

# ISE

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& EDUCATION

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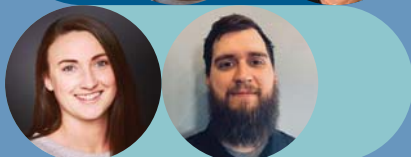
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“According to an IBM study,  
95% of cybersecurity breaches  
are caused by human error.”

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### **VP, Group Publisher**

Janice Oliva  
[joliva@endeavorb2b.com](mailto:joliva@endeavorb2b.com)

### **Editorial Director**

Sharon Vollman  
[svollman@isemag.com](mailto:svollman@isemag.com)

### **Managing Editor**

Lisa Weimer  
[lweimer@isemag.com](mailto:lweimer@isemag.com)

### **Art Director**

Meg Fuschetti

### **Multimedia Account Executives**

Robin Queenan  
[rqueenan@endeavorb2b.com](mailto:rqueenan@endeavorb2b.com)

Kristine Collins  
[kcollins@endeavorb2b.com](mailto:kcollins@endeavorb2b.com)

### **Production Manager**

Brenda Wiley  
[bwiley@endeavorb2b.com](mailto:bwiley@endeavorb2b.com)

### **Ad Services Manager**

Melissa Meng  
[mmeng@endeavorb2b.com](mailto:mmeng@endeavorb2b.com)

### **Circulation Manager**

Laura Moulton  
[circulation@isemag.com](mailto:circulation@isemag.com)



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# AI Displacing You Yet?

**CHATGPT AND AI ARE** already changing the world. From November 2022 to February 2023, ChatGPT gained 100 million users. As of March 2023, the website has 1 billion visitors per month.

Many are wondering whether AI will displace them.

So, I asked ChatGPT how many workers it expects to replace by 2030. It answered with this: "McKinsey Global Institute says up to 375 million workers, or roughly 14% of the global workforce, may need to switch occupations or acquire new skills by 2030 due to automation and AI."

SharonAI promptly double-checked this and found McKinsey shared that in 2018. So, we'll give ChatGPT a bye due to its transparency about being not-so-current. Still, let's remember:

- AI is not intelligence—it is prediction.
- AI can only work with inputted data.
- AI can still only do one task very well at a time (for the most part).
- AI lacks emotional intelligence.
- AI needs to be fact-checked.
- AI can hallucinate.
- AI has difficulty with ethics and morality. #yikes

Given those itty-bitty flaws, perhaps we should stop eeyore-ing about AI and thank it for keeping us on our toes. SharonAI humbly suggests turning your AI-frustration into passion for learning more. Focus on what you can be and be grateful you're not a machine, right?

To help, our very human team encourages you to develop your professional self! Take a gander at the 38 educational offerings (page 24) presented by people for people at ISE EXPO 2023 ([www.iseexpo.com](http://www.iseexpo.com)). Then, register, attend and connect with knowledge, solutions and your colleagues who want to exchange ideas with you.

ChatGPT and AI will be there as well as tools for you to crush your career goals.

Sharon and SharonAI can't wait to meet them and you there.

*Sharon*

## SOURCES

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*This article was written with the assistance of artificial intelligence.*



Sharon Vollman

[svollman@isemag.com](mailto:svollman@isemag.com)

Follow Sharon on Twitter and LinkedIn for further conversation and insights.

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# Can Our Industry Develop Fiber Talent?

## It Takes More Than You Think

**RECENTLY, THE SHORTAGE** in the fiber optic workforce has gained national attention because the billions of dollars of federal spending for infrastructure and broadband will create an even worse shortage of competent fiber optic techs.

As the state broadband agencies try to understand how to take part in these federal funding programs, they are learning how big a problem the shortage of fiber optic techs really is. Late last year, the FOA was contacted by a state agency which was starting a fiber optic middle mile project asking if the FOA could help get more contractors to bid on this large project. We contacted some contractors and were told that they were completely booked up and did not have workers to bid on any new jobs.

### Training – The Right Way

The FOA is now working with state workforce development agencies to help them create programs that can

train enough techs to meet their demand. We begin by telling them this story about Kentucky Wired to show how it can work.

Kentucky decided to build their own statewide fiber optic network, Kentucky Wired, to connect all 95 counties, many of which had no modern telecom infrastructure because no telecom company was interested. You know all the arguments about building infrastructure in rural and low-income areas, right?

Kentucky state officials hired contractors who then needed local workers. The FOA was asked if we could help because we already had a trainer offering classes in Kentucky. They asked how many FOA certified fiber optic techs lived in Kentucky. We searched our database and told them two. That's right two. That wasn't going to help very much.

But the FOA had a useful contact. One of the schools that was part of the Kentucky Community and Technical Colleges System (KCTCS) was FOA



**JIM HAYES**

Web [www.jimhayes.com](http://www.jimhayes.com)

Email [jeh@jimhayes.com](mailto:jeh@jimhayes.com)

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approved for years and the instructor, Tom Collins, was a FOA Director. We brought him into the conversation.

Everyone agreed that it was necessary for Kentucky to set up a program to develop their own workforce, but it was necessary to ensure all parties were on the same wavelength. With everyone's cooperation, FOA flew to Kentucky to run a meeting of all the parties involved, including the state agency overseeing the project, the contractors tasked with building the network, and representatives from all the KCTCS locations. (See Figure 1.)

The agenda for the meeting was simple—tell everyone about your needs. The state agency reviewed the plans for Kentucky Wired and the contractors made presentations about their needs for the workforce. The contractors all talked about what kinds of workers they wanted: workers who showed up every day, were not afraid of work, would take direction, wanted to learn a skilled trade, etc. Interestingly, competency as fiber techs was not on top of their list because they understood that these workers would learn by OJT (on-the-job-training), and workers who had completed a basic fiber course for FOA certification would be well prepared.



**FIGURE 1.** Kentucky Wired Workforce Summit held by the FOA.

# The Maine Thing

In Q1 2023, The Maine Connectivity Authority (MCA) hired Camoin Associates and its partner, Thomas P. Miller and Associates, to assess Maine's broadband workforce in order to:

- Determine which occupations will be most critical for deploying broadband across the state.
- Gauge the scale of any workforce shortages.
- Craft strategies for how MCA should address employer needs and address barriers experienced by potential workers.

What they found was quite interesting. According to the report, Maine is projected to have an average shortfall of 3,240 – 4,531 workers in the top broadband occupations across the economy if the state receives incremental broadband investments in the range of \$100 million – \$350 million respectively.

