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EXECUTIVE INSIGHTS WITH

# Angie Bailey

DIRECTOR OF THE N.C. DEPARTMENT OF INFORMATION TECHNOLOGY'S BROADBAND INFRASTRUCTURE OFFICE

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"We are seeing tremendous pressure on our broadband providers to take advantage of this unprecedented funding opportunity to expand access to our unserved and underserved areas in finite amounts of time."

ANGIE BAILEY, DIRECTOR, N.C. DEPT OF INFORMATION TECHNOLOGY'S BROADBAND INFRASTRUCTURE OFFICE — PAGE 12

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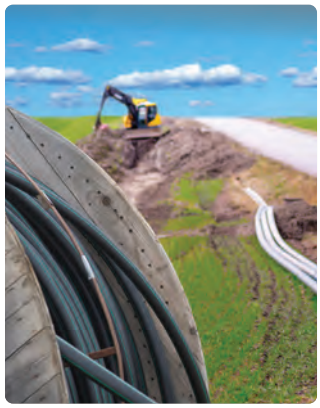

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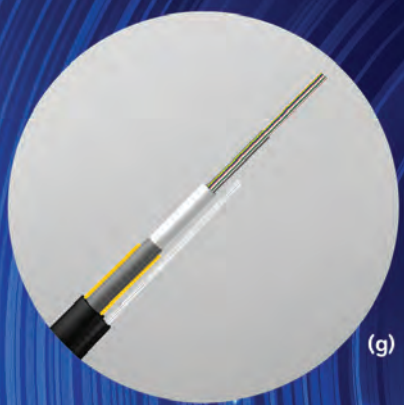

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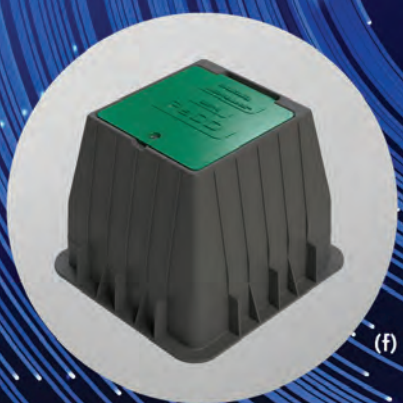

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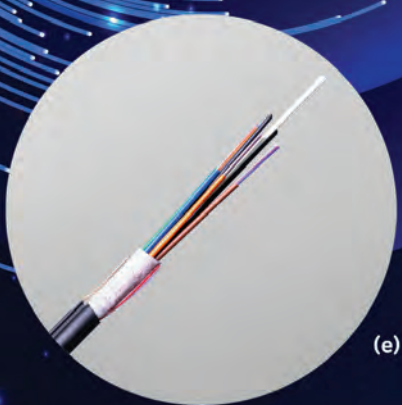

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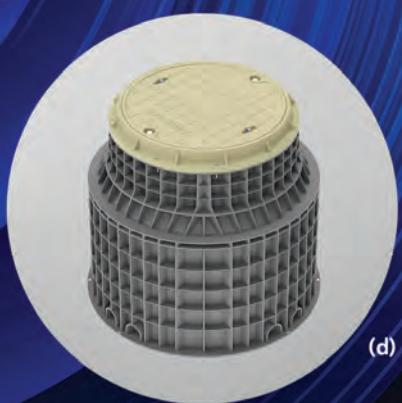

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(g) Toneable Drop Cable

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# Inflection Point

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

**PRINT PUBLISHING MOVES** slower than digital, so I can honestly say I don't know what the latest breaking story is at the time you're reading this. Is the stock market hitting all-time highs? Is it crashing? You, reader, know what's going on in the world right now, but me? I know only what was happening weeks ago. Why that matters is because I can't remember a time in history where a matter of weeks makes that much of a difference in the news cycle.

Maybe that sounds a little extreme, but it's fair to say a lot is changing (and sometimes changing back just as quickly) and while that can mean opportunities, it can also mean annoyance and distraction for industries.

Look at the BEAD program. Deployment decisions in states have become the famous marshmallow test. Do you want one marshmallow right now, or do you want two marshmallows five minutes from now? Do you want to meet the goals as fast as possible, or do you want to do the hard work to future proof the rural networks? How big is that first marshmallow? Are two marshmallows *really* better than one? It all seems like a distraction from the momentum felt only a few months ago.

Beyond rural broadband, however, telecom itself may be at an inflection point, where change is going to start happening rapidly and broadly. This is where opportunity comes. And it may not come around again, so if you're in this industry, get ready to move.

You can imagine a scenario where AI truly does become an essential part of business and daily life, smart cities become the norm, more people are sharing more media, factories look like they were designed by Tony Stark, and telecom races to meet the growing new demand, like when the internet first came on the scene.

You can also imagine a scenario where AI (and other technology) hype softens as energy resources are exhausted, data walls are hit, investors temper their expectations, and connectivity inches closer to commoditization with everybody satisfied with fast-enough broadband. Prices drop, saturation hits, and you'd better have some exceptional additional services or be agile and innovative enough to enter new markets.

Realistically, you must prepare for any future. But we're running out of time. You can't "wait and see" any longer. New players are entering the market with *their* new ideas. Big Tech is still calling the shots when it comes to what's driving bandwidth demand. Data center expansion is the talk of the town, while connectivity is assumed.

If massive changes are ahead, what are you doing to prepare? What trends are you following or avoiding and why? Have you thought, philosophically, about what your industry does and why it does it, and how it fits into various configurations of civilization?

The trillion-dollar companies that exist today were the ones that thought about what the future will look like. Right now, we're entering an unknown era. All of us have an opportunity to think about what the future might look like and how we will fit into the picture.


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# Uncertainty

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**THIS IS AN AWKWARD TIME** to be writing this column. At the time of writing, the town next to us has been devastated by a wildfire. AI developers are discovering that it hallucinates, creating misinformation, so some projects are being cancelled. Data centers are claiming they will run on nuclear fusion, or if that doesn't work, small nuclear reactors, restart Three Mile Island or burn coal. The new administration is expected to make major changes in broadband programs, upend the economy with tariffs, remake the government bureaucracy, and who knows what else.

## FOA Certifies 100,000 Fiber Optic Techs

What's the FOA? That might be the question you are asking yourself. Or thinking that's a lot of fiber techs; it is about equal to the total U.S. workforce according to the U.S. Department of Labor.

The Fiber Optic Association (FOA) was founded 30 years ago by those in the industry who were training fiber optic techs to create certification programs. The Internet was just taking off and the need for a trained fiber optic workforce made the current deficit look easy to fill (it is). FOA has been quietly working behind the scenes since its founding to develop a competent fiber optic workforce through education, certification and standards, a competent workforce capable of building the world's fiber optic communications networks.

About 90% of those FOA certified techs have been trained by the FOA worldwide network of approved training organizations, taught by FOA certified instructors. The others have been certified directly by FOA based on their experience in the field.

FOA works with service providers, contractors, governments and industry to develop its certification standards to meet their needs and keep them up to date. The FOA partners, schools and technical advisors are from around the world, making the FOA a truly international professional organization.

To support the FOA certification programs, it has developed the world's largest knowledge base in fiber optics, online and printed, used millions of times annually.

**"The fire was less than 5 miles from us. With gale force winds and very low humidity, the fire grew incredibly fast in the dry brush in the mountains and quickly reached the town, igniting houses and buildings in its path."**

All images courtesy Jim Hayes

**PHOTO 1.**

Someone once described FOA as "the biggest little professional organization you never heard of."

*On to the other topics in mind right now.*

## Disasters, an up Close and Personal View

On January 7th at 11 AM we had a Zoom meeting with one of the FOA's largest training partners. After the meeting, we went walking in our neighborhood. This is what we saw from the corner of our block, looking to the Northwest (see Photo 1).

A quick check of the news told us that a wildfire had started in the Santa Monica Mountains just North of Pacific Palisades, California, our neighboring town. The fire was less than 5 miles from us. With gale force winds and very low humidity, the fire grew incredibly fast in the dry brush in the mountains and quickly reached the town, igniting houses and buildings in its path.

At 5 PM the fire was now about 3 miles away and we were in an evacuation warning area. We went to Santa Monica's oceanside park a few blocks away where we could see this cloud of smoke from the fire as it burned its way to the coast (see Photo 2).

If you want to see something really frightening, here is the view from our balcony at midnight (see Photo 3).

**PHOTO 2.**

**PHOTO 3.**

It's hard to sleep with that view out your windows and the air filled with smoke, so we evacuated for a couple of days. Fortunately for us, the fire was stopped before it got to our neighborhood, but the evacuation zones were just blocks away.

I'll assume you have seen news photos and videos of the destruction in Pacific Palisades. More than 5,000 homes and buildings were destroyed. You probably know that wildfire started simultaneously in Altadena, north of Los Angeles, with similar devastation.

We've written a lot about preparing for disasters (ISE Magazine March/April 2024[1]), but this wildfire made apparent to everyone the importance of timely and effective communications. The most important notification is a warning to those who must evacuate immediately, wildfires move so fast. The second issue was communication with first responders fighting the fires.

The intensity of these wildfires is hard to imagine. Photos of houses burning in the Palisades fire showed aerial cables on fire. Power and communications were lost. Can you plan for that?

## What Will Change With the Change in Administration?

I'm writing this on the day of the inauguration. The last four years have seen unprecedented focus on investment in infrastructure, much created in the recovery from the pandemic. One goal was to bring broadband to unserved and underserved areas. The programs promoted fiber-to-the-home and created whole new methods of distributing grants that proved to be very time consuming, such that the new administration will take over before funds have been distributed. With the plans to change the government, will that proceed?

The incoming administration includes some who question the current broadband funding programs and/or promote other means of providing broadband than fiber, low earth orbit (LEO) satellites in particular. LEO satellites were awarded significant funds for rural broadband in the beginning, but they were later rejected in favor of fiber. That is already starting to change. ■

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

# Assume Breach – Now What?

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## What's this about?

**IN 2025, RANSOMWARE** is still running rampant, threatening everyone who reads this. Today, Zero Trust is the accepted strategy for protecting organizations and individuals from cybersecurity threats. Defenses are built around two principles: "Never Trust, Always Verify" and "Assume Breach." The first focuses on prevention: identifying and authorizing access to data, applications, and networks as do thousands of products, many based on the NSTAC[1] five-point implementation plan.

On the other hand, "Assume Breach" implies that your defenses may have already been breached, and the enemy is working inside your ecosystem. I realized that there was a game-changing opportunity for service providers to detect and curtail ransomware breaches for their customers inside their network as a massive business advantage. It happens inside the provider's network—that's what this article is about.

Today, the ubiquitous use of multiple and hybrid clouds and the growing importance of wide area networks, internet access, and distributed workforces has significantly increased the attack surface. The relevance being that attacks and breaches span and are therefore detectable via the connecting services such as Network as a Service (NaaS) and SASE.

My article[2], in ISE Magazine's November/December 2024 issue, described multi-layer defenses. This article deals exclusively with how detection and removal of breaches can empower service providers. It explores the nature and detection of these activities to circumvent highly visible ransomware attacks where breaches have occurred—an area that has received (perhaps shockingly) very little attention.

It shows how service providers, including MSPs and SASE providers, now have the opportunity to play a strategic role in the prevention of ransomware. It's about using Zero Trust techniques with the detection and removal of such attacks where defensive measures have failed. Its scope is to list the necessary steps required to implement such a strategy. As with all cybersecurity actions, the more weak links you strengthen, the more your risk is reduced.

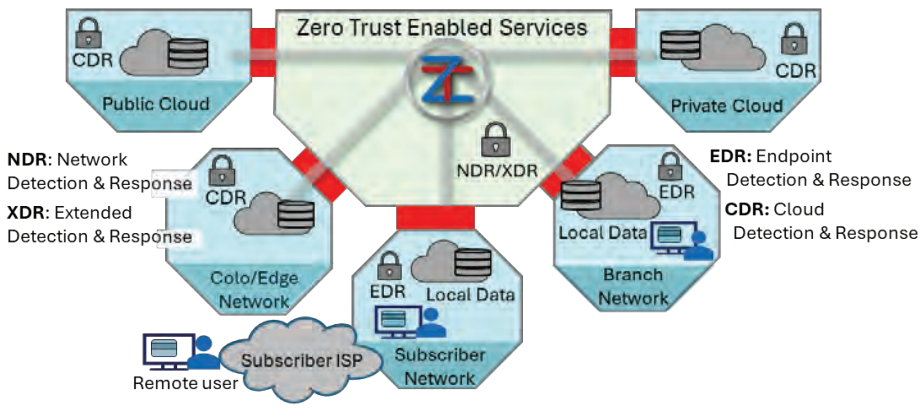
### Ransomware as a Service – The Threat Actors Killer App

It's important to understand the nature of such attacks and why, what, and where this approach works.

Ransomware attacks are most often enabled by the use of **"Ransomware as a Service" (RaaS)**—effectively a for-purchase platform to deliver such attacks with limited technical knowledge required. As opposed to malware, which typically acts immediately, RaaS delivers what is known as an **Advanced Persistent Threat** (APT) attack. This is a sophisticated, often complex and sustained cyberattack that is today's principal vehicle for ransomware. This platform typically delivers attacks that consist of techniques for:

- Initial penetration to create a breach. Many techniques. With 80+ threat types and 40+ defensive actions, it is inevitable that mitigating actions are missed, and breaches occur.
- Infiltration and discovery of vulnerabilities, deployment of malware in network-connected systems—central to this article.
- Corrupting or exfiltrating information—what we are ultimately preventing.

Breaches can occur within subscriber (end-user) systems, in multiple clouds and remote user systems. Increasingly the transactions between subject and target actor span wide area networks including NaaS and SASE services.




Mark Fishburn

**FIGURE 1.** *Breach Transactions Traversing the Network*

From Figure 1 above, it becomes obvious that when a breach occurs, it's the network service that is ideally placed to detect the signs of such a breach using Zero Trust security functions to disable them.

## Ransomware Detection and Removal

The initial penetration of an APT begins with reconnaissance of the end-user system including identification of vulnerabilities, employee credentials, hiding of malware through phishing and insider threats. This is followed by penetration of native software systems, known as "living-off-the-land attacks."

Next comes malware, the use of identity theft to elevate the privilege to discover network-connected software and data.

Then, transactions must run the gauntlet of the network services. This is where systems in the network software can identify suspicious and out of policy actions and block them.

## Zero Trust Architecture That Enables Breach Detection

It's recommended to begin with the study and implementation of three security standards developed by MEF[3]. These are MEF 118.1 Zero Trust Services Framework Attributes, MEF 138 Security Functions, and MEF 117 SASE Services. This author has been personally contributing to the work over the last four years. When implemented and deployed they present an important security foundation for this work.

## Applying Zero Trust to Nullify Threats

Figure 2 below shows the Policy Management steps that authorize actor transactions. This includes how they are identified, authenticated and that the types of transactions are aligned with policy, privilege, etc., as appropriate for every point where the policy is enforced. The following covers how services implementing Zero Trust attributes and related security functions fit together. Verification that supporting software and applications transmitted are malware-free are additional important elements.

## Detectable Network Transactions

There are some telltale signs. Actions such as "Beaconing" (attempts to communicate the threat actor's host software) are easy to spot. Lateral Movement to infiltrate connected systems embed malware can be detected by registering legitimate users and software, etc. While encrypted transfer of data is detectable by a middle box function, recursive encryption used by threat actors is not but can be blocked. An important addition to detection of breaches is the use of Extended Detection and Removal Software that is not covered in the MEF specifications. In all cases software supplied by third parties must be verified rather than trusted.

Something's wrong, something's not quite right. When a transaction is obviously "wrong" or not at the right time, from the right location, etc., it can be blocked, quarantined, and investigated.

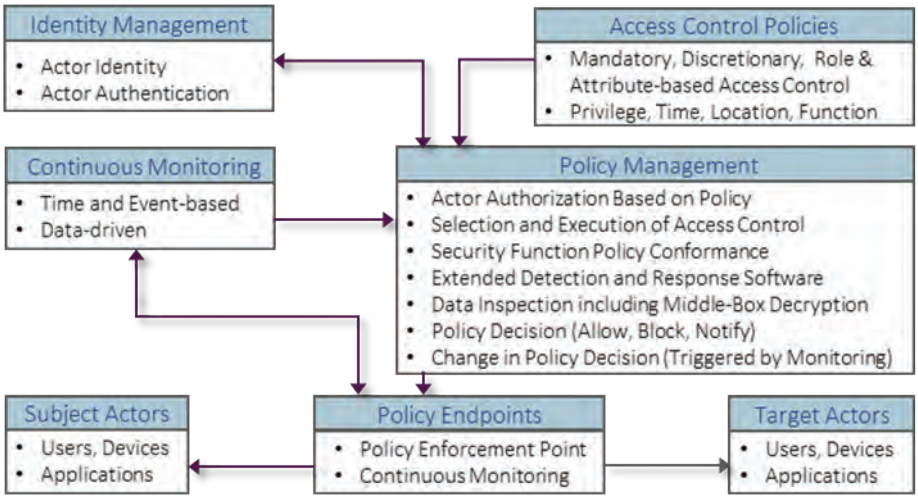



**FIGURE 2.** *Elements of a Zero Trust Implementation*

## What Actions Should You Take Next?

Clearly, there are too many threats and defenses to be covered in this article. Here we just created the framework. Next steps are to visit my website. There the story goes into detail on the specifications, links to MITRE ATT&CK threats and provides further descriptions of the security functions. The place to start? Cybyr.com/assumebreach.

