, we are moving into the terabit era with the development of 1.2+ Tb/s engines that can transmit 800G up to 3,000 km. Due to their high capacity-reach, embedded optical engines are ideal for long-distance DCI connectivity solutions, including across continents or oceans with subsea connectivity. Embedded engines are ideal where fiber is scarce and spectral efficiency matters most. As an example, data center operators that lease fiber can utilize embedded optical engines to maximize data transmission over a single fiber pair and thus avoid the incremental costs associated with leasing more fibers.

More Spectrum

For more than 10 years, we have used the 4.8 THz extended C-band spectrum for DCI and other fiber optic applications. Occasionally, especially with internet content providers and DCI applications, the 4.8 THz L-band spectrum has been added for a combined 9.6 THz C+L delivery. But, with



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advancements in optical line system components like amplifiers and wavelength-selective switches, we can now cost-effectively increase the transmission spectrum from 4.8 THz to 6.1 THz in both the Super C- and Super L-bands. For a small incremental line system infrastructure cost, we can realize 27% incremental spectrum and transmission capacity per fiber pair. Super C and Super L transmission is a cost-effective way to get more out of existing fiber resources to keep up with DCI capacity demands.

Change the Medium

Microsoft purchased Lumenity, a hollow-core fiber optic innovator, in late 2022. A sometimes-overlooked fact is that a wavelength does not travel at the speed of light through a silica (glass) fiber. Due to propagation and scattering, waves travel slower—~67% of the speed of light through a fiber strand. On the other hand, hollow-core fiber (HCF) with a gas vs. silica medium can travel faster—~47% faster according to Lumenity.

Faster transmission means lower latency, and we know lower latency is a desirable attribute for certain types of traffic like AI/ML or high-speed financial trading. Although improving, the knock on HCF has always been increased attenuation or signal degradation over distance. This too has been improving significantly in recent years. With an increase in modular, distributed data centers, we look for hollow-core fiber to be introduced for DCI connections in metro areas in coming years.

Bring It All Together

The commercialization of AI/ML technology, and in particular generative AI applications like ChatGPT, is having significant impacts inside the data center. In parallel, DCI traffic demands have accelerated. While modest today, AI/ML-related DCI traffic will continue to grow—and help buoy an already hot DCI market.

To accommodate the rapid connectivity growth between data centers, we will need to continue to innovate with modular, stackable optical solutions; with pluggable and embedded optical engines that deliver more capacity in less power and footprint; with more spectrum on the fiber super-highway; and with new transmission mediums like hollow-core fiber.

Commercially available generative AI solutions (like ChatGPT) only launched less than two years ago. We are literally just getting started. Hold on tight and grab an optical transmission partner that's laser focused on what's next. ■


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