While there are several training programs across the state for the more general Top Broadband Occupations, there are only a handful of training programs in existence for specialized fiber optics training. Two com-

munity college-based pilot programs are Washington County Community College and Central Maine Community College. Currently, there are two private training providers in the area: Canyon Networks and Fiber Insight.

The comments in the *Maine Broadband Workforce Strategy* reflect what we heard in Kentucky and have heard in many other areas. Training in broadband and fiber optics needs to be more widely available, more inclusive and tailored to the needs of employers.

In addition, workforce development is a community effort. You need the cooperation of government, schools, employers, teachers and trainers, plus all must understand the needs of each group and the need to cooperate to build a competent workforce.

The *Maine Broadband Workforce Strategy* is available for download at <https://www.maineconnectivity.org/workforce>. You should start on page 30 before going back to the beginning and reading it all. (See Figure 2.)

## Excerpts from Interviews with Employers

Formal classroom instruction is complicated by the fact that these workers don't want to be in a classroom. Entry-level workers need a baseline of theory, but the focus should be on hands-on learning and practical and soft skills. Training must be customized to Maine and to the workers we are trying to reach.

Fiber optics is THE communications platform. It is ubiquitous. Anybody being trained in Science, Engineering, or Communications needs to understand fiber. Fiber optics should be a basic skill used and understood by a broad swathe of the workforce.

The existing workforce system is very difficult to navigate. There is a need for someone to organize all of the programs in a central source so that employers can easily access assistance.

The only thing limiting our growth is the workforce shortage. We need to expand our view of workforce to include women, minorities, and reentry workers.

Inclusivity is a major problem across the trades. There should be no reason women or minorities don't enter these jobs, but the culture can be exclusionary.

There are very few training opportunities, so most workers receive on-the-job training. It's a major investment in terms of time and money, just to have that employee quit a few months later.

Career awareness is crucial. The general population does not know or understand broadband, including tangential industries (power, solar, electric).

Workforce retention is a major pain point. Feeder programs from K-12 schools, adult education, and community colleges are needed.

Workforce shortages across the board, from entry-level workers in customer service and flagging to engineers and managers. Broadband jobs offer good opportunities in terms of pay and advancement, but experienced workers are aging out and there's a lot of competition for labor.

Barriers to employment include lack of soft skills, childcare, transportation, healthcare, and affordable housing.

**FIGURE 2.** *Maine Broadband Workforce Strategy* report, page 30.  
(Courtesy of [www.maineconnectivity.org/workforce](https://www.maineconnectivity.org/workforce))

KCTCS officials talked about their state-wide network of schools and how the FOA program had been very successful at one location already. The FOA followed to explain our role in helping schools get started, providing curriculum, assistance in setting up facilities including hands-on labs, tutoring instructors, and providing certifications to their students. And we answered a lot of questions.

Everyone agreed on creating a network of schools and making funding available to start the programs as soon as possible.

Kentucky Wired finished connecting all 95 counties with fiber in late 2022. During that time, nine schools in the KCTCS system (located around the state) trained and certified 1,200 CFOT®s (FOA Certified Fiber Optic technicians). These techs worked for the contractors, continued learning by OJT, and helped make Kentucky Wired a

reality. Many of these CFOTs were re-trained from other low-income jobs, including laid-off coal miners—the ideal outcome of a workforce development program.

Now that all 95 Kentucky counties are connected to the backbone, it's the responsibility of the local counties to build-out connectivity to their citizens and businesses. Thanks to the cooperation between the state agencies, KCTCS, and the contractors, there is now an experienced local workforce around the state trained and certified in fiber optics ready and able to build out the local networks.

That's what workforce development is all about, isn't it—training and/or retraining workers for available well-paying jobs?

The lesson here is that success depends on cooperation. No state broadband or workforce agency, no school or training organization, no

contractor, nor any other organization can make it happen alone. They must work together and build on each of their strengths to make their programs a success.

We recently told this story to the workforce group the FOA is helping in the state of Maine. They had hired outside consultants, Camoin Associates, to create the *Maine Broadband Workforce Strategy* report ([www.maineconnectivity.org/workforce](http://www.maineconnectivity.org/workforce)). It's important to note the scale of need along with the job titles that are missing from Maine's workforce. The page of quotes from employers they interviewed is noteworthy as well. Read the sidebar, "The Maine Thing", for insights other states and broadband providers should focus on during this historic time—fiber investment is right around the corner. ■

**Jim Hayes** is a VDV writer, trainer, and the President of The Fiber Optic Association.

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# EXECUTIVE INSIGHTS WITH ISE EXPO'S TECHTALK PRESENTERS

## Their Perspectives Can Help Supercharge Your Career

BY SHARON VOLLMAN

These leaders walk in your shoes and have the scars to show it. From field fiber frenzies to trouble tickets that could have been prevented—they get you! These doers have distilled their years of experiences into network evolution wisdom that will help your team perform better and your reputation rise.



BRIAN BOND

CHARLIE CANO



Bond and colleagues explain the network transformation at Brightspeed's leadership conference.

### Brian Bond

Chief Operations Support & Innovation, Brightspeed

#### TOPIC: Your Tech Talk Topic and Title

**ISE:** Share the title of your Tech Talk and what attendees will learn to inspire network evolution greatness!

**Bond:** Brightspeed is transforming its network by upgrading its transport, metro, voice, access, and in-home network. Learn how our innovative approach could help your network efforts because it leverages a fully software-defined solution that includes digital twin capabilities and offers true real-time, end-to-end visibility across the



ASHLEY TRAVERS

JOHN AMUNDSON



entire network. The title of my Tech Talk presentation is “Network Evolution – Reaching Beyond Current Realities”.

#### **TOPIC: Biggest Challenges**

**ISE:** What are two big challenges you and your team face in terms of network evolution/transformation?

**Bond:** At Brightspeed, we are 100% cloud native. One of our first steps has been building the infrastructure that will host and manage our network evolution.

The team has been busy strategizing and architecting an end-to-end orchestration platform to enable management across the legacy and next-generation network elements. We will soon have full visibility and management capabilities across all network segments:

transport, metro, and edge. This will allow us to better serve our customers and expand opportunities for customers who want to self-serve.

One of the biggest challenges has been managing customer demand with the current supply chain constraints. Many of our locations require transport augmentation for our new Consumer and Small Business Brightspeed Fiber and Fiber-to-the-Tower services. Several vendors are still experiencing extremely long lead times, preventing us from delivering services that our customers want. Some vendors have managed this better than others, but the legacy architecture does not allow us to mix and match network equipment, so a backlog with one vendor can impact our entire build.