As indicated, there are many aspects of the enterprise ecosystem that can be affected: subscriber networks and systems, and cloud infrastructures where Endpoint and Cloud detection software can be used to detect breaches. This article does not let the end users off the hook either since almost any system can be breached. Full Asset Protection, business resilience and holistic cybersecurity cannot be ignored. I hope this was not too complicated to take on because the payoff is huge. To that end, we created our Virtual Cybersecurity Officer Service (cybyr.com/vcso) so we can help you implement the approach and reduce your risk and that of your customer/clients, measure your progress, and help banish the threat of ransomware.

## Vigilance

Finally, continual awareness of development in attack techniques and defensive responses remains an essential part of every cybersecurity strategy. Any questions, please contact me at linkedin.com/in/markfishburn/. ■

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All terms used here are explained at cybyr.com/cyberpedia. The extended version of this article is located at cybyr.com/assumebreach.

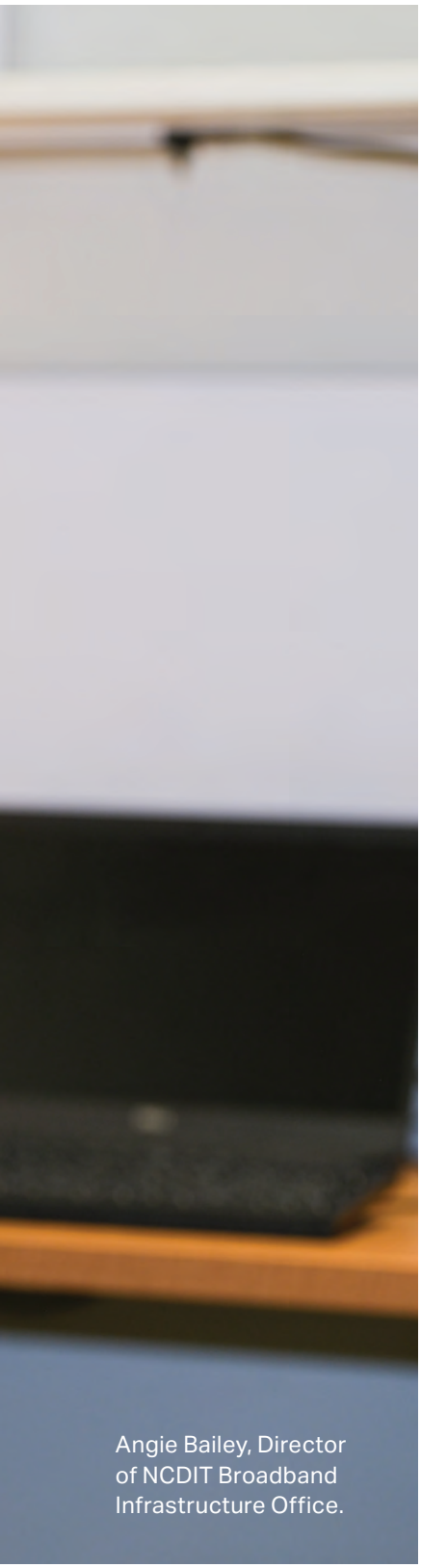

**Mark Fishburn** is CEO of cybyr.com and a provider of strategic network, cybersecurity, software and marketing services.

# EXECUTIVE

# INSIGHTS WITH

# ANGIE BAILEY

DIRECTOR OF THE N.C. DEPARTMENT OF INFORMATION TECHNOLOGY'S BROADBAND INFRASTRUCTURE OFFICE



Angie Bailey, Director of NCDIT Broadband Infrastructure Office.

All photos: Jer Warren, N.C. Department of Information Technology

## Advancing connectivity through collaboration and innovation.

BY SHARON VOLLMAN

As broadband providers navigate the challenges of expanding connectivity to rural and underserved areas, North Carolina offers a blueprint for success. The state is making significant strides in bridging the digital divide through innovative funding solutions, a commitment to emerging technologies and a collective vision for what is right.

With $2.5 billion in investments and a focus on affordability, Angie shares critical insights about the importance of flexible program designs, robust data mapping and hybrid networks. She is a leader who showcases how collaboration and innovation can drive transformative change in today's complex environment of building broadband networks that stand the test of time.

### TOPIC: The Rural Business Case

**ISE:** With North Carolina having the second largest rural population in the country, broadband connectivity remains a significant challenge. The N.C. Department of Information Technology's Broadband Infrastructure Office must help broadband network providers justify the business case to serve sparsely populated areas. What are two creative solutions to this problem?

**Angie Bailey:** The solution to deploy high-speed internet to sparsely populated areas isn't creative; it is financial. Broadband providers must be able to see a return on investment for building to locations and bringing them broadband. They want customers, but subscription rates must

offset the required capital expenditures and operating costs. For many sparsely populated areas, it takes state and federal investments to offset capital costs and incent companies to build to these locations. With more people working remotely and activities like online schooling and telehealth since the pandemic, we have seen a significant shift in willingness to invest these funds to ensure connectivity for our communities. Infrastructure in rural areas requires a willingness to invest in the economic future of these communities. With the combination of funds from the American Rescue Plan Act (ARPA), the Broadband Equity, Access, and Deployment (BEAD) program, the work of our Governor's office and the legislature, North Carolina is investing over $2.5 billion in last-mile infrastructure.

## TOPIC: Hybrid Networks

**ISE:** What is your team's recommendation for emerging technologies like 5G, satellite, and fixed wireless to complement traditional broadband deployment?

**Bailey:** There is no one solution for providing connectivity. Different households, businesses, and communities may have differing needs and budgets. Many will subscribe to multiple technologies at once, such as homes with fiber plus mobile service for their residents. Satellite can be quick to implement and has been essential for us in emergency operations. Multiple technology types are important in this landscape to meet different purposes and provide options.

## TOPIC: Lessons Learned

**ISE:** You've coordinated statewide programs and partnerships with broadband providers for many years. Your team has led several impactful programs, including ARPA, GREAT (Growing Rural Economies with Access to Technology), CAB (Completing Access to Broadband), Stop-Gap Solutions, and Pole Replacement. What are three best practices you recommend for improving partnership programs with community-based network providers?

**Bailey:**

1. Develop workable programs for broadband providers and funding agencies and have some flexibility for both parties. For example, providers need to be able to bid on locations that they can serve. Too many requirements will decrease participation in the program, and for funding agencies, too many requirements can make it impossible to award funds.
2. Spend the time and resources needed on mapping and data work. The foundation of any publicly funded broadband infrastructure program is managing and mapping data on the availability status of locations across the state. Typically, with state and federal money, you can only fund a location once and can primarily fund only locations that are unserved or underserved with broadband. The FCC and the broadband providers have done a tremendous job of moving to location-level availability data in the last few years. However, states must still invest time and effort refining this data with their broadband partners. We have partnered with the state's Center for Geographic Information and Analysis and the Friday Institute at NC State University to submit challenges to the FCC's National Broadband Map, which aided in surfacing 115,000 additional North Carolina homes and businesses that do not have access to high-speed internet. This effort added more new unserved locations to the map through this process than any other state and increased our funding allocation from the BEAD program.
3. Ensure your state focuses on adoption and digital literacy efforts. Our partner office—the Office of Digital Opportunity—focuses on adoption, digital navigation and digital literacy, device distribution, and affordability. Infrastructure cannot continue to be deployed or maintained without people subscribing to the service. The more subscribers, the more companies can further deploy. These efforts are a critical component of any state's broadband program.


**ISE:** Conversely, what are two practices others should avoid?

**Bailey:**

1. Don't create programs without input from providers. Maintain ongoing communication with broadband providers of all types to understand what programs will work for them from a business standpoint.
2. Don't create too many programs if they can accomplish the same thing! We have been fortunate in North Carolina to have multiple last-mile broadband infrastructure programs funded by the ARPA and now the BEAD program. If these programs could be combined into one deployment program, we could move more quickly to get funding out the door and start projects. But we have learned best practices from each program and appreciate the investment being made by the state for our residents and businesses.

Deputy Directors George T. Collier and Gretchen Ramirez update Bailey on eligible locations for state's broadband funding programs.

## TOPIC: Managing Expectations

**ISE:** Public and political pressure to deliver broadband quickly can clash with the reality of multi-year infrastructure projects. How do you effectively manage expectations and communicate project timelines to stakeholders?

**Bailey:** Be transparent with state leaders and stakeholders from the start that infrastructure projects take time to build. We are seeing tremendous pressure on our broadband providers to take advantage of this unprecedented funding opportunity to expand access to our unserved and underserved areas in finite amounts of time. We can't risk losing this opportunity to make the most of these infrastructure investments for each community by rushing the process. An enormous amount of broadband deployment is happening across our state, with both publicly funded and privately funded infrastructure projects. We see results daily and in each iteration of FCC broadband data released. Maintain clear communications on the status of the deployment programs and accurate timelines.

We hold monthly meetings with individual stakeholder groups, host live webinars and in-person town halls and share publicly available maps and dashboards showing project statuses and completion deadlines. We also communicate frequently with the governor's administration and legislators to keep them apprised.

## TOPIC: The Elephant in the Room

**ISE:** What is the broadband industry not addressing that it should be?

**Bailey:** Recovery from natural disasters is still somewhat uncharted territory for broadband providers, the communities they serve, and local, state, and federal leaders who work to rebuild areas after disasters. Rebuilding damaged infrastructure involves a complicated mix of players—last-mile broadband providers, middle-mile providers, utility companies, and pole owners—who may all have different processes for assessing damage and seeking reimbursement. These entities likely need to coordinate with states' departments of transportation on road damages and with permitting entities.

Processes for rebuilding "telephone" may be different than "broadband." It can take time to update data on locations in an area and the new availability status of locations. If a neighborhood had multiple providers serving it, will funds be invested to build back competition in the neighborhood? Should rebuilding include building with stronger technologies or more redundancy, depending on who is funding the rebuilds? There are a lot of questions to sift through with broadband providers and state and federal leaders to find the models and best practices in this space.

## TOPIC: The Clock Ticks

**ISE:** BEAD regulations require the $1.53 billion awarded on October 10, 2024, to be allocated within 365 days. Realistically, is this timeline achievable? If not, what would be a better approach?

**Bailey:** Because the BEAD program aims to reach 100% of unserved and underserved locations, it requires a very different approach than other broadband grant programs. States receive applications from broadband providers to serve specific locations but then must negotiate with broadband providers to identify solutions for the remaining unserved and underserved broadband serviceable locations.

North Carolina has the second-largest rural population in the country, one of the largest ARPA funds appropriations for broadband deployments, and the largest number of broadband programs. Fortunately, our governor and legislature are committed to broadband solutions for the state. For the BEAD program, states should be given more leeway to determine the timing of their BEAD subgrantee selection, best encompassing the program and its many federal program requirements.

## TOPIC: Navigating Bureaucracy

**ISE:** Deploying broadband to the last house on the farthest dirt road in rough terrain demands deployment challenges. The process requires navigating complex state and local regulations, including permitting, rights-of-way, and environmental reviews. How can your team help reduce these challenges to keep projects on track?

**Bailey:** We maintain strong relationships and communication with the N.C. Department of Transportation and coordinate with them on publicly funded project locations and timelines. We have held joint webinars to ensure broadband providers understand the permitting processes. We also ask our funded awardees to report on the status of easements and permits as part of their quarterly progress reports so we can flag any potential delays. While we can't necessarily change the required processes, we can create effective communication channels to ensure broadband providers understand what to anticipate and permitting agencies know about the upcoming workload. This is critical so

the agencies responsible for processing these requests can ensure adequate staffing capacity.

## TOPIC: Predicting the Unpredictable

**ISE:** Labor shortages, weather delays, and other unforeseen factors can disrupt deployment timelines. How does your team plan to ensure consistency in network deployment project timelines?

**Bailey:** Unpredictable events are a real thing that can't always be anticipated. North Carolina experienced a significant natural disaster in the fall with Hurricane Helene, which devastated many communities in the western part of the state. While we obviously require construction timelines in our award agreements, projects can be delayed at no fault of the broadband providers. Programs need to allow for realistic timelines and allow some flexibility for unforeseen or unavoidable circumstances. That's why we consider extension requests when necessary. We don't want to rush taxpayer-funded projects and create risks of failure or termination before the project can reasonably be completed. As such, North Carolina currently has requests submitted to the U.S. Department of the Treasury for an extension of the deadlines for projects funded by the ARPA.

## TOPIC: The Future

**ISE:** What emerging or disruptive broadband technology excites you the most, and why?

**Bailey:** Certainly, Low Earth Orbit satellites are the most intriguing as a new space in broadband connectivity. They carry additional capacity and higher speeds than earlier satellite products and can reach areas not accessible by other technologies. This technology was extremely helpful in western North Carolina with emergency operations during Hurricane Helene, both for internet connectivity and VoIP. In some cases, it was the only communication method available. Low Earth Orbit satellites can be a critical source of redundancy during emergencies, but managing a network of satellites is still a relatively new technology with few providers. It is important to understand the benefits and limitations of different technology types, and ideally, the market will match the technology type with the most useful purposes.

## TOPIC: Optimizing Networks

**ISE:** Network providers face increasing pressure to optimize networks while also maintaining network security. How do you encourage providers to build future-proof networks, and how do you monitor these networks?

**Bailey:** When we evaluate broadband providers and their projects, our most critical evaluation criterion is the "ability to perform." We look at broadband providers' years of experience, experience with a particular technology, past performance (especially on publicly funded projects), financial solvency, and ability to provide matching funds. We don't want to micromanage

Bailey reviews BEAD program prequalification process for broadband providers with team.

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To us, the companies are best suited to navigate that space. However, we need broadband providers that have experience and capacity to ensure they can implement the necessary network management requirements, including modernization and security. That's why experience, past performance and financial solvency are key criteria.

## TOPIC: Workforce Challenges

**ISE:** Today's limited workforce skilled in broadband deployment (e.g., fiber installation, network engineering, construction) could strain states' abilities to meet BEAD deliverables. What is your team doing to help with this?

**Bailey:** When we created our workforce development plan for the BEAD program, we included input from a committee of stakeholders like internet service providers, fiber manufacturers, the Communications Workers of America, the state Department of Public Instruction, the NCWorks Commission, the community college system, community-based organizations and national broadband employer associations. The plan outlines our strategies to address workforce needs, including creating a career pathway to map on-ramps to entry-level broadband jobs with career advancement opportunities, developing regional training hubs at community colleges to offer fiber technician credentials, working with school districts to create career accelerators and dual enrollment on-ramps for high school students, and promoting apprenticeships.

**ISE:** Is there anything we haven't covered?

**Bailey:** I want to stress the importance of affordability as a factor in ensuring connectivity across our state and others. North Carolina was a big participant in the Affordable Connectivity Program (ACP)—we had more than 901,000 participating households. Broadband providers are big supporters of the ACP, and we need consumers to subscribe to high-speed internet service to keep deploying and maintaining networks. We know that different technology types have different investment costs and, therefore, different costs in service plans. Other factors can contribute to costs such as changes in the content space with more streaming services, infrastructure changes, and the ability to retire old infrastructure. Many factors are at play, but we hope that a program like ACP can be implemented to help consumers afford to subscribe so they can access crucial things like online learning, job applications, government services, telehealth and more.

## TOPIC: Paying It Forward

**ISE:** Share three pieces of advice for leaders who want to follow your path.

**Bailey:** Choose to follow the path of something you are passionate about so you can wake up each day excited to contribute.

Build the team you need. Our work in North Carolina would not be possible without our team. I am very intentional about recruitment and work with the team to maximize their skill sets to meet the office's mission and goals. I encourage our folks to work in teams because everyone has different perspectives to offer. We are solving complex problems, so I urge the team to share ideas, listen, choose a path, and move forward.

Stay focused, set your energy for each day, and be clear on what you want to and need to accomplish. Block out the noise. Don't let it take you off course or distract you.

## TOPIC: Significant Risks

**ISE:** What is your most significant professional risk, and what did you learn from it?

**Bailey:** There is risk in being afraid to tackle difficult things. This work is complicated and not static. Don't fear change, complex issues, conflict, or debate. There may not be one finite solution to a problem, so choose a path and tackle it. Keep moving. Big challenges require continued dedication, flexibility, and perseverance.

## TOPIC: Constant Growth

**ISE:** Leaders must continually improve. What skills or knowledge must you acquire or build to achieve your goals?

**Bailey:** My son is an athlete, and we are reading a book about mental toughness by Moses and Troy Horne. Knowledge is always available and absorbable. Leaders must be willing to grow their personal capabilities to take on what is needed, whether it is navigating expectations and timelines, coordinating relationships with stakeholders, or encouraging their teams. Mental toughness is required to balance staying determined despite risks and maintaining confidence and resiliency.