Another challenge will be moving the legacy fiber inventory systems and customer records into our new systems stack. As part of the acquisition of incumbent local exchange carrier (ILEC) assets and associated operations across 20 states from Lumen Technologies (NYSE: LUMN) by Apollo-managed funds (NYSE: APO), we inherited multiple, outdated systems. To migrate the data, we have to extract it and load it to the new system. It will be a painstaking and time-consuming effort that demands flawless execution. Fortunately, our IT teams are the best in the industry and have the talent required to deliver this migration in record time while ensuring a seamless, unified customer experience.

**“We are constantly looking for opportunities to reduce truck rolls, enable self-install, and create self-help capabilities.”**

—Brian Bond, Chief Operations Support & Innovation, Brightspeed

#### **TOPIC: Worst of Two Evils**

**ISE:** Which is more difficult to handle: supply chain challenges or workforce talent challenges? How should the industry address these challenges that have been a thorn in Broadband Service Providers’ sides for quite some time now?

**Bond:** Supply chain challenges are a larger issue for us because they are generally out of our control. With respect to workforce talent, we have been able to build and grow our teams with talent from across different industries. We have solid bench strength within each of our domains, so even where we need to hire and train new employees, we feel good about our ability to do so.

#### **TOPIC: Operational Realities**

ICT industry analysts and observers often focus on CAPEX budgets. But the reality is that OPEX can make or break the bottom line. The key to controlling OPEX is improving network life cycle management for complex fiber and legacy networks in a cost-efficient manner.

**ISE:** How is your company ensuring the networks it deploys are maintained in an operationally efficient manner?

**Bond:** At Brightspeed, we are being highly strategic in how we invest and innovate for the future. We are constantly looking for opportunities to reduce truck rolls, enable self-install, and create self-help capabilities. This starts with designing and creating a robust network that doesn't require a lot of maintenance. Then we leverage digital and automated solutions for efficient order, activation, monitoring, and troubleshooting capabilities.

We are building our fiber network with new, innovative plug-and-play technologies that allow us to build to our customers and connect them faster than ever. When fiber repairs are needed, this technology enables us to fix it easily and efficiently, with minimal to no splicing required.

### TOPIC: The Future

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

**Bond:** Three technologies excite me the most: cutting-edge pluggable upgrades to scale our optical network, development of an end-to-end orchestration platform, and a customer-friendly plan to evolve Wi-Fi standards from 6e to 7. These three components of our strategy will provide our customers with reliable, fast connections using the latest network and system technology.

First, we are focusing on upgrading our optical network to deliver greater spectrum efficiency and utilization. Newer pluggable technologies will give us the ability to scale beyond 1.2 TB in key strategic markets. Approximately 92% of our Enterprise customers consume services that ride our metro Ethernet network. Many of these customers have an immediate need for greater capacity to the edge. Therefore, in parallel with the optical enhancements, we are also upgrading our metro to a 100G core which will quickly position us to deliver 10G to the edge. In 2024, we will begin transitioning to a solution that will deliver a 400G Core allowing us to offer 100G Ethernet services.

Second, on top of our new robust network, Brightspeed is developing a platform that will allow us to provision and manage these

devices and services end-to-end while creating visibility across our entire network. The new platform will allow us to retire legacy systems and will support both new and legacy equipment. In the Consumer and Small Business space, we are deploying XGS-PON and developing CPE that will enable us to deliver speeds up to 8G synchronously to the consumer. We recognize that most customers don't have an immediate need for these services, but we are investing in the technology that offers even more reliability, capacity, and self-service mechanisms.

Finally, to round out the best customer experience, we are developing an in-home wireless solution that leverages Wi-Fi 6e. We will then transition to Wi-Fi 7 as the technology evolves. We don't want our customers to have to think about using our service—our goal is to provide a superior customer experience that makes staying connected simple and easy.

### TOPIC: Vendor Collaboration

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

**Bond:** Product development from the customer's point of view. Many vendors are still developing products that are designed for technicians to install and troubleshoot, which is extremely costly for service providers. We appreciate vendors with people who are more customer- and operations-focused to assist with developing solutions that help reduce OPEX.

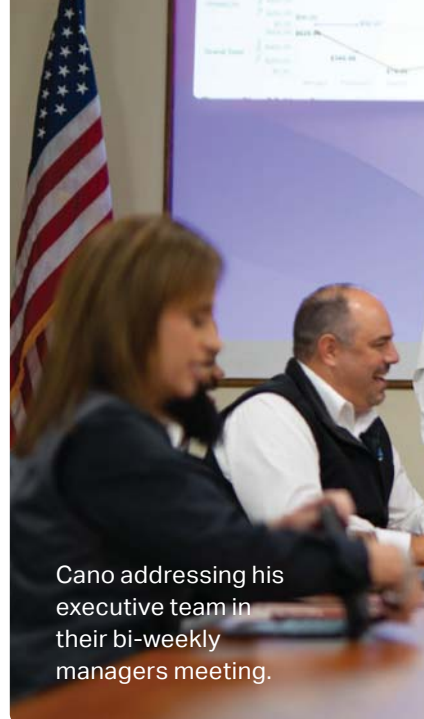
API-first mentality—Brightspeed is building our own cloud-native BSS/OSS stack. We don't necessarily have a need for vendors to bring us flashy user interfaces—we prefer to integrate with them directly via APIs so that we can create a single pane of glass for our agents and technicians, then leverage those same APIs for customer-facing apps.

We need our vendors to solve their supply chain challenges. The vendors that do this will be the ones who win our long-term strategic partnership.

### TOPIC: Drive

**ISE:** What ONE thing motivates you to do what you do each morning? Relationships, money, success, or something else?

**Bond:** I was born and raised in rural America, and bandwidth has always been an issue for folks in my state. Working for Brightspeed is exciting and motivating for me because I know we're making a difference for communities like mine. Every day is an opportunity to close the gap for underserved markets, with access to improved distance learning, remote work, telemedicine, and all the things that people in other areas take for granted. Each day is a chance to improve the quality of life for our customers and communities.



Cano addressing his executive team in their bi-weekly managers meeting.



## Charlie Cano

CEO/General Manager, Etex Telephone Cooperative

### TOPIC: Your Tech Talk Topic and Title

**ISE:** Share the title of your Tech Talk and what attendees will learn to inspire network evolution greatness!

**Cano:** When I look at the state and federal maps, they look nothing like the reality from a boots-on-the-ground perspective. The current maps paint a foggy view of what currently exists in terms of broadband services. Even worse, the maps don't show what customers are experiencing.

Undoubtedly, the maps will evolve a bit due to the challenge period and public feedback. But the lack of detail is disturbing. The problem is being painted in two dimensions: Is that a broadband serviceable location and what is the technology potential? The real problem is multidimensional. Decision makers need to consider what the uptime and dependability of the current network is, will it scale and grow with the usage trends, and what is the trouble response reliability of the provider? Some customers are waiting days and weeks for technicians to resolve their issues. That's frustrating to know that funding decisions will be made with incomplete knowledge and understanding of the networks.

The potential of fiber is life-changing to our customers—those who are trying to better themselves and their families. Alternative solutions don't provide the future-proof symmetrical speeds and network reliability people in rural communities deserve.

My childhood years of farming and ranching gave me a great appreciation for the hard work it takes to survive in ranching and farming. This hard work life

**“When I look at the state and federal broadband maps, they look nothing like the reality from a boots-on-the-ground perspective.”**


—Charlie Cano, CEO/General Manager,  
Etex Telephone Cooperative

is passed down through generations. These hard-working families deserve more than an alternative technology. They deserve the BEST technology.

The title of my Tech Talk presentation is “Multidimensional Challenges of Mapping – Reading Between the Lines to Create a True Broadband Roadmap for the Underserved”. You should attend this talk because you will

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hear the technical truths around this politicized issue.

### TOPIC: Biggest Challenges

**ISE:** What are two big challenges you and your team face in terms of network evolution/transformation?

**Cano:** Talent development is critical. Etex now performs all OSP engineering, permit acquisition, splicing, equipment installation and turn up with internal teams. These teams are involved in the vision and planning from the beginning. Of course, our long-lasting supplier and contractor partnerships are an integral part of our plan. However, the main ingredient that makes this successful is our employees. Having staff who live in the communities we serve establishes the accountability and intimate knowledge of our territory and customers. Our employees take great pride in serving our friends and neighbors.

**Network security must be an industry priority.** Cyberthreats and ransomware continue to increase. Every new connection is a new potential victim to this crime wave. Providers must continue to keep up with software upgrades and added appliances to deploy a trusted network. Additionally, we must work with our communities to provide continued education and support on cybersecurity as part of our digital literacy efforts.

### TOPIC: Operational Realities

ICT industry analysts and observers often focus on CAPEX budgets. But the reality is that OPEX can make or break the bottom line. The key to controlling OPEX is improving network life cycle management for complex fiber and legacy networks in a cost-efficient manner.

**ISE:** How is your company ensuring the networks it deploys are maintained in an operationally efficient manner?

**Cano:** Etex is in the process of adding new 400GB fiber rings to increase capacity and keep pace with customer growing demands. This will reduce network vulnerabilities and increase reliability by segregating network elements. We are also adding a new upstream Internet link to existing dual connections. This will increase stability and enable new peering service offerings.

### TOPIC: Vendor Collaboration

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

**Cano:** I'd boil it down to ONE thing—vendors. They must be sincere about working within your budget. Etex had to find the next-generation fiber and routing solution to address our massive growth. That's easy if you're flush with cash. The trick is finding a solution that has to fit within a flat budget.

### TOPIC: The Elephant in the Room

**ISE:** What is the industry NOT addressing that it should related to network evolution and broadband for all?

**Cano:** Rural providers are deeply invested to close the digital divide in their markets. While politicians are *now* focused on unserved or underserved areas, the small providers have always focused on their rural customers and have delivered better broadband speeds compared to similar areas with low density customer counts.

The second important issue we must double down on is engineering best practices—because in broadband engineering, there's no such thing as being technology neutral. Think about it in terms of best practices for building highways and structures. There is no such thing as being material neutral when building them to last. So, while there is a niche for fixed wireless or satellite solutions for some extremely rural areas, fiber optic facilities must be the priority to build a resilient network for the long-haul.

### TOPIC: Advice

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

**Cano:** Well, being the engineering and math nerd that I am, I actually developed and solved the formula for leadership success.

$$LS = \int_{HD}^R \frac{(P + G^2 + GR)}{RtC}$$

Leadership Success (LS) comes from realizing that the professional focus should be constant from beginning to end—from the day you are hired through retirement. Once hired, three things develop your success.

First, we all graduate with a skill that translates to our work performance. It is what you bring to the table.

Add to that a double dose of grit, which is the fire (your background, challenges, motivators) that inspires you to educate yourself and evolve. Everyone has a story, something that pushes you to overcome obstacles. Grit also represents your potential to grow. We are never done learning.

A significant companion to grit is the golden rule: treating your team members with respect, honor, and integrity. That goes a long way, both at the beginning and end of a career.

$$LS = \int_{Hire\ Date}^{Retirement} \frac{(Performance + Grit^2 + Golden\ Rule)}{Resistance\ to\ Change}$$

Finally, understand that the professional individual you are today will not be the same in the future, and you don't want to be. Do not resist change, for it will decrease your potential for continued success.



## John Amundson

Director of Planning & Implementation, TDS Telecom

### TOPIC: Your Tech Talk Topic and Title

**ISE:** Share the title of your Tech Talk and what attendees will learn to inspire network evolution greatness!

**Amundson:** The title of my Tech Talk presentation is “Creating an Equilibrium Between Speed/Labor/Technology & Cost/Revenue/Profit”. This Tech Talk focuses on how to plan realistically and build lean—don’t make things more complicated than they need to be to reach your goals.

### TOPIC: Worst of Two Evils

**ISE:** Which is more difficult to handle: supply chain challenges or workforce talent challenges? How should the industry address these challenges that have been a thorn in



Amundson reviewing the fiber network design of the market construction that Leah Wisdorf, Manager of OSP Construction, oversees in Wisconsin.

**“Our vendor partners should understand what we are building, and that as we change our designs, change with us.”**

—John Amundson, Director of Planning & Implementation, TDS Telecom

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Broadband Service Providers' sides for quite some time now?

**Amundson:** Workforce is the tougher challenge. Supply chain issues are being solved by the force of the free market and the prevailing tension provided by profit motive. We are turning the corner on supply chain concerns.

Workforce, however, is another issue all together in terms of recruitment and retention. To build a robust internal workforce, an organization needs a combination of communicated and clear career path options involving training and skills development, coupled with advantageously leveraging workforce diversity. In terms of recruitment, an organization can be limited in terms of salary and benefits to entice new hires. On the positive side, with the new remote work environment, we now have a larger and more diverse applicant pool and talent who wouldn't have considered working for us in the past.