## TOPIC: Leadership Style

**ISE:** Share one word that encapsulates your leadership style, and one that describes you.

**Bailey:** Empowering. Intentional.

## TOPIC: Dissent

**ISE:** What is one thing you believe almost everyone disagrees with you about?

**Bailey:** Some people believe I shouldn't resist pressures, whether from federal rules, state requirements, or timeline mandates. However, broadband grant programs have existed for a limited time and are unique in using state and federal dollars to fund private infrastructure. As state broadband leaders, we must help others understand what is required to implement these programs and accomplish our missions. ■

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**Angie Bailey** was appointed director of the Broadband Infrastructure Office in December 2021. She served as interim director since August 2021 and was previously director of NC Broadband within the N.C. Department of Commerce. She has more than 20 years of experience in broadband planning and development in North Carolina, primarily at the state level. Angie was named N.C. Tech Association's 2022 Tech Woman of the Year as part of the N.C. Tech Awards. For more information, visit https://www.ncbroadband.gov/.

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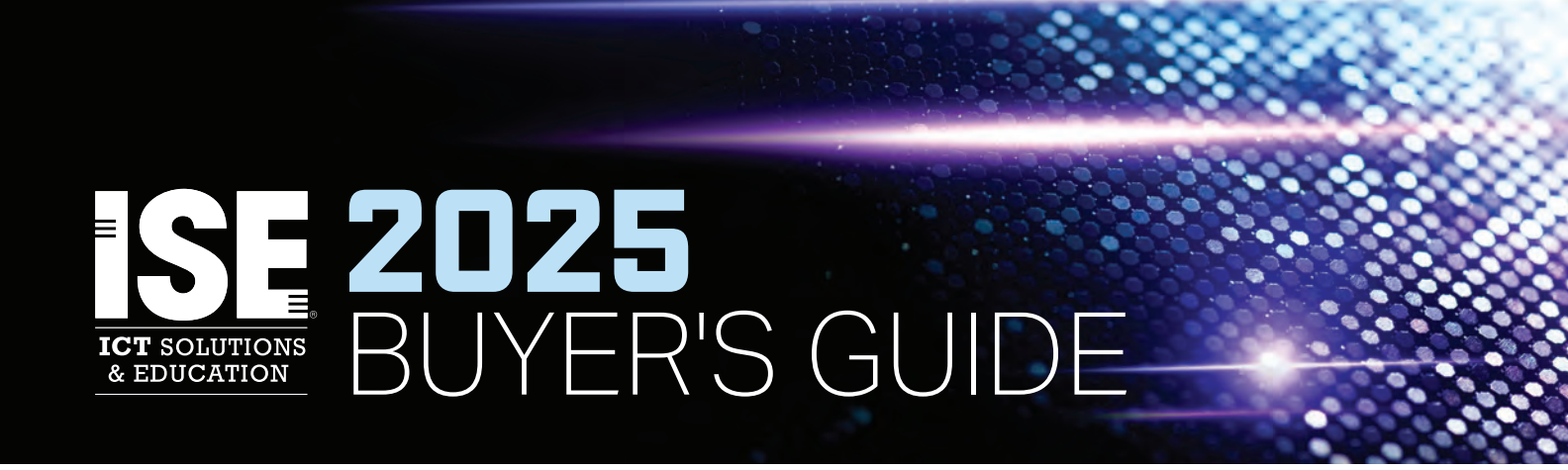




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Piperton, TN, 38017, US
901-866-3300
info@ptsupply.com
https://www.ptsupply.com

Power & Tel provides trusted telecom supply chain solutions, offering extensive inventory from top manufacturers. With strategic locations across North America, we ensure fast delivery of fiber, connectivity, and network components. Count on us for efficiency, reliability, and seamless sourcing. Learn more at www.ptsupply.com

**CATEGORIES:** BEAD/BABA/Funding, FTTX, Wireless

## Pro-Mark Utility Supply, Inc.

2603 Pacific Pk Dr
Whittier, CA, 90601, US
562-692-6161
sales@promarksupply.com
https://www.promarksupply.com

Pro-Mark Utility Supply, Inc. is a leading manufacturer of marker posts, utility signs and terminal enclosures with over 25 years of experience in identifying and marking buried cable and fiber optic lines. Pro-Mark's marking systems and products are made to perform, identify, and prevent damage and dangerous accidents.

**CATEGORIES:** Construction & Engineering (EF&I), Safety

# BROADBAND COMMUNITIES SUMMIT

**June 23-25, 2025**

**George R. Brown Convention Center - Houston, TX**

## AMERICA'S KEY MEETING PLACE FOR COMMUNITY, PROPERTY & TELCO LEADERS

**Broadband Communities Summit** is the leading event for community leaders, property owners, network infrastructure builders and telco service providers to meet and discuss strategies for delivering connectivity for communities all over the US. With a focus on how to connect every community with next-generation communications infrastructure – this is a **must-attend event** for the industry.

The 2025 edition will bring together **1500**+ senior industry leaders for three days packed of networking, essential learning, and securing business.


**1500+ Attendees**

**120+ Exhibitors & Partners**

**6 Key Themes**

**200+ Industry-Leading Speakers**

For more information on who's speaking, sponsoring and exhibiting, as well as details on how to get involved visit: **bbcmag.com/bbcsummit**

**FREE and discounted tickets available using promo code 'ISE15'**

## Quest Controls

208 9th St Dr W
Palmetto, FL, 34221, US
941-729-4799
info@questcontrols.com
https://www.questcontrols.com

Quest Controls' solutions are designed for today's telecom providers. By combining hardware, software and responsive end-to-end customer service, clients experience solutions that meet their facility monitoring requirements. Our remote monitoring solutions save money by managing energy systems, reducing service costs, identifying and resolving issues before they become major network events.

**CATEGORIES:** Construction & Engineering (EF&I), I&M/Network Reliability/Cybersecurity, Power/Sustainability

## RaDD Network Solutions, Inc.

**1010 Centennial St**
**Green Bay, WI, 54304, US**
**920-328-1020**
**info@raddnetwork.com**
**https://raddnetwork.com**

■ **SEE AD ON PAGE 5**

RaDD Network Solutions is a full solution provider in the telecommunication/broadband industry, providing innovative products and application engineering services. RaDD partners with key manufacturers to provide innovative and cost-effective products, and by working with engineering firms and end users to ensure the best application of products for each network type.

**CATEGORIES:** Construction & Engineering (EF&I), Core/Legacy, Education, FTTX, Network Transformation/Simplification, Wireless

## Reef Industries

9209 Almeda Genoa Rd
Houston, TX, 77075, US
800-231-6074
ri@reefindustries.com
https://www.reefindustries.com

Reef Industries is a plastic film and laminate manufacturer with more than 65 years of experience. We specialize in custom plastic laminates that help customers tackle the challenges they face when needing solutions to safeguard and prolong the service life of their investments.

**CATEGORIES:** Construction & Engineering (EF&I), Miscellaneous, Safety

## Safeguard Equipment

4202 W Riverbend Ave
Post Falls, ID, 83854, US
208-773-9263
sales@safeguardequipment.com
https://www.safeguardequipment.com

Safeguard Equipment is a leading provider of innovative safety solutions for companies worldwide. The Safeguard Solution Suite, which includes the Compass, Compass Pro, MobileApp and now the WebApp, revolutionizes team management and safety, empowering companies to enhance operational efficiency and ensure the well-being of their workforce like never before.

**CATEGORIES:** Network Transformation/Simplification, Power/Sustainability, Safety

## Tech Products, Inc.

105 Willow Ave
Staten Island, NY, 10305, US
718-442-4900
team@techproducts.com
https://www.techproducts.com

Tech Products, Inc. is your global source for quality identification products to the broadband and telecommunication industries. Since 1948, we have been making cable markers for fiber optic cable. Our brands include Everlast®, Fasttags, TechBrite and Tech-3D. Our customer service people are from the industry and can help you.

**CATEGORIES:** BEAD/BABA/Funding, FTTX, Safety

## Technetix

8490 Upland Dr, Suite 200
Englewood, CO 80112, US
720-517-6239
brenda.stottler@technetix.com
https://technetix.com

An industry-leading solutions provider, delivering tailored end-to-end full fiber and fiber access network technology for premium performance. Technetix PON solutions are at the forefront of bridging the connectivity gap in remote and rural areas, and augmenting cable networks with PON extensions and overlay. Providing reliable, high-speed, and cost-effective broadband.

**CATEGORIES:** Core/Legacy, FTTX, Power/Sustainability

## Tii Technologies, Inc.

141 Rodeo Dr
Edgewood, NY, 11717, US
631-789-5000
sales@tiitech.com
https://www.tiitech.com

Tii Technologies, Inc. has been a pioneering force in the telecommunications industry for over 60 years, consistently delivering cutting-edge fiber and copper solutions that address evolving network demands. By combining innovative designs with a deep understanding of customer needs, Tii has successfully improved network reliability and reduced costs, solidifying its commitment to delivering high-quality products that meet the industry's changing landscape.

**CATEGORIES:** BEAD/BABA/Funding, Core/Legacy, FTTX, Power/Sustainability, Wireless

## US Conec

**1138 25th St SE**
**Hickory, NC, 28602, US**
**828-323-8883**
**ams-cs@usconec.com**
**https://www.usconec.com**

SEE AD ON PAGE 19

US Conec provides industry leading components that enable high bandwidth systems such as cloud computing, core routing, and distribution networks like fiber-to-the-home. Our continued success is driven by the ongoing satisfaction and loyalty of our customers. We strive to exceed customer expectations in all that we do, including product design and performance, quality, logistics, and customer service.

**CATEGORIES:** Cloud/IoT/AI, FTTX, Network Transformation/Simplification

## VIAVI Solutions

1445 S Spectrum Blvd, Suite 102
Chandler, AZ, 85286, US
408-404-3600
https://www.viavisolutions.com

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.

**CATEGORIES:** Cloud/IoT/AI, Core/Legacy, FTTX, I&M/Network Reliability/Cybersecurity, Testing, Wireless

## Vivax-Metrotech Corp.

3251 Olcott St
Santa Clara, CA, 95054, US
800-446-3392
salesusa@vxmt.com
https://www.vivax-metrotech.com

Vivax-Metrotech develops and manufactures products for buried utility locating and mapping, fiber-optic cable locating, ferrous metal detection, coating analysis (ACVG) on pipelines, finding sheath-to-ground cable faults, inspecting pipes and ducts (CCTV), and cloud data services. The global distributors and service centers network provides customers with local sales, training, and service.

**CATEGORIES:** Cloud/IoT/AI, Mapping/GIS, Testing

# ISE EXPO'S ADVISORY BOARD MEMBERS Speak Their Minds

Q&A with leaders from altafiber/ Hawaiian Telcom, Bell Canada, Brightspeed, Frontier, Meta, NextLight, Norvado, PC Telcom, TDS Telecom, and Verizon.

BY SHARON VOLLMAN

After reading our Advisory Board members' insights on leadership, network evolution, innovation, soft skills, and embracing uncomfortable truths, I was reminded of one of my favorite quotes from Ruth Bader Ginsburg, Associate Justice of the Supreme Court from 1993 to 2020: *"Fight for the things you care about but do it in a way that will lead others to join you."*

These leaders share their perspectives honestly yet in a way that truly resonates. I invite you to not just hear their words but truly listen—you may discover more than you expected.

**TOPIC:** Dirty Little Secret

**ISE:** Share an uncomfortable truth about the fixed and/or mobile networks that our industry must confront in 2025.

**Randy Alderton, Bell Canada:** 5G and fiber rollouts promise unprecedented speeds and capabilities, yet a significant portion of the global population remains unconnected or underserved. This isn't simply about lacking physical infrastructure; it's also about affordability, digital literacy, and the lack of relevant content and services in certain languages or cultural contexts.

This disparity isn't just a social justice issue; it's a business one. A large segment of potential customers is excluded from participating in the digital economy, limiting market growth and hindering the full realization of the potential of advanced network technologies. Ignoring this will lead to:

- Missed Revenue Opportunities: A large, untapped market remains inaccessible.
- Increased Social Inequality: As the gap between the connected and unconnected widens, it could lead to social unrest and economic instability.
- Security Risks: Unequal access can create vulnerabilities, as unconnected populations are more susceptible to misinformation and exploitation.
- Slower Technological Innovation: A less diverse user base limits feedback and hinders the development of inclusive and truly beneficial technologies.

Failure to confront this uncomfortable truth will ultimately limit the long-term success and societal impact. The focus must shift from simply expanding coverage to ensuring equitable access and meaningful inclusion.

**Francis Alueta, altafiber/Hawaiian Telcom:** An uncomfortable truth is that revenue and pricing models may not be keeping up with the capital investment needed to deploy and transition existing customers to fiber networks.

**John Amundson, TDS Telecom:** FTTx OSP that is more complex than needed. Costs for OSP in fiber networks are too high, but not solely because of rising labor and material costs—those have historically always gone up. But it's because we, the network owner/operators, require, design, and build with more complexity than required. The industry needs to think critically about how we are building

Randy Alderton

Francis Alueta

and what is really needed to provide the services we want to sell. We need to think about simplifying design, which will, in turn, simplify engineering and construction processes. Radical simplification (my own terminology) thinking will get us the network we need and give contractors the speed and profitability needed to meet the demands of today's fiber networks in terms of cost and speed of deployment.

**David Curran, Frontier:** As an industry, we probably spend as much or more time and money dealing with legacy technologies and systems than we do on our current generation. No investor wants to spend limited funds on replacing or removing "perfectly good" hardware and software, but it leads to inefficiencies and unnecessary complexity and cost.

**Marc Durocher, Verizon:** The uncomfortable truth about fixed wireless access is that churn is higher than traditional wired broadband connections. We need to fix this issue in order to grow the technology.

**Sherry Hessenthaler, Brightspeed:** The uncomfortable truth is primarily related to the ability to execute quickly in updating and expanding networks and related technology. Most deployments are faced with infrastructure challenges related to facility locating, securing access in public and private right of ways, permitting, etc., that impact deployment intervals and the ability to execute as quickly as desired.

**William Kurtz, Norvado:** The escalating costs of network construction are increasing at an unsustainable rate. While mobile networks are often considered a complementary solution, they are not universally viable due to environmental and logistical constraints. The industry must confront these financial and deployment challenges to ensure continued broadband expansion.

**Kevin Lybrand, PC Telcom:** The uncomfortable truth is that security and privacy are becoming increasingly difficult in fixed wireless and mobile networks. Cybercriminal tactics become more advanced as technology advances.

**Dennis Pappas, NextLight:** In our community, it is the gaps in coverage that all cell providers have.

**Michael Wilson, Meta:** The uncomfortable truth in fixed/mobile networks is that the overall decline in skilled labor directly results from poor training and management.

## TOPIC: Innovation

**ISE:** If you could wave a magic wand, what groundbreaking product or solution would you like to see showcased at ISE EXPO 2025?

**Alderton:** I'd wish for a truly seamless and universally interoperable AV-over-IP ecosystem.

Currently, the AV-over-IP space suffers from fragmentation. Different manufacturers use proprietary protocols and codecs, making integration complex, expensive, and often unreliable. This limits scalability, flexibility, and the potential for innovative applications.

My magic wand solution would be a standardized, open-source protocol and a suite of tools that allow any AV device, regardless of manufacturer, to seamlessly connect and communicate over a standard IP network.

Such a universally interoperable AV-over-IP ecosystem would truly be a game-changer, showcasing the potential of IP technology to transform the AV landscape. It would be the highlight of ISE EXPO 2025, demonstrating the power of collaboration and standardization in driving technological advancement.

**Alueta:** I would like to see the use of blockchain technology for secure network transportation and decentralized networks (e.g., data centers) and the implementation of AI that drives resiliency with self-optimizing networks.

**Amundson:** I would like to see a universal system used for municipality (local, state, and federal) permitting that ties their GIS records to our GIS plans for a simple, low-cost high-speed way for both parties to be on the same page about construction requests and construction progress. It would require integration on a large scale, but the benefits would be amazing. AI is driving more and more system-to-system knowledge transfer, so this idea seems like an excellent use of that technology.

Kevin Lybrand

Marc Durocher

William Kurtz

Dennis Pappas

David Curran

John Amundson

**Curran:** Believe it or not, ways to prevent copper theft! With all the talk about fiber, copper theft is still a huge problem and results in not only expensive replacements but also outages for customers and first responders. I'd love to see some solutions that not only make it harder to steal the cable, but also harder to sell and process it.

**Durocher:** Passive geolocation. A way for the customer to follow an AR roadmap to the passive equipment within their home, like a fiber access port.

**Hessenthaler:** Showcasing innovative, groundbreaking products or solutions would allow us to quickly and economically transition services from antiquated networks (like copper networks or discontinued networking equipment) to alternative and advance technology solutions.