### **TOPIC: Vendor Collaboration**

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

**Amundson:** **Understanding our business model.** The most important thing I need from my vendor partners is innovation that is on pace or ahead of our needs. Our vendor partners should understand what we are building, and that as we change our designs, change with us. We are making those adjustments in real time to improve our cost models by lower material costs and more importantly, lower labor costs.

**Understand size does matter.** Terminals are a great example, but it starts with the cable. If I use a fixed size of cable for most of my build, then I need one type of terminal for most of my build as well. We don't need one terminal that handles 20 different scenarios—I need a terminal that handles two. These choices have an impact on the cost of materials and ultimately labor costs.

**If there's a better way to do something—tell us.** We need to spend more time with our vendors simplifying what we are doing. A great example is the bidding process. There may be a discrepancy between what's on our list and what the contractor thinks we should have on it. Having a better understanding of each other's wants and needs will go a long way toward getting the desired result.

### **TOPIC: Network Automation**

**ISE:** Share how your company is approaching network automation.

**Amundson:** TDS, like many others in the space, must deal with older SNMP-based equipment. We have automated everything possible, but that model only goes so far. We are moving to systems based on NETCONF/YANG but that has issues as well, chiefly disparate management systems. Conversion and integration across vendor platforms aren't small issues. Our goal is to unify our access network under a common control plane—the path to the goal has been hard to follow but one which we are continuing to evaluate.

### **TOPIC: The Elephant in the Room**

**ISE:** What is the industry NOT addressing that it should related to network evolution and broadband for all?

**Amundson:** We spend a lot of time creating for perfection when perfection isn't needed. We also spend time and money building networks for the "what ifs" of the future. In my experience, both lead to excess cost and stranded assets. I don't mean we should throw rationality out the window, but we should understand the actual requirements of the plan and build to those requirements. The future is never certain, and neither is technology (reference NGPON2). Plan realistically, build lean.

### **TOPIC: Your Passion**

**ISE:** Share one problem/challenge you are passionate about solving for the ICT Industry.

**Amundson:** With \$42.45 billion dollars that will soon be allocated to states for broadband deployment, I am passionate about finding efficiencies in network design and deployment that can meet the aggressive timelines and expectations. We need to find economical solutions to bring broadband to unserved and underserved areas that don't break the bank and allow us to reach the maximum number of service addresses.

### **TOPIC: Advice**

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

**Amundson:** Think. Seems simple but it is one of the most critical attributes to job performance. We often spend time doing things according to established processes under the guise of this is how we do it and never ask why. I am referring specifically to the process details that are buried down in the minutiae of the organization. Bottom-up improvements are often the gold we dig for, but unless we get deep enough into the dirt, we won't find it.

Be humble and stay humble. Remember, people don't work for you—they work for a paycheck or personal satisfaction, or some other driver that is not you personally. The former might be true in some cases but those are rare and fleeting. Sometimes the hardest thing for leaders to do is deflate your ego, sit on your hands, and shut up. Listening and leading go hand-in-hand.

## Ashley Travers

Director of Network Engineering, Verizon

### TOPIC: Biggest Challenges

**ISE:** What are two big challenges you and your team face in terms of network evolution/transformation?

**Travers:** COVID-19 and the subsequent supply chain disruption drastically shifted how we approached our network deployment. The pandemic occurred right as we were in the midst of our 5G network build-out. Our top priority was to keep our employees safe while keeping our customers connected when it mattered most. To that, we saw the challenge as an opportunity to double down on our 5G network and raised our CAPEX guidance soon after the pandemic began to actually invest more than we had originally planned.

**“Fixed wireless access is one of the most disruptive technologies, both for consumers and businesses.”**

—Ashley Travers, Director of Network Engineering, Verizon

### TOPIC: Worst of Two Evils

**ISE:** Which is more difficult to handle: supply chain challenges or workforce talent challenges? How should the industry address these challenges that have been a thorn in Broadband Service Providers' sides for quite some time now?

**Travers:** Both are difficult but in different ways. We have trusted relationships with our suppliers, however we were also susceptible to global supply chain challenges. We worked through these challenges with a combination of smart forward planning and flexibility. It wasn't uncommon for us to work around delays and/or find alternatives to ensure a project was completed.

We've approached workforce challenges from a different perspective. We've been fortunate to have relatively low turnover, however we're always looking at how to attract and recruit talent to our network teams. We've approached this by reevaluating the requirements of our job postings

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### TOPIC: Operational Realities

ICT industry analysts and observers often focus on CAPEX budgets. But the reality is that OPEX can make or break the bottom line. The key to controlling OPEX is improving network life cycle management for complex fiber and legacy networks in a cost-efficient manner.

**ISE:** How is your company ensuring the networks it deploys are maintained in an operationally efficient manner?

**Travers:** We are building our next generation 5G network and we are decommissioning legacy assets. Decommissioning these assets is improving operational costs, driving energy efficiency, and delivering the best experience possible for our customers.

### TOPIC: The Future

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

**Travers:** Fixed wireless access is one of the most disruptive technologies, both for consumers and businesses. For consumers, it's leveraging our 5G network to deliver more Internet choice in many parts of the country.

For businesses, it's ideal for use cases like small offices, mobile retail, kiosks, and temporary business locations. What's important for businesses is you get the security of Verizon's network along with scalability.

### TOPIC: Vendor Collaboration

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

**Travers:** Trust, transparency, and shared objectives. All of our approved vendors must adhere to strict guidelines regarding sourcing and ethics.

### TOPIC: Failure

**ISE:** Talk about it.

**Travers:** I believe in the adage of "fail fast" and move on. Failure often means you tried

something new. However, the most important thing about failure is to learn from it and not make the same mistakes twice. Innovation is what drives our industry but often the price of innovation is failure. You can't be afraid of failure provided you use it as a learning tool.

**"Innovation is what drives our industry but often the price of innovation is failure. You can't be afraid of failure provided you use it as a learning tool."**

—Ashley Travers, Director of Network Engineering, Verizon

### TOPIC: Retaining and Retraining Top Talent

The great resignation is not ending. How does your team hold onto professionals with the most talent and the greatest work ethic when they must upskill to remain relevant? (Oftentimes, "upskilling" translates into working their day job and at the same time learning new skills for the future.)

**ISE:** Share your thoughts about the "rub" of this reality to employers AND employees.

**Travers:** We are fortunate to have a team that has been with us for a long time. However, one element I am passionate about is getting women comfortable in engineering and technology. There's a perception that you "need to be an engineer" or need to be directly involved in technology to work in the industry, and that is not true. Especially now, where technology is a part of everything—the ability to broadly understand how technology works and how it interacts with the business is vital. My background isn't engineering but my career has been spent working in network technology and it's been incredibly enlightening and rewarding because I allowed myself to not get intimidated by it, but rather open to learning it. ■

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**BUT WAIT, THERE'S MORE!** Go online at [isemag.com/14292618](https://isemag.com/14292618) for more topics discussed with these leaders.



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## OPENING KEYNOTE | BRIGHTSPEED PANEL

### A Fiberside Chat

Learn from Brightspeed's executive leadership team, Bob Mudge, Chris Creager and Tom Maguire, during a "Fiberside Chat" at ISE EXPO 2023's opening keynote presentation on August 30, 2023. Discover the secrets behind their "boots on the ground" approach to deploying a FTTP network across 17 states by the end of 2023. They will discuss solutions to rapid delivery of XGS-PON and Wi-Fi 6 to underserved areas across the Midwest and Southeast as well as how potential BEAD funding can expand the company's build plans. The three Brightspeed leaders will dive into topics including: finding the right talent, fostering vendor relationships to meet build demands, and more.



**BOB MUDGE**  
Chief Executive Officer



**CHRIS CREAGER**  
Chief Administration Officer



**TOM MAGUIRE**  
Chief Operating Officer

### EDUCATION BY THE NUMBERS

3

Day 1 C-Level  
Keynote Presenters  
from Brightspeed

4

Service Provider  
Focused  
Panel Discussions

2

Deep-Dive Several  
Hour Fiber-  
Forward Courses

4

Day 2 Keynote Tech Talks  
from Brightspeed, Etek  
Telephone Cooperative,  
TDS Telecom, and Verizon

38

Hour-Long Educational  
Seminars focusing on the latest  
fixed and mobile solutions,  
technologies, insights, and  
best practices to solve your  
greatest network pain points

## CLOSING KEYNOTE | TECH TALK PRESENTATIONS

These leaders walk in your shoes and have the scars to show it. From field fiber frenzies to trouble tickets that could have been prevented—they get you! Join the leaders and doers who have distilled their years of experiences into 10 minutes of network evolution wisdom that will help your team perform better and your reputation rise. Our Tech Talk presenters deliver the bite-sized knowledge you crave—complete with the ability to shake their hands after their keynote.

### Creating an Equilibrium Between Speed/ Labor/Technology & Cost/Revenue/Profit



**JOHN AMUNDSON**  
Director of Planning &  
Implementation

### Multidimensional Challenges of Mapping – Reading Between the Lines to Create a True Broadband Roadmap for the Underserved



**CHARLIE CANO**  
CEO/General Manager

### Network Evolution – Reaching Beyond Current Realities



**BRIAN BOND**  
Chief Operations Support &  
Innovation

### Presentation Title Coming Soon



**ASHLEY TRAVERS**  
Director of Network Engineering



## TEE OFF AT THE 2ND 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 Tuesday, August 29, at Drumm Farm Golf Course, for a fun-filled day on the course!** Registration for ISE EXPO and the golf tournament are separate.

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## EDUCATION

The following guide contains a detailed breakdown of the educational sessions taking place at ISE EXPO 2023. These sessions are subject to change. For the most up-to-date information on the event and to register, please go to [WWW.ISEEXPO.COM](http://WWW.ISEEXPO.COM).

### TRACK 1: 5G Mobile Infrastructure Evolution

#### Transitioning to a True 5G Connected World

Today, CSPs are competing with MSOs and WISP providers to deliver 5G private networks and services. Learn how moving from 5G-NSA to 5G-SA will depend on an effective scale of the mobile AND fixed broadband access network infrastructure.



**SPEAKER:**  
Prasad Kodaypak  
*Radisys*

#### Setting Up for Success with Wi-Fi 6E

As multi-gig services roll out, wireless home connectivity capabilities must keep up to handle the extra load. Learn the benefits of Wi-Fi 6 and 6E solutions and the multi-gig gateways that can offer relief for congested home networks.



**SPEAKER:**  
Andrew Cuellar  
*Zyxel Communications*

#### Verizon: Wireline & 5G Fixed Wireless Access Deployment Strategy

Verizon shares how problem-solving and out-of-the box thinking can help traditional wireline groups lead 5G FWA installation and maintenance success. Topics covered include business challenges, planning, tooling, training, testing, and launching.



**SPEAKERS:**  
Robert Sheehan, *Verizon*  
Marc Durocher, *Verizon*



### TRACK 2: FTTx/Optical Networks

#### PON Holds the Key to Efficient Next-Gen Network Deployments

A deeper understanding of PON technologies can help you deliver FTTH efficiently to underserved rural areas and key verticals like healthcare campus environments and multi-tenant facilities. Learn the pros and cons of Central Split, Distributed Split, and Indexing architectures to help improve your future planning and design efforts.



**SPEAKER:**  
Craig Hemperly  
*Wesco*

#### Rethinking Rural Panel Discussion

Shifting from urban/suburban areas to rural markets puts fiber deployment strategies under a new light. Lower densities, uncertain take rates, challenging terrain and other considerations challenge rural business cases. You need to consider spanning architecture, design guidelines, product selection, workforce training and more. Learn from panelists about how alternative architectures can create labor efficiencies, reduce truck rolls, and make fiber deployments in rural areas more compelling.



**SPEAKERS:**  
Barry Walton, *Corning Optical Communications*  
Calvin Deleavey, *Mobia*

#### Running Compliant Projects with Your Federal Funds

With federal funding at an historic level, learn funding options that are currently available, and best practices to run successful and compliant programs once funding is secured. Specific requirements for prevailing wage, buy American, the Miller Act bond and more.



**SPEAKER:**  
Joshua Broder  
*Tilson*

### Speed, Accessibility and Productivity: How to Prepare Your Legacy Fiber Management Data for Digital Transformation

Improve your fiber network engineering workflow by learning clear, attainable steps to get your network data ready for digital onboarding—the foundation of a truly integrated software ecosystem for the future.



**SPEAKER:**  
Andrew Eubank  
VETRO

### Fiber Troubleshooting – Efficient Methods for Fault Identification and Repair

When outages occur, technicians may haphazardly hunt and peck trying to find the faults. This presentation recommends a logical series of steps and tools to quickly identify the root cause of the trouble(s) so your teams can quickly restore the network. Equally as important, you'll learn how to leverage proper reporting of path placements to help prevent accidental dig ups in the future.