**Kurtz:** I would like to see innovations that significantly enhance the efficiency of fiber optic construction. Specifically, solutions that accelerate the deployment process—whether through advancements in plowing technology, automation, or streamlined permitting—would have a transformative impact on the industry. The question remains: *How can we make fiber deployment faster without compromising quality or cost-effectiveness?*

**Lybrand:** I would like to see more about AI. How can we integrate this to help with real-time analytics, automated troubleshooting, and predictive maintenance?

**Pappas:** City wide Wi-Fi so your always connected to our network.

**Wilson:** If I had a magic wand to wave, I would see more on hollow core/multi core fiber.

## TOPIC: Constant Growth

**ISE:** What soft skills and leadership strategies are essential for achieving your future career goals in an evolving industry?

**Alderton:** To succeed in a rapidly changing technological landscape, a professional needs a strong foundation in both technical expertise and crucial soft skills.

Essential Soft Skills:

- Adaptability and Continuous Learning: The pace of technological change is relentless. The ability to quickly learn new technologies, adapt to new workflows, and embrace change is paramount.
- Communication and Collaboration: Collaboration is crucial in team-based

projects, requiring strong interpersonal skills and the ability to work effectively with diverse individuals.
- Problem-Solving and Critical Thinking: This includes a willingness to question assumptions and explore alternative approaches.
- Creativity and Innovation: Generating new ideas and exploring unconventional solutions is crucial for staying ahead of the curve.
- Resilience and Perseverance: These skills are necessary to maintain motivation and overcome obstacles.
- Emotional Intelligence: Understanding and managing one's own emotions and understanding the emotions of others is crucial.

There are also essential Leadership Strategies that include empowering and mentoring, being agile and adaptable, using data to inform decisions, cultivating knowledge sharing and creating a diverse and inclusive team.

By focusing on these soft skills and leadership strategies, professionals can significantly enhance their ability to navigate the complexities of a rapidly evolving industry and achieve their career goals. These skills are not just beneficial, they are increasingly necessary for success.

**Alueta:** Leaders need to clearly articulate an organization's goals and the vision they have for people and the organization to achieve them. Always have open and transparent communications across all levels of the organization.

**Amundson:** In my view, leaders must be adaptable to change, comfortable with ambiguity, and continuously learning. Think of those three things flowing from one to another—call it the waterfall of managing and adapting to the unknown. The workplace dramatically changed thanks to the COVID-19 pandemic, but that change was coming. It was inevitable, given the pace of technology; COVID-19 just sped it up. We are in the remote work environment now and will stay in it. There isn't a practical way back to the "old days," nor should there be.

Michael Wilson

Going forward, adaptation is key to managing, as this type of environment will only lead to more challenges and more ambiguity. Dealing with ambiguity certainly goes hand in hand with adaptation—much like the time-honored chicken and egg quandary. Continuous learning is like the windshield washer fluid that adds clarity to the situation. But don't relegate continuous learning to only academic pursuits. Instead, broaden the definition to include learning about people, ideas, cultures, and points of view. The workplace is a far more fluid environment than it once was, requiring us to spend more time learning how it all fits together to effectively lead.

**Curran:** As a technical leader, I'd say "listening." We tend to be as opinionated about technology as we are about cars or sports teams. It's entirely possible, though, that someone on your team or in the industry had a better idea. Fostering open communication and listening is the only way to stay grounded and keep current with fast-paced technology change.

**Durocher:** Engaging in more valuable networking opportunities with other industry leaders.

**Hessenthaler:** Soft skills like the ability to listen and learn. Leadership strategies related to facilitating innovation and execution across cross-functional disciplines or business entities are critical as well.

Sherry Hessenthaler

**Kurtz:** Adaptability and strategic foresight are critical in a rapidly evolving telecommunications landscape. Leaders must be able to pivot strategies in response to regulatory shifts, technological advancements, and economic pressures. Additionally, fostering cross-functional collaboration and maintaining a data-driven decision-making approach will be essential to driving long-term success.

**Lybrand:** Some soft skills I believe are key for our changing workforce needs are adaptability, emotional intelligence, and communication. As leaders, we have to be visionaries and have agility in decision-making. We also need to invest time in mentoring and coaching if we are going to sustain growth in this rapidly changing industry.

**Pappas:** You must build a team whose members' attributes complement each other. You must also have relative experience in community operations to share and teach other team members.

**Wilson:** I think empathy is the best soft skill, and humility is the best leadership strategy/skill for moving forward. Knowing when to admit you don't know or are wrong is critical to learning and building trust with a team. ■

For more on our Advisory Board members, please visit **isemag.com/55265995**.

ISE EXPO
ICT SOLUTIONS & EDUCATION

JULY 29–31, 2025
ERNEST N. MORIAL CONVENTION CENTER
NEW ORLEANS, LA

# WHERE INNOVATION MEETS CONNECTIVITY

Discover the future of network infrastructure at ISE EXPO, the industry's premier event bringing together cutting-edge technology and innovative solutions, content-rich educational sessions, and valuable industry connections. Join thousands of professionals from across the globe to explore the latest advancements in telecommunications, 5G, fiber, network reliability, BEAD, workforce training, and more.

This year's event will showcase dynamic exhibits, thought-leading educational sessions, and hands-on product demos designed to help you deliver faster, more reliable connectivity. You can also look forward to new, exciting networking opportunities and receptions designed to help you effortlessly expand your industry connections.

At ISE EXPO, **innovation meets connectivity,** bridging the gap between today's challenges and tomorrow's opportunities. Whether you're a broadband operator, network engineer, manufacturer, or business leader, this is your chance to stay ahead of industry trends and connect with peers driving the future of connected infrastructure.

**Join us at ISE EXPO in New Orleans, Louisiana, July 29–31, 2025, and discover how the latest innovations can optimize your network and shape the connected world of tomorrow.**

OWNED AND PRODUCED BY: ENDEAVOR BUSINESS MEDIA

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PREVIEW THE 2025 EVENT

# WHY ATTEND ISE EXPO 2025?

**Preview What's in Store for the 2025 Event**

## Educational Conference Sessions

ISE EXPO will deliver the latest telecom education to guide professionals to success in their careers and business ventures. This robust program will be packed with content focused on:

### Design, Construction, Engineering & Operations (Fixed & Mobile)

Explore cutting-edge processes and platforms for cost-efficient fixed and mobile networks. This track covers topics from C&E improvement processes to the latest GIS technologies and the use of drones to build smarter networks. Attendees will learn innovative solutions that enhance operational efficiency, streamline project workflows, and maximize long-term return on investment (ROI).

### FTTx Networks (Fixed & Mobile)

Learn the latest innovations in FTTx design, deployment strategies, and emerging technologies like 10G XGS-PON. This track delves into topics such as advanced fiber management systems, best practices for cost-effective network deployment, and workforce solutions designed to accelerate network builds. Attendees will learn how these cutting-edge technologies and optimized processes can help them deploy FTTx services faster, more efficiently, and cost-effectively.

### Automation, AI, Reliability, Security & Network-as-a-Service

Network performance is closely tied to cash flow; even brief downtime can jeopardize Average Revenue Per User (ARPU). As threats to fixed and mobile networks increase, new strategies are vital to automating performance, maintenance, and reliability. This track will dive into the latest testing and maintenance technologies that minimize latency, reduce jitter, and strengthen network resilience.

Attendees will also uncover how AI-driven solutions can revolutionize network management by boosting operational efficiency, automating troubleshooting, and enhancing security protocols. From advanced automation to Secure Access Service Edge (SASE) to detecting network vulnerabilities, optimizing traffic, and proactively preventing outages, AI can be a game-changer in delivering the uncompromised reliability that customers demand.

Network-as-a-Service (NaaS) seminars will focus on the future of network management and service delivery. As telecom providers face increasing demand for flexibility, scalability, and cost efficiency, attendees will learn how NaaS can simplify network operations by transforming infrastructure into a service-based model.

### Permitting, Regulation & BEAD

This track offers comprehensive insights related to working with municipalities and states to deploy broadband networks. It explores obstacles, such as expediting approval processes for rights-of-way, and best practices for staying compliant with new environmental requirements. Attendees will also learn communication strategies to effectively engage with local agencies and Broadband Development Offices (BDOs).

### Workforce, Training & Leadership

The telecom industry's need for a highly skilled workforce has never been greater. This track will explore the critical gaps in talent, training, and leadership that telecom providers must address to meet the demands of today's fixed and wireless networks.

Attendees will learn about innovative workforce development programs, from technical training to upskilling initiatives, designed to equip teams with the knowledge to manage, construct, and maintain high-performance networks. Seminars will also discuss the importance of adaptive leadership in managing growing teams, implementing new technologies, and ensuring project success in a fast-changing regulatory and operational environment.

**FOR CONFERENCE PROGRAM DETAILS, VISIT WWW.ISEEXPO.COM.**

## Keynote Presentations

### Opening Keynote

Join us on Wednesday, July 30, for the Opening Keynote, featuring Julie Slattery, Senior Vice President, Core Engineering & Operations, Verizon.

verizon

### Closing Keynote: Executive Insights

The Closing Keynote will take place on Thursday, July 31, featuring Tom Maguire, Chief Executive Officer, Brightspeed

brightspeed
Fiber Internet

**FOR ADDITIONAL KEYNOTE PRESENTATION DETAILS, VISIT WWW.ISEEXPO.COM.**

**NEW!**

## Women in Telecom Luncheon

**TUESDAY, JULY 29**

Join us for roundtable discussions during a plated lunch focused on essential topics such as career advancement, work–life balance, diversity, well–being, leveraging AI as a professional tool, and personal branding. Following lunch get inspired by an engaging panel of accomplished executive women from the broadband industry. This insightful discussion will cover a range of relevant and timely topics, including:

- The personal career journeys of each panelist
- The single most pivotal moment or decision that shaped their careers
- Key advice and lessons for growing a company and advancing professionally
- Diversity, Equity, and Inclusion (DEI) initiatives at their firms—what's effective and what challenges remain
- Strategies for developing top–tier talent
- Their outlook and strategic plans for 2025–26 and beyond

The luncheon will be followed by an interactive Q&A segment between the panel and audience and concludes with several high–end sponsored giveaways you don't want to miss!

## Innovative Equipment, Products, & Solutions

### 200+ Vendor Exhibit Floor

From industry trailblazers to up–and–coming innovators, the 2025 exhibit floor will be packed with experts ready to talk through their innovative equipment, products, and technologies.


**FOR A LOOK AT THE CURRENT LIST OF EXHIBITORS FOR ISE EXPO 2025, VISIT WWW.ISEEXPO.COM.**

# VERIZON EMERGENCY RESPONSE: Showcasing Disaster Preparedness and Response Through Technology and Innovation

## Meet the engineers who bring network innovation to life.

Step inside and discover the cutting-edge technologies that empower teams to respond swiftly to disasters, aid recovery efforts, and help mitigate future emergencies. Meet the dedicated engineers who go to extraordinary lengths to keep communities connected when it matters most.

Be inspired as you explore the latest innovations, advanced equipment, and groundbreaking capabilities shaping the future of disaster response and recovery. Then, take that inspiration back to your organization to develop innovative solutions that strengthen community resilience through collaboration with industry leaders, government agencies, and local stakeholders.

Before doing so, attend the Opening Keynote—on July 30 by Julie Slattery, Senior Vice President of Core Engineering & Operations at Verizon—titled "Building Resilient Communities: Enhancing Disaster Preparedness and Response Through Technology, Innovation, and Partnership."

Then, visit Verizon's Response Team, on the exhibit floor, to witness these innovations firsthand.

VERIZON

**THOR:** Verizon Frontline's Tactical Humanitarian Operations Response (THOR) is a mobile, rapid-response command center vehicle capable of deploying Verizon Frontline technology, including private Verizon 5G Ultra-Wideband, along with additional applications and advanced computing solutions for partners including first responders and the Department of Defense.


VERIZON

**RED – Robotic Dog:** 5G enabled platform capable of going into austere environments. RED can go into hazardous areas to collect data such as temperature and air quality for first responders and assist in search and rescue or hazmat situations. The slats on the top of RED can be used to mount radio equipment, cameras and more.


**RRCU – Portable Cell Site:** 5G enabled with satellite backhaul capabilities for data and voice services for up to 120 users.

VERIZON


VERIZON

**Off Road Comms on the Move ATV:** This asset is used for comms beyond the edge where not only service is impacted but access is challenging. In the aftermath of a disaster, roads are often damaged to the point where traditional First Responder vehicles cannot gain access. This asset is used for access in remote areas and provides a cellular footprint using eFemtos, high performance antennas and LEO satellite. Verizon deploys this asset for drone teams so they can provide aerial mapping, surveillance for infrastructure and tower surveys for areas that have limited access.

## Networking Events

### On-Site Networking Happy Hour

Building connections and meeting with fellow members of the ICT industry is what ISE EXPO is all about. All attendees are invited to join us for a special Networking Happy Hour, Wednesday, July 30, starting at 3:30 PM. Connect with fellow attendees, exhibitors, and sponsors over drinks and appetizers, and take the opportunity to build valuable professional relationships in a casual setting.

**ISE EXPO ADD-ON**

### 4th Annual Golf Tournament

Whether you are looking for additional networking opportunities, hosting a team of your customers, or wanting to try a new course, the ISE EXPO Golf Tournament is a great way to tee off ISE EXPO week. Join us on Tuesday, July 29, at the Lakewood Golf Club, for a fun-filled day on the course. Don't delay registering—the tournament sells out early every year! *Registration is separate.*

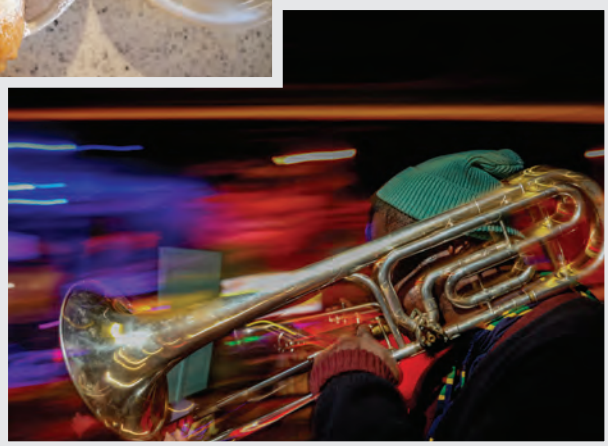
### ISE Network Innovators' Awards

The 2025 ISE Network Innovators' Awards will honor the best telecom infrastructure/network innovations that solve Communications Service Providers (CSPs) AND end-users pain points in a cost-effective manner. Honorees will be announced at ISE EXPO in New Orleans, July 30, at the ISE Network Innovators' Awards Breakfast.

# 2025 SCHEDULE OF EVENTS

ISE EXPO 2025 promises to build off our stellar 2024 program with a variety of new offerings that will educate you on the next wave of Information and Communications Technology (ICT) to come. Don't miss this opportunity to stay ahead of the curve to ensure continual business viability with insights only presented at the show.

| | |
|---|---|
| **MONDAY, JULY 28** | |
| 11:00 AM – 5:00 PM | Exhibitor Move-in |
| **TUESDAY, JULY 29** | |
| 7:30 AM – 2:00 PM | Golf Outing |
| 8:00 AM – 5:00 PM | Exhibitor Move-in |
| 8:00 AM – 11:15 AM | Preconference Workshops |
| 10:00 AM – 5:00 PM | Registration Open |
| 11:30 AM – 1:00 PM | Women in Telecom (WiT) Lunch & Panel *(additional fee required)* |
| 1:15 PM – 4:45 PM | Conference Sessions |
| **WEDNESDAY, JULY 30** | |
| 7:00 AM – 5:00 PM | Registration Open |
| 7:00 AM – 10:00 AM | Exhibitor Move-in |
| 8:00 AM – 9:00 AM | ISE Network Innovators' Awards Breakfast |
| 8:00 AM – 10:15 AM | Conference Sessions |
| 10:30 AM – 11:30 AM | Opening Keynote \| **Julie Slattery, Senior Vice President, Core Engineering & Operations, Verizon** |
| 11:30 AM – 5:00 PM | Exhibit Hall Open |
| 12:00 PM – 1:30 PM | Lunch on Exhibit Floor |
| 3:30 PM – 5:00 PM | Networking Happy Hour on Exhibit Floor |
| **THURSDAY, JULY 31** | |
| 7:00 AM – 2:30 PM | Registration Open |
| 8:00 AM – 10:15 AM | Conference Sessions |
| 8:00 AM – 9:00 AM | Workforce Development: State of the Industry Panel |
| 10:30 AM – 11:30 AM | Closing Keynote: Executive Insights \| **Tom Maguire, Chief Executive Officer, Brightspeed** |
| 11:30 AM – 3:00 PM | Exhibit Hall Open |
| 12:00 PM – 1:30 PM | Lunch on Exhibit Floor |
| 2:45 PM – 3:00 PM | Attendee Vacation Giveaway in ISE EXPO Rebooking Booth |
| 3:00 PM – 7:00 PM | Exhibitor Move-out |
| **FRIDAY, AUGUST 1** | |
| 8:00 AM – 12:00 PM | Exhibitor Move-out |



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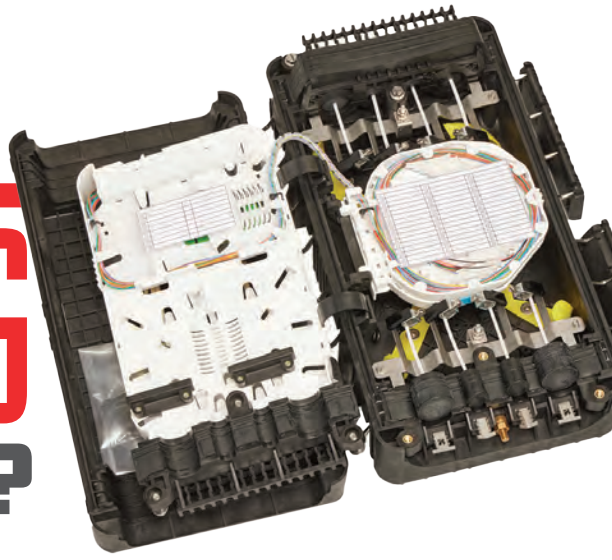
# WHAT'S NEW IN OPTICAL NETWORKING TECHNOLOGY?