**SPEAKER:**  
Sean Kelly  
Light Brigade

### Optimizing 10G-PON and Beyond User Experience in the Home

Fiber brings blazing symmetrical speeds to the ONT in the home, but user experience can be degraded by 80% or more by the in-home Wi-Fi. Different options to improve user experience will be explored and compared, based on the latest and upcoming Wi-Fi technologies, and by optimizing the location of the Wi-Fi router in the home.



**SPEAKER:**  
John George  
OFS

### TRAINING SESSION: Help Close the Digital Divide – FTTx Outside Plant Design Short Course

This 3-hour session will focus on the proper design of FTTx point-to-point and point-to-multipoint passive optical networks (PON) with home-run, centralized, and distributed topologies. Learn the importance of customer take rate and density and how they apply to your design. The session will review various network configurations, design benchmarks, and installation parameters for FTTx systems.



**SPEAKERS:**  
Danny Huffman, ONUG Communications  
Sean Kelly, Light Brigade



### NETWORKING HAPPY HOUR



All attendees are invited to join us for a special **Networking Happy Hour Wednesday, August 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. Whether you're looking to make new contacts, discuss industry trends, or simply unwind after a busy day, the Networking Happy Hour is the perfect way to do it.

### Solving the Troubles with Troubleshooting FTTH Networks

Optimizing a FTTH network requires clean connectors and ports (IEC 61300-3-35). Learn how using live visual inspection techniques—including visual fault locators (VFL), passive optical network (PON), optical power meters (OPM), optical spectrum analyzers (OSA), and optical time domain reflectometers (OTDR)—can help keep your fiber network performing as it should.



**SPEAKER:**  
Steven Harris  
SCTE

### Leveraging Hybrid (Fiber/Copper) Connectivity for Real-World Networks

Hybrid connectors (fiber/copper) are being introduced to ease installation and improve the reliability and resiliency of today's fixed and mobile networks. Learn how to leverage the benefits and remedy the problems associated with this new network approach.



**SPEAKER:**  
Jim Pelegris  
SENKO Advanced Components

### Brightspeed: Battling the Forces of Evil to Deliver FTTx to the Underserved – Critical Success Factors Panel

The description for this session is pending, check back at [www.iseexpo.com/2023/conference](http://www.iseexpo.com/2023/conference) for updates.



**SPEAKERS:**  
Nilesch Schroff, Brightspeed  
Jay Cadman, IQGeo

## TRACK 3: Power/Sustainability

### Enhancing the Telecom Power Grid

Today's telecom power grid is evolving to a distributed architecture with more elements spanning greater distances from the CO. Learn why hybrid cables containing fiber and copper can create a more sustainable solution to the existing telecom power grid and manage network densification.



**SPEAKER:**  
**Tony Wilson**  
*Superior Essex*

## TRACK 4: Construction & Engineering/BEAD & Middle Mile Network

### Edge Computing Is a Big Deal – Are You Ready to Cool It?

Gartner expects 75% of enterprise-generated data will be “created and processed outside a traditional centralized data center or cloud” by 2025. Learn how that reality impacts cooling requirements at the network edge and why you need to distinguish which option is the most energy efficient, cost effective, and reliable for your network.



**SPEAKER:**  
**Jim Magallanes**  
*TechniCool Innovations, Inc.*

### Closing the Digital Divide with the Utility Business Model

This panel will demonstrate why broadband providers and utility partnership models are critical to closing the Digital Divide. Learn unique business models, emerging funding options, and innovative community development programs to advance this critical initiative.



**SPEAKER:**  
**Josh Leonard**  
*Burns & McDonnell*

### Solving Permitting Challenges with GIS Solutions

Permitting can derail your broadband project in a hurry. Learn how GIS technology can help permitting teams secure data they need to make better decisions and get approvals quicker.



**SPEAKERS:**  
**Dustin Heath**, *CHR Solutions*  
**Randall Rene**, *Esri*

### Utilizing IMU Mapping Technologies to Streamline and Improve Your As-Built Process

Learn how IMU and related sub-surface sensor technologies can better map your underground assets and provide quality documentation of your as-built network. Learn how this technology can help eliminate continuous construction inspections and streamline your deployment processes.



**SPEAKER:**  
**Eric Cope**  
*Intelligent Mapping LLC*

### Hidden Costs of Construction Panel Discussion

When you peel back the onion on the various costs to build a Fiber Broadband network, 50% or more of the costs can be attributed to labor. Learn strategies for successful deployments and items to watch that often create cost and time overruns in the construction phase as well as unexpected expenses in the operational realm.



**SPEAKERS:**  
**Bob Whitman**, *Corning Optical Communications*  
**David Eckard**, *Nokia*

### Getting on Board with BEAD Applications

Competition for NTIA's \$42.45 billion funding is fierce, meaning small errors or weak narratives could make or break your grant application. Join funding strategists to gain insight about BEAD requirements, spot the “hidden” details of what is required, prepare for the next steps, and engage with the communities they intend to serve.



**SPEAKER:**  
**Megan Beresford**  
*Learn Design Apply, Inc.*

### Automating Network Planning Supports BEAD and Cost Containment

To quickly expand your fiber footprint, learn how ML image classification of utility poles can map out optimal build areas with greater accuracy. Learn why this more granular visibility into aerial and buried morphologies can improve FTTH routing and cost containment.



**SPEAKER:**  
**Kyle Berg**  
*Arrow by Altman Solon*

### FTTx Lessons Learned from Construction to Maintenance to Customer Satisfaction

It only takes one weak link to jeopardize the end-to-end visibility your FTTx operations teams' need. Learn how the right automated tools can help accelerate every phase of deployment from capacity planning to field execution and turn up.



**SPEAKER:**  
Prateek Chakravarty  
*Zinier*

### Intelligent Build – Harnessing the Power of Digitization in Construction

Given that large field deployments can overrun budgets by 80% and construction project delays can be on the order of 20 months, something must change. Learn three processes that can help address many of the challenges and inefficiencies in optical network deployments: Intelligent Passive Infrastructure; Construction Software-as-a-Service (SaaS) Platforms; and Automation and Digitization of Equipment.



**SPEAKER:**  
Seán Adam  
*AFL*

### Digitizing to Digging with GIS to Breakthrough Roadblocks in Fiber Permitting and Construction

Learn how to scale up deployment while reducing costs and time to activation. GIS processes and digital twins can help streamline processes that pinpoint gaps and uninstalled plant while improving field collaboration.