A roundup of some of the latest innovations in optical networking.

Optical networking technology continues to evolve to meet the insatiable bandwidth demand driven by new advances and new consumer and business demands.

So, what's new in optical networking? We asked some technology companies to describe their recent innovations and how they can solve problems for your network.


## Apex X-1 Sealed Splice Closure from AFL

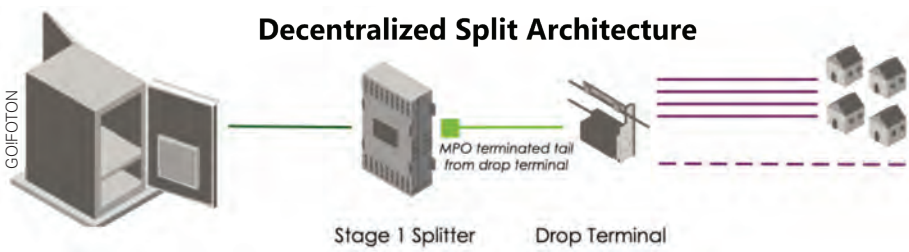
**AFL SAYS:** "The Apex X-1 is a new addition to AFL's Apex family of sealed splice closures. It is a transformative solution in the telecommunications infrastructure sector, revolutionizing the industry's approach in fiber deployment. As the most compact sealed dome splice closure in its class, this latest design balances size optimization with exceptional performance, supporting up to 144 single fusion, 432 mass fusion with standard ribbon, or 864 mass fusion with "rollable ribbon" fiber types such as AFL's SpiderWeb Ribbon® (SWR®)."

## Decentralized Split Plug-and-Play Architecture from Go!Foton

**GO!FOTON SAYS:** "Go!Foton's Decentralized Split Plug-and-Play Architecture solution provides a more cost and labor-efficient way to design your network. The approach utilizes single-stage splitters, like centralized architecture, but distributes those splitters throughout the network in several key locations. Connectorized drop terminal stubs pull back to each splitter location eliminating the need for splicing.

This plug-and-play approach helps speed deployment and create more flexibility for the network as it continues to evolve. In addition to minimized splicing, the cable size used is reduced from the typical 144F-288F cable used in a centralized split architecture to just 12F-48F which significantly reduces material cost as well.

Go!Foton's PEACOC® Multiport Mid-span Terminal (MMT) houses up to three 1x32 splitters to feed up to 96 homes. Then, Go!Foton's PEACOC® Clamshell Hardened Terminal (CHT) plugs back into the MMT for rapid, splice-free connectivity. Each CHT provides service for up to eight homes and enables hardened fiber terminal functionality with the use of proprietary connectors. Benefits of this network design include easier documentation, flexible split ratios, reduced installation costs, and flexibility in drop cable sourcing."



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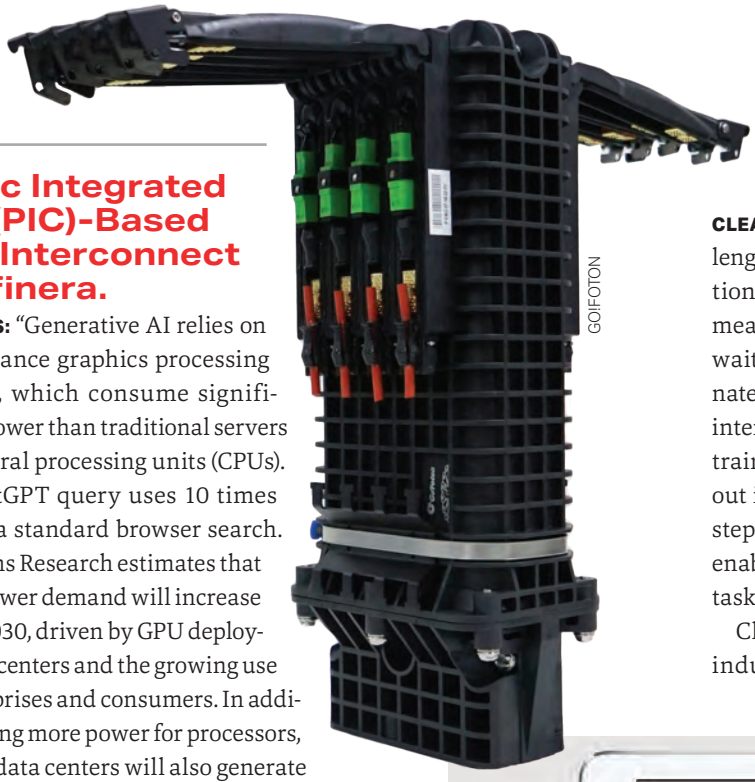

GOIFOTON

## Photonic Integrated Circuit (PIC)-Based Optical Interconnect from Infinera.

**INFINERA SAYS:** "Generative AI relies on high-performance graphics processing units (GPUs), which consume significantly more power than traditional servers based on central processing units (CPUs). A single ChatGPT query uses 10 times the power of a standard browser search. Goldman Sachs Research estimates that data center power demand will increase by 160% by 2030, driven by GPU deployments in data centers and the growing use of AI by enterprises and consumers. In addition to requiring more power for processors, these new AI data centers will also generate a massive amount of data that will need to be transported between AI racks and clusters.

To help network operators manage rising power and bandwidth demands, Infinera has developed a pioneering solution for short-reach intra-data center connectivity. Our unique monolithic, massively parallel indium phosphide (InP) photonic integrated circuit (PIC)-based optical interconnect solution, ICE-D, can transmit 1.6 terabits of bandwidth per second while consuming up to 70% less power than alternative solutions. ICE-D is a flexible, highly integrated single-chip technology that can be incorporated into various optical solutions, including fully retimed, half retimed, and linear pluggable optics. ICE-D will be showcased at this year's OFC50 conference in San Francisco from March 30 to April 3."

INFINERA

## BILT App from Clearfield

**CLEARFIELD SAYS:** "Fiber technicians often face challenges in the field that require quick, practical solutions. Traditionally, resolving these issues might mean returning to the office, delaying progress, or waiting for support. The BILT® mobile app eliminates these inefficiencies by providing real-time, 3D interactive guides designed to streamline setup and training processes. Accessible anywhere, even without internet connectivity, the app delivers step-by-step manuals enriched with audio, text, and images, enabling technicians to troubleshoot and complete tasks without leaving the site.

Clearfield has partnered with BILT to offer the industry's first 3D interactive fiber installation


CLEARFIELD

guides on the app, created with the needs of today's workforce in mind. As the fiber technician demographic evolves, with many experienced technicians retiring and a new generation of installers stepping in, resources like the BILT app are crucial to bridge the skills gap. Its intuitive, user-friendly design caters to how younger generations learn and consume information—quickly, visually, and interactively.

By equipping technicians with tools that improve on-site efficiency, reduce errors, and eliminate unnecessary trips back to the office, the BILT app maximizes time in the field and ensures fiber networks can be deployed faster and more effectively. Clearfield remains committed to creating innovative resources and tools that support the continued modernization of the fiber workforce." ■

# A Composite Solution

## Overcoming barriers to rural broadband with composite poles.

BY DUSTIN TROUTMAN AND SAM LYNCH

Crews in challenging rural areas can easily handle, transport and raise FRP poles and guide them into position. Creative Composites Group

Most Americans take for granted how quickly a situation can go bad when you don't have the ability to communicate with the rest of the world. But rural Americans fully appreciate how much this disconnection affects people's lives.

Where I live in rural Pennsylvania, my neighbors and I have experienced the near helplessness of emergencies happening without cellular or internet access. It's not an overstatement to say these can be cases of life and death.

This is the reality for nearly a quarter of Americans living in rural areas,[1] according to the USDA, and for those working in rural jobs like logging and mining. There are two different Americas when it comes to access to the technology that drives the modern world.

Composite utility and telecom poles are playing a key role in advancing broadband access equity across the U.S. Their lightweight, extremely resilient, customizable properties have made them a preferred choice among companies like EasyStreet Systems for small-cell installations across the rural U.S. Composite poles are changing the game for rural internet access for users, utilities, and installers.

## The Challenges of Rural Broadband Buildout

Financial and physical barriers block equitable broadband access in rural communities.

### FINANCIAL BARRIERS

The Rural Electrification Act (REA) of 1936 shifted the mindset of the government and the public to view access to electricity as a right of all Americans. Today—and even more since the COVID-19 pandemic lockdowns—our lives rely on not just electricity but also the connectivity provided by the internet. But unlike power, the internet isn't yet treated like a public utility.

This has left rural people with no option but to self-fund their access to the internet—often at significant expense. My co-author on this piece, Sam Lynch, VP of Sales at EasyStreet Systems and a lifelong rural Georgian, told me of a gentleman in his town who had to drive 45 minutes each way to a coffee shop in Dahlonega, Georgia, to have internet access to do his job during the COVID-19 pandemic lockdowns. That same man later paid out of his own pocket to have a pole put on his property and for fixed wireless access (FWA) internet to be installed, which he uses for his own home and to serve the areas surrounding the property and a university in northern Georgia.

On my own property in Pennsylvania, my only option was to pay for satellite internet access. Comparing notes with my city-based colleagues, I pay almost three times as much for access.

Some new policies and funding reflect the spirit of the REA for internet access. The Rural Digital Opportunity Fund (RDOF)[2] is a multi-phase grant project meant to bring broadband to unserved or underserved areas of the U.S. through taxpayer dollars. The Broadband Equity Access and Deployment (BEAD) Program[3] is a $42.45 billion project within the Infrastructure Investment and Jobs Act (IIJA) meant to extend access to high-speed internet through funding planning, infrastructure deployment, and adoption programs across the entire U.S. and its territories.

Both programs have the admirable goal of improved access, but both programs suffer from the same slowdown: like many government-funded projects, the actual distribution of the funding has been very, very slow. One major obstacle was that BEAD funding was only available to fiber networks. To quote Forbes:[4]

*"FWA provides wireless broadband through radio links between two fixed points that operates on licensed spectrum over LTE and 5G networks. This serves a home or business through a wireless connection to a customer premises equipment (CPE) unit that typically integrates Wi-Fi. On the other hand, fiber employs optical cable trenched underground with last-mile connections made either aerially (usually from a telephone pole) or underground depending on the topography of the homes and businesses being served. Again, CPE devices serve as the termination points, but in the case of fiber they are physically wired to the carrier network."*

While they create a more robust network, fiber is much slower, more complicated, and more expensive to install than FWA. Internet providers like Verizon, AT&T, and T-Mobile would struggle to justify the costs of plowing, installing, and burying a single mile of fiber versus covering up to 20 homes using FWA. Because of this, BEAD rules were eventually relaxed to include FWA, but major internet providers are still businesses and rural installations are less economical than urban ones.

### PHYSICAL BARRIERS

The terrain itself represents a substantial physical barrier to internet access equity. Rural properties are much larger and further apart than suburban and especially urban ones. The land in between properties is often forested, hilly or in another natural state, making it extremely difficult to deliver conventional weight poles and installation crews to the sites. Sometimes, additional permits are needed. Many rural properties use well water, which means wood poles have additional regulations to avoid leaching treatment chemicals into the groundwater. And none of this considers the critters: beavers, termites, woodpeckers, squirrels and other animals and insects are plentiful and see wood poles as just another tree.

Between terrain and money, it's no wonder that the rural broadband buildout has moved at a glacial pace. The rising adoption of composite poles, however, is helping to pick up the pace.

## How Composites are Speeding Rural Access to Broadband

Sam Lynch of EasyStreet Systems is one of many telecom professionals who sees composite poles as an essential step towards a truly nationwide broadband buildout. EasyStreet specializes in small cell deployment for rural FWA. "We prefer the term 'smart cell,'" Sam told me. "While these are low-quantity installation sales, even a single composite pole can be the smartest choice for everyone involved because they go up fast, and they last."

Mostly working with 10-inch diameter Creative Composites Group (CCG) StormStrong® poles between 20 and 40 feet long, Sam and his colleagues are most impressed with the high strength-to-weight ratio. "As we go into rural FWA broadband, we're finding that we need taller poles that can handle more equipment without exceeding the overturning moment." Composites are speeding rural access to broadband by overcoming the two major barriers of total cost and terrain.

## Lower Total Costs

The process is impressively simple when EasyStreet is brought in to install a "smart cell" pole in a rural area. Sam reports that the carrier's cost of construction is usually reduced between 30% and 70% when using fiber reinforced polymer (FRP) composites. "These get installed with a two- or three-person crew and a bucket truck instead of a huge crew with a crane truck," explained Sam. "From just a personnel and equipment standpoint, these companies are saving a ton, especially when there are so many open jobs for utility and telecom line crew workers."

Even getting the poles to the site comes with a lower price tag. A standard truck can carry about a dozen steel poles. That same truck could carry nearly 60 composite poles of the same diameter. This is economy of scale.

And because the poles are entirely sourced and made in the U.S., they qualify under the Build America, Buy America Act, a requirement for BEAD funding. This also means that everything installed on a rural site is traceable and backed by both quality assurance and accessible support. The pole will perform as expected for decades (EasyStreet estimates up to 50 years), and in Sam's words, "We view CCG as a partner, not just a supplier."

## Less Impact

FRP composite poles have a lower environmental impact, especially in rural installations. As previously stated, composite poles are two to three times lighter than same-diameter wood poles and much lighter than steel, saving fuel on transport and labor and installation costs.

Some FRP poles, like my company's, have earned an Environmental Product Declaration for cradle-to-gate emissions. The data shows that the global warming potential (GWP) of FRP poles versus galvanized steel, when adjusted for final weight based on equivalent strength and length, is much lower (see Figure 1).

FRP poles have a lower impact on the environment in these additional ways:

### WATER-SAFE

Composites leach no preservatives or insecticides into the water, making them ideal for setting even near water sources. They also don't corrode or rot when exposed to water, giving them a longer service life.

### FIRE-SAFE

FRP poles have outstanding dielectric strength, unlike steel, and are inherently fire retardant, unlike wood. They won't add fire risk to a property where emergency services may not be readily accessible.

### EXTREMELY RESILIENT

Some FRP poles, like StormStrong, have been tested—in both a lab setting and in actual natural disasters—and shown to resist hurricane-force winds, even when carrying lots of equipment like microwave dishes. The poles stay standing under even very harsh conditions, extending the service life.

### CRITTER-RESISTANT

Replacing a wood pole every two to ten years due to animal damage is unrealistic for a rural FWA pole. Unlike wood poles, composite poles are not a desirable home or target for birds, insects and small mammals.

### CAMOUFLAGE-READY

FRP poles do not decay and, with additional coatings from EasyStreet, resist weed-eater chemicals and even graffiti. They come standard with UV-resistant

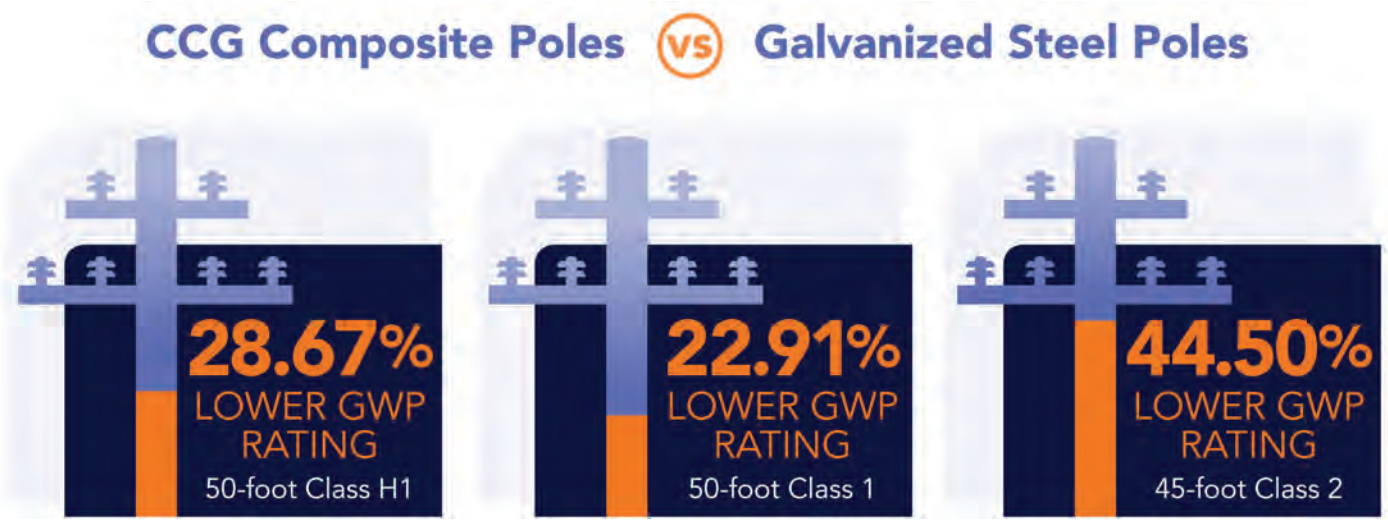


**FIGURE 1.** GWP comparison between FRP and steel poles. Creative Composites Group

EasyStreet Systems team members installing a fiber composite pole in rural Bay County, Florida. EasyStreet Systems

coating and may be tinted to the customer's color of choice. This allows them to blend into the environment in which they're installed and stay in as-new condition for longer, rather than becoming an eyesore or a hazard. Added Sam, "We've encountered a somewhat fixed mentality about changing material. Folks tell us, 'We've always had wood poles.' But once we show them the new material and explain the benefits, they quickly are on board."

## Internet for All is Possible

Composite poles are accelerating rural broadband buildout. "I think in the next two or three years, we'll be seeing some sizeable deployments," Sam said. "The need for internet isn't getting any lower, and composites make the buildout less of a challenge." This lightweight but super strong material is changing the reality of rural broadband installation and getting more people reliably online. ■

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**Sam Lynch** is VP of Sales at EasyStreet Systems. For more information, visit www.easystreetsystems.com.


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# EVOLVING YOUR PON: Leveraging PON Investments to Expand Service Offerings

Advancements in fiber technology shouldn't force providers to undertake expensive construction.

BY JON BALDRY

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It is quite astonishing to think how bandwidth in broadband networks has increased over recent years, transforming how we all connect to the world from our homes for entertainment purposes. For some of us, it has also enabled our ability to work from home. I've actually worked from my home office for over 20 years.

Key to the rapid expansion of last-mile access speeds into homes is the rapid rollout of passive optical network (PON) technology. My experience working from home started in the dial-up era, which was painful at times, before moving to ADSL, which made things workable, and finally to PON. I now have 900 Mb/s PON-based fiber-to-the-home, which is great.

However, not all communities have access to PON in the last mile yet, which creates a digital divide for both recreation and business—from a work-from-home perspective but also for connectivity requirements for any business in the local area. Governments across the globe recognize this issue and are regulating, or even providing stimulus funding, to close this digital divide.

Natural market growth, boosted by additional stimulus funding, means the PON equipment market currently has considerable momentum. Julie Kunstler, Chief Analyst, Broadband Access Intelligence Service at industry analyst firm Omdia, produced a blog for the OFC 2024 event outlining Omdia's view on the PON market. This blog stated, "PON equipment revenues are forecast to exceed $21 billion in 2028, representing a CAGR of 11.7% from 2022." Good news for residential and small business customers with bandwidth requirements that are well served by PON technology.

## Substantial PON Investments

The huge investment in fiber-based access networks extends well beyond the PON hardware itself. Data from network operators suggests that up to 90% of network deployment costs are actually for construction and trenching fiber ducts and for the fiber cables. With such a big investment in the fiber access network, service providers need to leverage this investment to deliver a broad range of services, including high-speed services beyond today's residential PON focus.

This creates a very interesting challenge for DWDM vendors that typically operate deeper in the network in aggregation, metro, and long-haul networks. DWDM networks operate over two fibers, one for each direction of data transmission. PON networks, on the other hand, are based on single-fiber infrastructure with bidirectional traffic to minimize installation costs. This creates a bit of a dilemma for DWDM networking vendors and those deploying

DWDM networks: can this single-fiber domain be used when dedicated N x 25G high-capacity services are required right out to the edge of the network?

This would all be fine if capacity in DWDM networks wasn't also ramping up at the same time. Older 10G DWDM can easily operate over single-fiber infrastructure. But the latest 25G/50G PON technology can support 10G services natively today, and 10G DWDM is also rapidly being replaced in the DWDM access network by higher-speed coherent optics that generally don't work over single fiber. Coherent optics have been used for over a decade in long-haul core networks, but as network capacities continue to grow, long-haul networks have moved to higher 800G, and soon 1.2T, speeds, and lower speed 100G, 200G, and 400G coherent optics have pushed ever closer to the edge of the optical network.

So, we have the optical network splitting into a dual-fiber DWDM transport network domain and a single-fiber edge/access network domain, at the same time as DWDM optics are moving to higher speeds requiring coherent technology that doesn't support single fiber!

Of course, residential users don't need N x 25G services. And most small and medium-sized businesses don't either. But there are many use cases that increasingly do need this capacity, including 5G cell towers, larger businesses/enterprises, business parks, or even backhaul for PON optical line terminals (OLTs) deeper in the single-fiber access network.

How do network operators address this challenge today? Simply put, if they need higher-speed coherent optics to support higher-capacity N x 25G services, then they need to make sure dual fiber exists all the way to the end customer.

They typically can't leverage the substantial investment they have already made in the PON network to also support these services. If, as is often the case, the dual-fiber infrastructure isn't in place, then they have to invest significant time and money in digging new ducts and/or pulling new fibers to support the new service. These costs can be very high, at up to $60,000 per trenched mile of fiber or more, according to the Fiber Deployment Annual Report 2023[1] from the Fiber Broadband Association. These high costs may even make the service unviable economically.

> "We now have a solution to the challenge of higher-speed coherent optics over single-fiber infrastructure to deliver higher-capacity N x 25G services that exceed the capabilities of the underlying PON network."

## Optical Innovation

Help is at hand with one of the newest innovations from the optical networking industry. The recent innovation of subcarrier-based point-to-multipoint optics offers a solution to the "coherent DWDM over single fiber" dilemma for network operators. This new class of "XR optics" pluggables is based on the concept of digital subcarriers, where a single laser is modulated into multiple subcarriers enabling a single higher-speed hub optic to communicate with multiple lower-speed leaf optics, as shown in Figure 1.

One additional benefit of this new class of XR optics is that the underlying subcarrier technology enables us to fix the problem of higher-speed coherent optics over single-fiber networks. We can use some of the subcarriers in one direction and others in the opposite direction, turning, for example, a conventional 400G dual-fiber coherent optic with 16 x 25G subcarriers into a 200G single-fiber bidirectional, or bi-di, optic with 8 subcarriers per direction. We can use this subcarrier-based XR architecture for both point-to-point and point-to-multipoint deployments over single-fiber networks like PON.

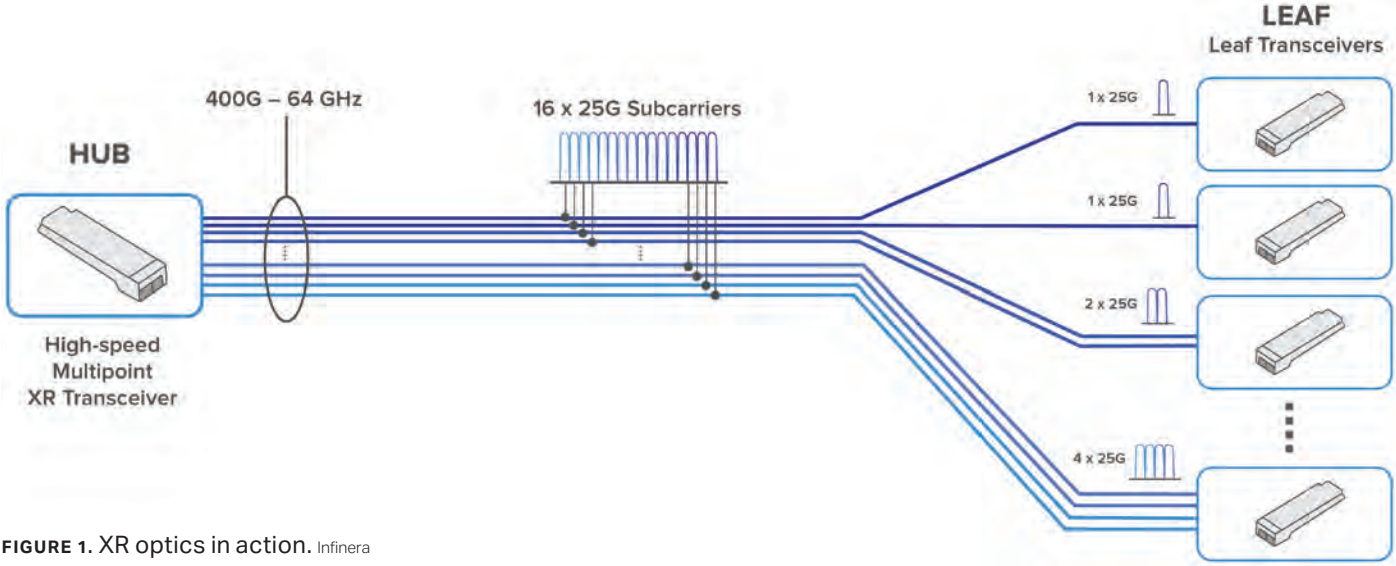


**FIGURE 1.** XR optics in action. Infinera

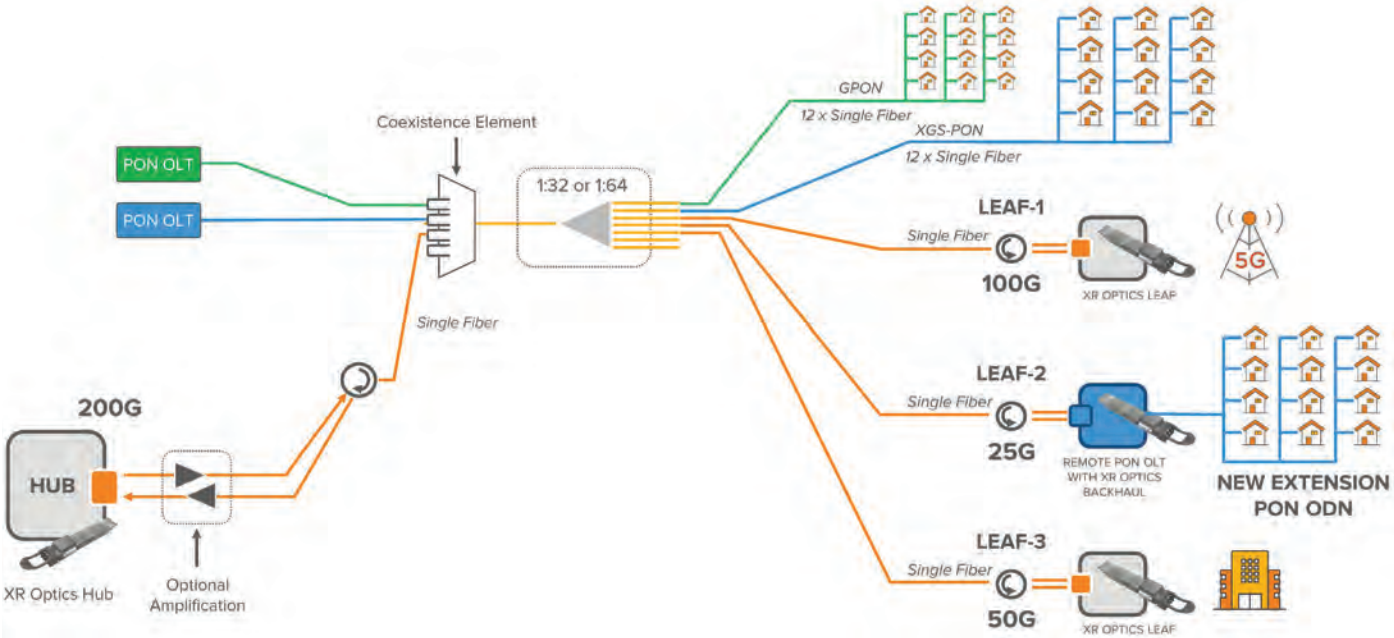


**FIGURE 2.** PON overlay supporting high-capacity N x 25G services for 5G xHaul and businesses, and remote PON OLT backhaul. Infinera

## Leveraging Existing PON Deployments

We now have a solution to the challenge of higher-speed coherent optics over single-fiber infrastructure to deliver higher-capacity N x 25G services that exceed the capabilities of the underlying PON network. This means that network operators can leverage the significant investments they have made in single-fiber PON access networks for a much broader range of services and are able to support the push of higher-speed coherent DWDM optics right to the edge when needed.

We briefly mentioned earlier some services that might require capacity that exceeds the capabilities of the PON network. Let's look at these PON overlay applications (see Figure 2) in a little more detail:

- Edge data center connectivity – Network operators who own fiber can now push their multi-access edge compute (MEC) data centers closer to end users and deeper into access networks utilizing the single-fiber domain.
- Similarly, data center owners who rent fibers can now cut fiber rental costs by renting just a single fiber for data center interconnect networks.
- High-capacity N x 25G services for 5G xHaul and demanding business customers can now quickly, and cost effectively, be deployed over what was a residential PON.
- To support local communities, high-capacity services can now also be offered to anchor institutions in the community, such as schools or libraries, where bandwidth demands might outstrip a residential service level.
- PON network owners can push their own aggregation devices that require higher-capacity backhaul deeper into their single-fiber access plant to support remote PON OLTs or new PON buildouts that weren't initially anticipated in the original design, e.g., to support new housing developments.

A further consideration beyond the economics of reusing the existing single-fiber infrastructure rather than creating new dual-fiber infrastructure is the speed of rollout of these new services and the associated time to revenue for the services. Reusing the existing fiber network means that new services can be deployed in minutes once the hardware is shipped to the customer site. The alternative option of a new fiber build, or even a short extension to existing fiber, can take weeks or even months to survey, plan, dig/pull, and install.

New subcarrier-based XR optics, such as Infinera's ICE-X intelligent coherent pluggables, can help us address a major challenge that has occurred due to the rapid capacity expansion in both PON-based access networks and DWDM-based transport networks. As PON and DWDM technology were both evolving and diverging, the new XR optics architecture based on digital subcarriers is enabling us to close the gap and bring these two domains back together again harmoniously. ■

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# The Escalating Threat of ROBOCALLS

The urgent need for advanced digital identity to combat a pervasive problem that is predicted to get worse.

BY GERRY CHRISTENSEN


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Robocalls have evolved into a pervasive and disruptive problem, largely due to the rapid advancements in telecommunications and information technology. These technological leaps have significantly reduced the costs associated with telecommunications and computing infrastructure, making it cheaper and easier to place automated calls.

While these advancements have brought many benefits, they have also inadvertently fueled the rise of robocalls, creating new challenges for individuals, businesses, and regulatory bodies alike.

VoIP/SIP technology, while offering cost-effective solutions for legitimate communication purposes, has also been exploited for unlawful activities, allowing perpetrators to operate with a high degree of anonymity.

Unlike traditional telephony systems, VoIP/SIP makes it incredibly cheap to place massive volumes of calls, often without incurring significant costs even if the calls go unanswered. This has emboldened scammers and unscrupulous telemarketers to utilize robocalls for their nefarious purposes.

One of the most common tactics employed by robocallers is "telephone number spoofing," which involves manipulating the caller ID to display a telephone number that is not legitimately owned and/or controlled by the entity originating the call.

While there are ethical and lawful use cases for spoofing, such as a pharmacy displaying a local branch number for prescription notifications, illegal spoofing is rampant. Bad actors often impersonate legitimate organizations to deceive call recipients, potentially leading to fraud, identity theft, and other harmful consequences.

## The Challenge of Trust in VoIP

Voice over Internet Protocol (VoIP) has revolutionized business communications with its cost-effectiveness and scalability. However, the inherent anonymity of VoIP systems has also enabled the rise of unwanted robocalls and phone number spoofing, eroding consumer trust. Unlike traditional SS7/TDM networks, VoIP lacks end-to-end authentication, making it difficult to verify the identity of callers.

While telephone numbers (TNs) serve as a form of identity, they are not reliable in the long term. Consumers change numbers frequently, and organizations, especially those involved in telemarketing and tele-sales, often rotate TNs rapidly. This "hyper-rotation" can be used to circumvent regulations and even perpetrate scams.

The STIR/SHAKEN framework has emerged as a significant tool in combating caller ID spoofing. By using digital signatures to authenticate call origins, STIR/SHAKEN verifies that the caller is authorized to use the displayed number. The framework also assigns attestation levels to calls, indicating the level of trust associated with the caller ID.

Despite its benefits in reducing robocalls and improving trust, STIR/SHAKEN has limitations. It primarily focuses on authenticating networks to TNs, not on verifying the organizations behind the calls. This leaves a gap in accountability, especially

for organizations that frequently change numbers or engage in questionable calling practices.

## Brand Impersonation and the Rise of Deep Fakes

Brand impersonation is another deceptive tactic used by robocallers, where they explicitly or implicitly claim to represent a legitimate company or organization. This unethical and often illegal practice erodes consumer trust and can cause significant damage to the impersonated brands.

The emergence of AI-generated deep fakes has further exacerbated the problem, making it increasingly difficult to distinguish between real and fabricated content. Deep fakes can create highly realistic videos or audio recordings that appear to show someone saying or doing something they never actually did. This technology can be used for malicious purposes, such as blackmail, extortion, or reputational damage.

## Voice Cloning and Conversational AI: New Tools for Deception

Voice cloning technology, powered by advanced machine learning algorithms, has made it possible to replicate a person's voice with remarkable accuracy. This technology has various legitimate applications, such as recreating voices for movies, video games, or personalized virtual assistants. However, voice cloning can also be misused for malicious purposes, particularly when combined with conversational AI.

Conversational AI enables machines to engage in natural-sounding conversations with humans, mimicking human-like responses and interactions. While perfectly replicating an individual's speech patterns remains challenging, conversational AI can create highly believable interactions, especially when programmed with personal or contextual information.

This creates new opportunities for deception, as bad actors can use voice cloning and conversational AI to impersonate individuals or organizations with greater credibility.

## The Ethical Concerns of AI Misuse

The rapid advancements in AI technology, particularly in voice cloning and conversational AI, have raised significant ethical concerns. The potential for misuse is substantial, as bad actors can exploit these technologies for fraud, deception, and manipulation. The ability to create highly realistic synthetic voices and engage in believable conversations opens up new avenues for social engineering attacks, phishing scams, and other forms of online fraud.

Generative AI, which can create realistic websites, emails, and messages, further amplifies the threat. When combined with data scraping techniques, generative AI can be used to train conversational AI systems to deliver highly personalized and contextually relevant information, making the deception even more convincing. This raises serious concerns about the potential for large-scale manipulation and the erosion of trust in online communications.

## Combating Unlawful Communications With Advanced Digital Identity

To combat the growing threat of robocalls and AI-driven deception, a comprehensive approach is needed, encompassing technologies, policies, procedures, and methods that work together to create a "Trusted Communications" framework.

Key components of this framework include Consent Management, UI/UX design, Digital Identity, Know Your Everything (KYX), Monitoring, Authentication, and Validation. While these tools can be implemented individually, a more effective approach is to integrate them into a cohesive system.

## The Need for Organizational Identity and Proof-of-Life ID

Advanced digital identity management is a crucial tool in the fight against unlawful communications. As mentioned, current methods rely heavily on network and telephone number identification, such as the STIR/SHAKEN framework.

STIR/SHAKEN authenticates calling numbers and networks, providing a degree of protection against spoofing. However, it does not address the issue of organizational identity or provide direct traceability to the organizations responsible for the calls.

To overcome these limitations, two key areas of focus for next-generation digital identity are:

### ORGANIZATIONAL IDENTITY

This involves establishing a verifiable link between a communication attempt and the organization responsible for it. This enables non-repudiation, meaning that organizations cannot deny their involvement in a call or message. It also provides a mechanism for accountability, allowing for the identification and prosecution of bad actors. Advanced implementations of Organizational Identity could even enable real-time call processing, allowing for the blocking or flagging of suspicious calls based on the identity of the originating organization.

### HUMAN VS. BOT (PROOF-OF-LIFE ID)

This involves determining whether a communication attempt originates from a real human or a synthetic voice (bot). This is a crucial distinction, as "bot-generated" calls and messages are often used for malicious purposes. A Proof-of-Life ID could be used to filter out "bot-generated" communications or to provide users with additional context about the nature of the communication.

The implementation of organizational ID would likely involve assigning a unique ID to each organization and mapping it to their associated TNs. This data would be shared between telecom service providers, initially on a non-real-time basis for post-call analysis and accountability. Eventually, real-time sharing could enable more proactive call processing and reduce false positives in analytics engines.

The benefits of organizational ID are numerous:

**Traceability and Accountability:** Linking calls to specific organizations ensures that bad actors can be identified and held accountable.

**Enhanced Trust:** Consumers can have greater confidence in calls from verified organizations.

**Improved Analytics:** Real-time organizational ID data can improve the accuracy of analytics engines, reducing false positives and negatives in spam detection.

**Support for Branded Calling:** Organizational ID is a crucial foundation for branded calling, which provides a richer and more trustworthy caller ID experience.

## Verification and KYC Integration for Enhanced Trust

Reliable authentication and validation are essential for both Organizational Identity and Proof-of-Life ID. The use of cryptographically verifiable credentials and blockchain technology is recommended to ensure the integrity and trustworthiness of these digital identities. Additionally, these digital identities should be integrated with Know Your Customer (KYC) onboarding and monitoring practices to further enhance trust and accountability.

Organizations would be required to register their telephone numbers and declare whether they are associated with human or bot activity. KYC monitoring would then be used to verify the accuracy of these claims and identify any false or misleading information. This would help to ensure that organizations are held accountable for their communication practices and that consumers can trust the information they receive.

## UI/UX Considerations for User Transparency

In addition to technical solutions, it is also important to consider the user experience when designing and implementing digital identity systems. UI/UX enhancements should focus on providing users with clear and transparent information about the nature of their communications.

Simple visual cues, such as icons or checkmarks, could be used to indicate whether a call or message is from a human or a bot. This would empower users to make informed decisions about how to engage with different types of communications and help to build trust in legitimate businesses and organizations.

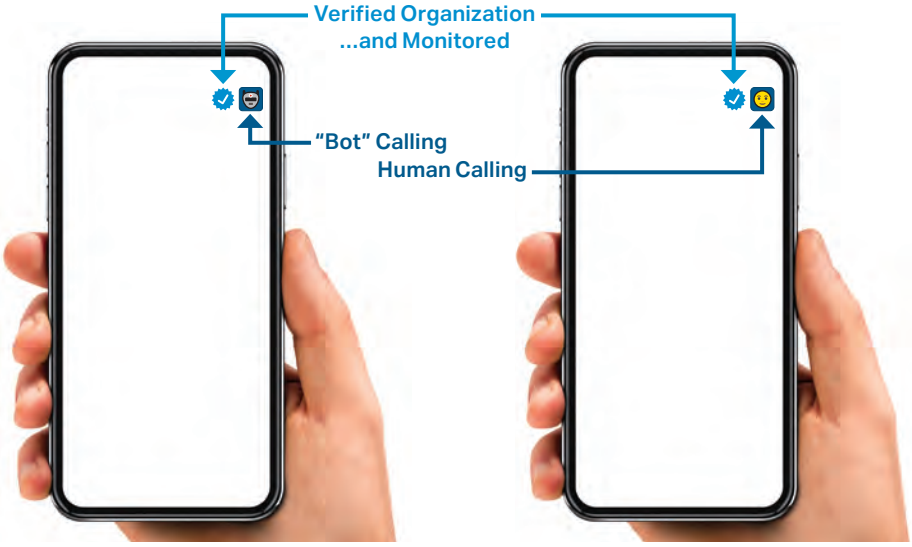


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**FIGURE 1.**

## Organizational Identity and Branded Calling

Branded calling represents a significant step forward in caller ID, providing a more visually appealing and informative display for consumers. This enhanced UI can include the company logo, call reason, and other verified information, increasing consumer trust and engagement (see Figure 1). There is inherent trust in branded calls, as the businesses involved are assumed to be fully vetted, and the calls associated with these businesses are assumed to be authenticated and validated as genuinely from the organization.

However, branded calling and organizational identity may each stand alone as separate means of facilitating trust in B2C contact. For example, non-branded calls, displaying a "Verified Organization" indicator can enhance trust and transparency. This allows organizations to benefit from increased accountability and consumer confidence without the added cost of branded calling.

## Conclusion: A Multi-Faceted Approach to Secure Communications

The escalating threat of robocalls and AI-driven deception demands a multi-faceted approach to secure communications. Advanced digital identity solutions, such as Organizational Identity and Proof-of-Life ID, coupled with robust verification, KYC integration, and user-centric UI/UX design, are crucial for combating unlawful practices and protecting consumers.

Introduction of a cryptographically verifiable organizational ID is a crucial step in establishing a more trustworthy and accountable communication ecosystem. By providing a persistent and reliable identifier for organizations, this new data element will enhance transparency, deter bad actors, and empower consumers to make informed decisions about the calls they answer.

By implementing these measures, the industry can foster a more transparent, accountable, and trustworthy communication environment, empowering users to engage with confidence and mitigate the risks associated with malicious actors. ■

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# TIA-942-C Data Center Standard Brings a Host of Changes and Updates

BY PATRICK McLAUGHLIN

This article originally appeared in *Cabling Installation & Maintenance* magazine, a sister publication.

The years-long undertaking to revise the Telecommunications Industry Association's TIA-942 telecommunications infrastructure standard for data centers culminated in the publication of ANSI/TIA-942-C in May 2024. In September, the TIA's Fiber Optics Tech Consortium hosted a webinar featuring three of the primary contributors to the revision process that brought about 942-C:

- Jonathan Jew, Principal, J&M Consultants—Editor of ANSI/TIA-942-C, Secretary, TR-42, Vice-Chair, TR-42.3
- David Kozischek, Manager Enterprise Networks, Corning Optical Communications—Chair, TR-42.12
- Jacques Fluet, Director, Data Center Program, TIA

This article is a summary of information these three provided and points they made in the webinar. The hour-long webinar can be viewed in its entirety at tiafotc.org/event/tia-942-c-data-center-standard-whats-new. And you can purchase the ANSI/TIA-942-C standard at store.accuristech.com/tia/standards/tia-ansi-tia-942-c?product_id=2902413.

## Edge Data Centers

Between the time the "B" and "C" revisions of TIA-942 were published, the TIA published Amendment 1 to 942-B, which covered edge data centers. That amendment was incorporated into the C revision. Furthermore, language within the C revision defines and classifies a micro edge data center (µEDC).

"A micro edge data center is a small data center in a premanufactured enclosure that is capable of being remotely monitored and located at the network edge," Jew said. The creators of the 942-C revision took care to differentiate a µEDC from a small data center that is close to the user; TIA-942-C defines a rating system for

the classification of µEDCs that provides requirements and recommendations for Type A and Type B.

A Type A µEDC is part of a network of µEDCs. "If this micro edge data center failed, others in the network could take over its function," Jew explained. "Type B is the type you may find in a retail store, for example, that relies on a combination of measures internal to the micro edge data center to keep it running," he added.

In that sense, a Type B µEDC is more robust than a Type A µEDC.

"There are quite a few use cases for edge data centers, which have been around for a while," Jew continued. "They are supporting remote offices, stores, factories. If you package [this type of a data center] in an enclosed system, we have named it a micro edge data center" in the 942-C standard.

One change made within 942-C lowers the minimum floor loading for computer rooms that are less than 20 square meters (220 square feet). That minimum loading is 5 kPA (100 lb/ft2). The experts pointed out that floor loading requirements should always be confirmed by a structural engineer, but also noted that previous requirements were unnecessarily stringent for the smallest edge data centers.

## Thermal Guidelines from ASHRAE

TIA-942-C includes language that originated from ASHRAE, the association that advances heating, ventilation, air-conditioning and refrigeration (HVACR) system design and construction. The guidelines and requirements adopted from ASHRAE apply to edge data centers and other facilities. Jew pointed out, "ASHRAE recommended we look at their technical bulletin 'Edge Computing: Considerations for Reliable Operation.'" The thermal-management guidelines contained in this bulletin, intended to help data center operators control temperatures within their facilities, include procedures like "putting a tent over the edge data center, so when you open the door, the hot air from the outside doesn't get inside the data center," Jew explained.

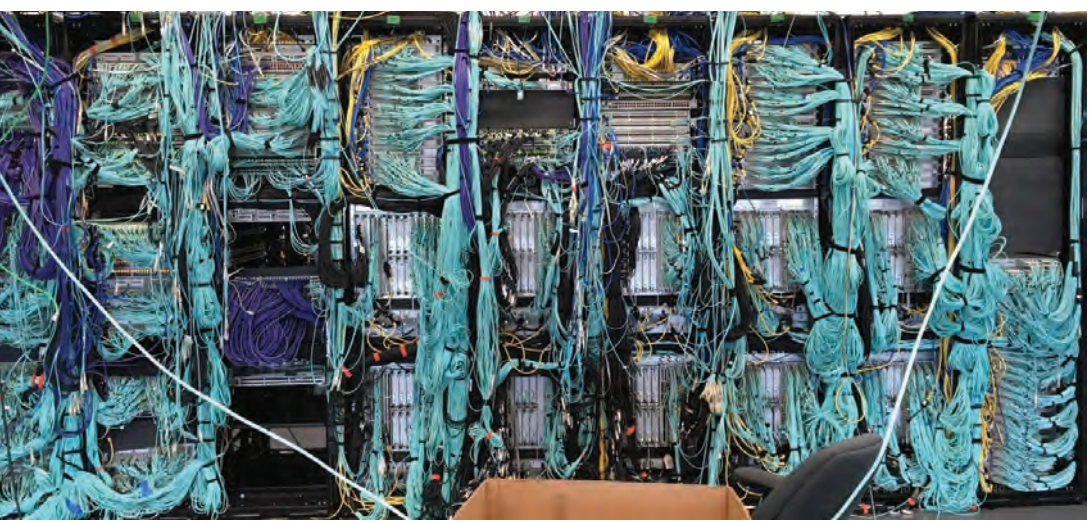
TIA-942-C incorporates significant content from ASHRAE documents, including a requirement to comply with what is known as ASHRAE's "recommended envelope." ASHRAE's TC 9.9 Thermal Guidelines for Data Processing Environments includes a recommended temperature and humidity envelope for different building classes. Complying with ASHRAE's recommended temperature and humidity envelopes for classes A1, A2, A3, and A4 is a requirement of 942-C. Additionally, 942-C requires temperature and humidity for high-density air-cooled ICT equipment to meet ASHRAE's recommended ranges for class H1.

"Operating outside these ranges is permitted for rooms that don't support air-cooled equipment or only support equipment designed to operate outside the envelope, and any negative impacts of operating outside the envelope are determined and mitigated," the TIA's experts explained in the webinar.

## Cabinets, Cabling, and Congestion

The practical reality of high-density cabling, and high-fiber-count cabling that is prominent in many data centers is addressed in several parts of 942-C. One is the new requirement that in distributors (main distribution area, intermediate distribution area, horizontal distribution area), cabinets must be a minimum of 800 mm (~31.5 inches) in width. The 800-mm-mininum-width requirement is also found in standards published by BICSI, CENELEC, and ISO/IEC. By comparison and also as a practical consideration, the individual tiles within a tile floor on which these cabinets typically stand are 600 mm (~24 inches) in width. "In an MDA or IDA, you would quickly run out of space for patching," with a cabinet narrower than 800 mm, Jew said.

Kozischek added that in some of his data center clients' facilities, "We're seeing 32-inch minimum" requirements for cabinet width. "Everybody wants more density in cables, connectors, and hardware." Without sufficiently wide cabinets in which to patch these dense connections, neatness is impractical in the workspace. The nearby image was taken from the TIA webinar, and was captured in a data center that uses 24-inch-wide cabinets. "With 24-inch racks, you end up with optical cables sitting on the floor," Jew emphasized. "They are easy to step on. Or with cabinets, the door will not close. It's difficult to manage."



Shown here is a distributor in a data center, with 24-inch (600-mm)-wide cabinets. Patching in such congested spaces is impractical. The ANSI/TIA-942-C standard requires cabinets within distributors (main distribution areas, intermediate distribution areas, horizontal distribution areas) to be a minimum of 800-mm wide. Telecommunications Industry Association

A change in the standard's required connector-interface type also affects the distributor areas (MDA, IDA, HDA) as well as the entrance facility/carrier room. The previous version of the standard required the use of the LC and/

or MPO connectors in these areas; that requirement has been removed, which allows for use of very small form factor (VSFF) connectors in those spaces. In 942-C, the equipment outlet (EO) is the only space where the LC and/or MPO are required.

"We really need these [VSFF] high-density connectors for AI," Jew commented. In an AI network, "each server node includes a considerable amount of kilowatts [approximately 10 to 12]," he explained. "So, in cabinets where you have only 10, 20, or 30 kw, you'll have empty spaces and be OK. But in networking areas, you likely need these VSFF connectors. "400G is the base speed for AI," Jew explained. "In 2025, it will be 800G. And in 2026, we'll have 1.6 Terabit, which uses 16 fibers … I was working on a design to connect two AI clusters in two different rooms, and I counted that I needed in the neighborhood of 70,000 or 80,000 fibers between the two rooms." This massive presence of connected fibers make VSFF connectors, as well as smaller-diameter cables, necessary and invaluable elements in AI networking.

"We have moved past tens of fibers or even hundreds of fibers per connection," Kozischek added. "We are in the thousands of fibers per connection. And it will be millions." TIA-942-C also includes a recommendation for a minimum of 2 fibers for horizontal backbone cabling. While single-fiber backbones can be found in video applications and passive optical networks (PON), nearly every other network type includes a 2-fiber backbone minimum. Most data centers, Jew and Kozischeck pointed out, use fibers in multiples of 4 (4, 8, 16) in their backbones.

Copper cabling also has a place in the 942-C standard, just as it has a place in many data centers, even including high-speed, high-density facilities. 942-C recognizes single-pair cabling as a transmission medium. "For IoT, single pair is a great alternative," Jew opined during the webinar. "It allows you to power and deliver signal over a single pair of wires. In data centers, it can be used for sensors and control and security applications." There are two categories of single-pair cabling, he also pointed out—SP1-400, which reaches distances up to 400 meters and allows up to 5 intermediate connections; and SP1-1000, which reaches up to 1 kilometer and allows up to 10 intermediate connections.

942-C also recognizes broadband coaxial cable as a medium. 75-ohm cables, typically Series 6 and 11 coaxial cable, are most often terminated to F-type connectors. Jew observed, "I still work in data centers that use broadband coaxial cable. Some is used for antennas. We also use these cable types to support broadband video distribution."

Another copper-cabling-related requirement in TIA-942-C is to use a minimum of 2 Category 6A cables—primarily for the purpose of supporting latest-generation Wi-Fi technologies that transmit at multiple-dozens-of-gigabits per second.

## Direct-Attach Versus Structured Cabling

A question from an attendee sparked a discussion about the use of direct-attach cabling versus structured cabling in modern and next-generation networks, particularly including those supporting AI. The experts had plenty to say.

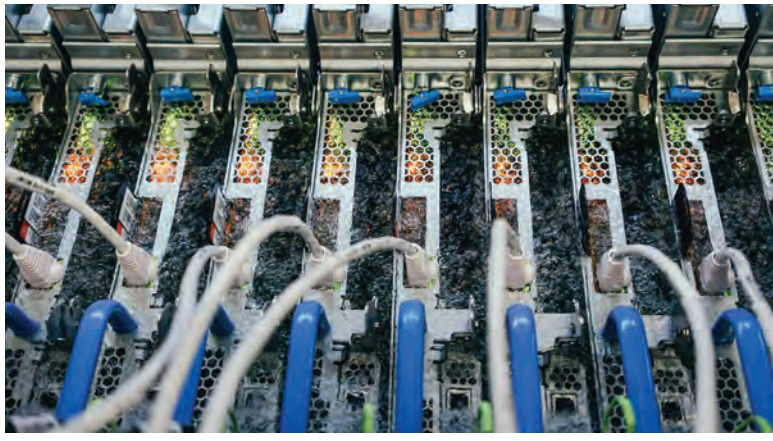
"TIA-942 says you should only use direct-attach cabling between equipment in the same cabinet or in adjacent cabinets," Jew explained. "Some people use AOCs [active optical cables] and DACs [direct attach cables] within a row for AI connections within a pod [such as for a] GPU node and leaf switch. If the spine switches in the same row are close by, you probably are OK. But once you get past that row you really need to be using structured cabling because of the problem with tray capacity," referring to the lack of capacity within trays for all the direct-attach cables that would be needed to serve these connections.

Kozischek added that in a relatively small data center, "direct connect is popular. But in a large data center, even going from one hall to another, you need structured cabling." Jew provided more insight: "In the designs we're working on, we're using direct connects between the GPU nodes and the leaf switches, then all the other cabling—from leafs to spines and spines to superspines—we're using structured cabling partly because of the cable tray capacity and partly because we're in this transition period between using 400G [8 fibers] and 800G or 1.6T, which use 2 MPOs. This allows us to use the same structured cabling to upgrade the speed rather than ripping out the DACs when I upgrade. If you're looking long-term and any size in terms of your deployment, you're going to need to use structured cabling."

## Site Selection, Cooling, and Power

Since its initial publication, the TIA-942 standard series has ambitiously covered data center-related topics and considerations beyond the facilities' telecommunications cabling systems—addressing the reality that data centers are interdependent ecosystems and one aspect or system affects the operations of others. In that vein, site selection, cooling, and power considerations are addressed in TIA-942-C.

About site selection, the TIA's Fluet noted that risk analysis and mitigation are now necessary parts of the selection process. "The industry is finding out that looking at a 5-year flood zone is no longer valid," he stated as one example. "A data center has to be able to be put anywhere—in an airport, near roads to control



Shown here is a liquid cooling process taking place within a Microsoft data center. Microsoft

traffic." These types of locations cannot be avoided, as they likely were in the past. The practical reality of edge and micro-edge data centers being placed as physically close to users as possible, has forced a rethinking of site selection, and TIA-942-C's language reflects the new reality.

The new revision's approach to cooling also differs from previous versions', Fluet noted. "We previously referred to AC or HVAC. Now it's heat-removal, including direct-to-chip cooling and immersion cooling. We made sure the standard's requirements take into account various methods of cooling.

"We're starting to see newer versions of GPUs coming by the default with liquid cooling," Fluet further explained."

References to standby power systems also have been revised in 942-C. "Diesel generators have been tradition, but we're seeing more gas generators now," Fluet said. "Some other technologies are also in trial, including battery energy storage systems. Batteries are improving; so are fuel cells, including hydrogen fuel cells. We adapted the standard to make sure our requirements apply to whatever you are using for standby power."

Furthermore, Fluet explained, the standard acknowledges and addresses the fact that some data center operators are generating their own power. "We're used to seeing this in the Midwestern U.S. and in other parts of the world, where there are huge solar power plants." Nuclear is another energy source to be recognized, he said. Some small and medium reactors put out 20 to 50 Megawatts. "We need to make sure we don't prevent [these technologies from being implemented] as long as resiliency and redundancy are there," he concluded.

## Tables and Rating Levels

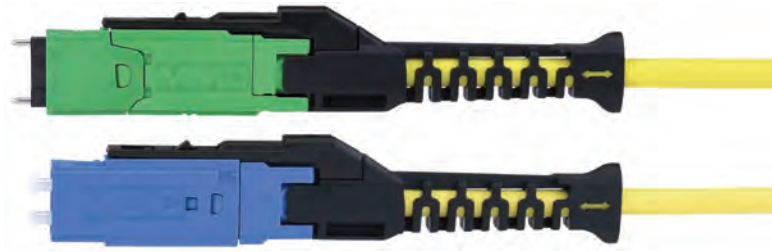
Jew pointed out the significance of updates that were made to several tables that appear at the end of the standard. Among those changes are that "Yes/No" language has been replaced with "Required/Not Required"; fire resistance is now the same for all walls, ceilings, and roofs; seismic requirements have been simplified to align with International Building Code and telecommunications-rack requirements; security access control and monitoring has been clarified; lights-out data centers are now allowed for; and several changes to UPS and battery system requirements, including clarification of monitoring requirements, room separation, and battery room safety.

"We spent a lot of time on the UPS and battery points," he recalled. "There was a lot of debate. These tables are meant to make the ratings a lot more streamlined and usable. We are TIA [in which the "T" stands for "telecommunications"] but we have a lot of people with expertise in electrical and mechanical systems because they design data centers for a living."

The rating systems Jew referred to comprises 4 levels:

- Rated 1: Basic
- Rated 2: Redundance components
- Rated 3: Concurrently available
- Rated 4: Fault tolerant

Data center facilities can earn a rating from TIA. Kozischek explained, "TIA's rating system is important for users. We have many experts who certify data centers for a living. If you wanted to be a Rated 3 data center, you can go to this section [of the 942-C standard]. Instead of having a lot of Yes/No's, it will guide you to help you pass the audit. This is a very good change in 942-C."



The MMC (top) and MDC (bottom) from US Conec are examples of VSFF—very-small-form-factor—connectors. The TIA-942-C standard eliminates the requirement for only LC or MPO connectors to be used in distributor areas, which opens the door for the use of VSFF connectors in these spaces. US Conec

Jew emphasized the value of these rating systems by pointing to financial institutions—explaining that the TIA rating system is one of just a few that financial institutions will recognize and accept for their facilities.

## Always a Work in Progress

The development and revision of industry standards is a perpetual work in progress. While several years passed between the publication of the "B" version and the "C" version of TIA-942, efforts toward adding to or refining the document never ceased. That remains the case. Jew pointed out that representatives of TIA TR-42 "are working on a white paper with the idea that it may become an addendum," while also pointing out, "ASHRAE is developing standards for immersion cooling."

Fluet noted that the Open Compute Project (OCP) also is currently working to establish how to connect servers to liquid, and how to design a server that is going to be connected to liquid. "All of this is going to be important," he said.

Jew added, "Our part will be: how will the structured cabling interface? Connectors that we deal with, the impact of immersion cooling liquids on cable jackets and cable performance … if you have an optical fiber connector with an air gap, liquid will get in there."

Kozischeck noted, "You will need sealed connectors, because it will be immersed in something. There are many unknowns."

You can watch Fluet, Jew, and Kozischek's complete presentation online at tiaonline.org/event/webinar-tia-942-c-data-center-standard-whats-new.

We at *Cabling Installation & Maintenance* will continue to track standards-development activities and report them to you. ■

**Patrick McLaughlin** is Chief Editor, Cabling Installation & Maintenance. For more information, email pmclaughlin@endeavorb2b.com or visit www.cablinginstall.com.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# FTTH Solutions for Rural Areas

BY VLADIMIR GROZDANOVIC

This article originally appeared in *Cabling Installation & Maintenance* magazine, a sister publication.

Generally, FTTH passive optical network(s) (PON) are built to a length of up to 20 km. Optical fibers are split using symmetrical splitters (32, 64, or 128 splits), with one, two, or rarely three levels of splitting. Networks are constructed either underground (preferred) or above ground (common in countries with weaker economies), using standard fiber connection methods—fusion splicing or pre-connectorized solutions, typically applied only in the final segment (drop segment). However, these are standard solutions for urban and suburban areas.

What are the possible FTTH PON solutions for rural areas?

## Standard Construction Method

Operators rarely build FTTH PON networks extending beyond 20 km using standard symmetrical splitters with one or two splitting levels. In such cases, they are limited by the optical budget and must reduce the number of fiber splits to 16 (e.g., first splitter 1:2, then the last splitter 1:8) or 8 (e.g., first splitter 1:2, then the last splitter 1:4). They often operate at the limits of the optical budget, which can later result in problems that are extremely difficult to resolve.

Additionally, feeder cables with a higher number of fibers are required due to the lower level of fiber splitting. In some cases, this requires the installation of new cables

or the reconstruction of the network (e.g., when CATV companies switch from 2 fibers to 1 fiber for optical nodes), which can pose a significant challenge.

However, due to the mentioned issues, most telecommunications companies avoid building standard FTTH PON networks. Instead, they choose remote optical line terminal (OLT) solutions and/or utilize asymmetric splitters or taps in combination with standard optical splitters. In addition, pre-connectorized solutions are being introduced.

## Remote Optical Line Terminal (OLT)

Telecommunications companies predominantly prefer this solution. The existing or newly installed feeder cable is routed to the rural area where the network will be deployed. The cable can be laid either underground or above ground, utilizing various installation techniques. The number of fibers in the feeder cable can be significantly lower than in standard feeder cables. Generally, a cable containing 12, 24, or at most 48 fibers is sufficient, allowing for the connection of several mini OLTs, with additional fiber capacity reserved.

A mini OLT can be either an outdoor OLT or an indoor device with a suitable cabinet. Both outdoor OLTs and indoor OLT cabinets must provide high protection against water and moisture, typically rated IP68. Additionally, OLTs require a stable power supply, backup batteries or UPS (to ensure a minimum of 8 hours of operation without standard power), proper grounding, ventilation, etc. (see Figure 1).

The use of Uninterruptible Power Supply (UPS) units or batteries requires regular performance checks. Additionally, a constant power supply, whether from permanent or mobile generators, is essential. Ensuring the physical protection of this equipment remains an ongoing challenge, with various solutions being implemented, such as the installation of cameras, alarms, secure physical spaces, and other similar measures.

Mini OLTs typically have 4, 8, or a maximum of 16 PON ports. Most commonly, they support Gigabit Passive Optical Network (GPON), XG(S)-PON, or even both GPON and XG(S)-PON standards simultaneously. This allows for the construction of a standard FTTH PON network, enabling the development of a network up to 20 km long with symmetrical optical splitters, typically divided up to 128 fibers across 2 or 3 splitting levels.

## What is the New Challenge?

We are limited by the small number of PON ports, and the irregular, scattered arrangement of houses makes traditional construction with symmetric splitters an inefficient solution. For this reason, asymmetric splitters or taps are introduced and used in combination with symmetric splitters (cascade solution).

**FIGURE 2.** Examples of pre-connectorized solutions.

**FIGURE 1.** An example of a remote OLT.

## Using Solution With Taps and Symmetrical Splitters

This solution enables optimal FTTH PON construction in rural areas. In the first level of splitting, an asymmetric splitter is used, typically with a 30/70 ratio, followed by a symmetrical splitter in the second and usually final level of splitting, typically 1:8. These splitters send 70% of the power further along the optical line, while 30% of the optical power is sent to a symmetrical splitter for subscriber connection. The use of taps significantly reduces the number of required cables and fibers.

## Pre-Connectorized Solutions

Pre-connectorized solutions (see Figure 2) have become increasingly popular, particularly for the drop segment, and in recent years, they have also been adopted for other segments of the PON network (ODN gen. 2). Today, it is possible to build an entire network without the need for fusion splicing. Typically, cables with a small number of fibers are used.

Feeder cables usually contain a maximum of 12 fibers with MPO/MTP connectors, distribution cables have 1 or 2 fibers with SC/APC connectors, and drop cables contain 1 fiber with SC/APC connectors. All connectors are designed to protect against water and moisture penetration, typically with an IP68 rating.

In addition to pre-connectorized cables, specially designed optical distribution boxes are used, which do not require opening but only the physical connection of connectors. Thanks to this solution, network construction time is significantly reduced, and reliability is improved, as there is no need for fusion splicing or opening distribution boxes. Furthermore, maintaining such a network does not require trained personnel or expensive tools for processing and fusion splicing.

> "Today, it is possible to build an entire network without the need for fusion splicing."

## Conclusion

The use of mini OLTs with pre-connectorized cables and specially designed enclosures featuring both asymmetric and symmetric splitters enables optimal network construction in rural areas. This approach results in a high-quality, reliable network that allows for easy subscriber connections and simple maintenance. ■

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# Preparing for the Fiber Workforce Shortage: Your Key to BEAD Success

Tips for entering the uncertain BEAD era with a robust and capable workforce, despite the challenges.

BY ASHLEE STOEPPLER

The BEAD initiative is set to bridge the digital divide, bringing high-speed broadband to unserved and underserved communities. *But there's a catch!* The ambitious plan to get every American connected to fiber by 2030 will likely lead to a significant workforce shortage in the telecom industry.

The BEAD program is expected to create 150,000+ jobs over the next 5+ years. That's a lot of opportunity. But here's the thing, the telecom workforce has been shrinking due to reasons like pressure to increase wages and a lot of industry vets retiring.

So, how do we ensure we have enough skilled workers to make this vision a reality?

Here are some practical strategies for companies of all sizes to prepare for the skilled workforce needed to meet the demands of the BEAD initiative.

## Launch Apprenticeships/Internships

Hands-on experience is invaluable. We've all heard the saying, "Teach a person to fish..." Well, in this case, teaching someone to install fiber can make a huge difference and turn into a great career path.

You not only attract fresh talent but also give them practical knowledge that classroom training just can't provide. Plus, you're helping to build a future-ready workforce from the ground up.

## Connect With Local Communities About Job Opportunities

Don't underestimate the power of community. By tapping into local networks, community centers, schools and local social media groups, you can spread the word about job opportunities in broadband deployment.

You can also encourage your local colleges to add a fiber optics training program, helping to build a pipeline of skilled workers. At TekCom Resources, our leadership team has heard from industry events like Fiber Connect and others that some companies are engaging high school students early to try to capture their attention with an exciting career in telecom. When communities feel invested, they're more likely to support and sustain the broadband infrastructure long-term, creating a win-win situation for everyone involved.

> **"...the telecom workforce has been shrinking due to reasons like pressure to increase wages and a lot of industry vets retiring."**

By taking proactive steps to address the potential workforce shortage, we can ensure the BEAD initiative achieves its goal of connecting every American to high-speed broadband by 2030. This means fostering partnerships with educational institutions, investing in specialized training programs and leveraging the expertise of telecom staffing firms.

Together, we can build a resilient and skilled workforce that not only meets the current demand but also paves the way for future innovations in broadband technology that will strengthen our digital infrastructure for generations to come.

## Partner With Telecom Staffing Experts

Finding a company that specializes in telecom and understands how to bridge the gap between talent demand and supply can make all the difference in your company's success. When you need specialized talent fast, the right staffing partner is your secret weapon. That's where TekCom Resources comes in.

As a woman-owned, full-service national telecom recruiting firm, we're a go-to resource for telecom staffing solutions. Partnering with TekCom Resources means you'll have access to top-notch telecom professionals who can hit the ground running, keeping your BEAD projects on track. ■

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