**SPEAKER:**  
Chris Helms  
*3-GIS*

### Solving the MDU Gigabit Coverage Challenge

Over 25% of US residents live in MDUs. Unlike their SFU neighbors, their Internet access is limited to the lesser capabilities of VDSL2 or DOCSIS 3.1. Understand how G.hn is an ideal XGS-PON 10 Gbps fiber extension platform. And learn how G.hn technology extends XGS-PON to deliver virtually symmetrical Gigabit to each subscriber in MDUs/MTUs over existing copper pairs or coax.



**SPEAKER:**  
Pierre Trudeau  
*Positron Access Solutions Corp.*

### Using Technology to Optimize OSP Route Selection and Improve the Pole Attachment Application Process

Pole attachment permitting and makeready engineering delays can prevent you from meeting deadlines and complying with contract obligations. Learn how LiDAR, AI, and digital twins can help.



**SPEAKER:**  
Ron Bilodeau  
*Osmose*

### TRACK 5: Network Reliability & Maintenance/Testing/Security/Damage Prevention/Safety

#### Verizon: Proactive End-to-End Customer Experience Through AI and Automation

Though our segment of the industry is busy deploying successful networks, we must remember, everything we do is about improving the customer journey. Toward that end, Verizon will share case studies that demonstrate proactive approaches to using field tools that drive efficiency—field management strategies that improve employee engagement and proactive approaches to installs and maintenance activity that is focused on the customer.



**SPEAKERS:** Melissa Basciano, *Verizon*  
Dennis Klein, *Verizon*  
John DiLiegro, *Verizon*  
Michael Strollo, *Verizon*

#### The Human Factor of Connectivity: Accelerating Tech's Learning Curve and Fiber Deployment Efficiencies

Attracting/training and retaining fiber technicians is a huge challenge today. Learn how to use automated test solutions that empower your new employees to perform like experienced technicians. Given the complexity of high-fiber count networks today, the right testing strategies can help your technician provide you with the visibility and diagnostic tools you need for quality FTTx deployments.



**SPEAKER:**  
Guillaume Lavallee  
*EXFO*

## Lightning Mitigation

Learn the nature of lightning and its energy levels' impact on the network. Understand how inductance, not resistance, affects lightning and the best ways to properly ground equipment to protect equipment from lightning strikes.



**SPEAKER:**  
**Jerry Hogan**  
*Solara Technical*

## Energy Storage Solutions for Increased Network Reliability

Computational processing at the network edge is critical to powering new mobile and fixed network technologies. Learn how different energy storage solutions can help increase network uptime and prevent power interruptions that threaten network reliability.



**SPEAKERS:**  
**Mike Johnson**, *Charles Industries LLC, an Amphenol company*  
**STEVE LATHAM**, *Charles Industries LLC, an Amphenol company*

## WOMEN IN TELECOM (WIT)

ISE EXPO is hosting our 2nd annual Women in Telecom (WIT) Panel Discussion at ISE EXPO in Kansas City, MO. Join us for a continental breakfast at this must attend session, sponsored by Corning. Leading female executives will share insights into how they position themselves to succeed, ways to achieve a healthy work/life balance, mentoring insights, and more. You won't want to miss this insightful session, all are welcome!

**MODERATOR:**  
**Janice Oliva**  
*VP, Group Publisher, Endeavor Business Media*

**PANELISTS:**  
**Beth Hannan**  
*Global Director of Product Operations, Meta*  
**Kimberly Hartwell**  
*SVP and Chief Commercial Officer, Corning*  
**Katy Greenfield**  
*VP, Customer Solutions, Americas, Telstra*  
**Emily D. McGinn**  
*Senior Vice President, Windstream*

## Managing SLAs and Regulatory Compliance Using Infrastructure Management Platforms

Infrastructure management can be complex and tedious. Learn how integrated GIS can help create service and operational efficiencies while improving budgeting, problem solving, and team collaboration.



**SPEAKER:**  
**Kianoosh Yazdani**  
*Dugo Systems, Inc.*

## Prevent Fiber Cuts that Lead to Bad PR and Reduced Profits

Shockingly, many fiber cuts are not tracked even though they can dramatically decrease your bottom line. Learn how a better fiber damage prevention strategy can reduce fiber cuts, keep your company out of the headlines, and improve your ROI.

Panelists will be announced soon

## TRACK 6: Talent & Leadership Training/DEI/ Professional Development/Upskilling/ Workforce Solutions

### Solving the Resource Challenge by Scaling the Upskill Solution

While the industry needs to recruit new talent, it also must harvest the talent of current team members. Learn how cross-training and upskilling can help align your team members' professional goals with the resource challenges you face. Be an authentic leader who builds multiskilled teams that pull together to meet a common objective.



**SPEAKER:**  
**Bob Mophew**  
*Tersus Services*

### Esports: A Competitive Edge for Telecom Talent Recruitment in Rural Spaces

Esports is expected to hit a \$317M market value in the US this year. Learn how rural broadband providers are working to leverage esports as a needed pipeline of skilled IT and tech workers. Learn how to tap this potential talent pool AND serve their individual, group and tournament play with the broadband networks you deploy.



**SPEAKER:**  
**Joshua Seidemann**  
*NTCA-The Rural Broadband Association*

**PREVIEW ISE EXPO'S FULL CONFERENCE AT [WWW.ISEEXPO.COM](http://WWW.ISEEXPO.COM)**

### Rapid Fiber Deployment and Workforce Engagement

Given the industry-wide shortage of skilled fiber technicians, retaining talent is critical. This seminar will share the right elements for successful training programs that improve technicians' skills, increase their engagement, and help meet your fiber deployment objectives.



**SPEAKER:**  
Kelly Weissmann  
Clearfield

### Developing Your Team's Superpower of EQ

Emotional intelligence is more than a soft skill. By learning how to create emotionally aware teams, you can take your network transformation efforts to new heights and retain the talent your company needs.



**SPEAKER:**  
Dustin Dale  
Beyond the Horizon Consulting

### VISIT THE DEMO ZONE!

Get your hands on the latest ICT products and technologies in the Demo Zone, located on show floor! Our exhibitors will be showcasing their innovative products through interactive demos, giving you the chance to experience them firsthand.



## HANDS-ON FIBER TRAINING AT ISE EXPO

powered by **SCTE**  
Society of Cable Telecommunications Engineers  
a subsidiary of CableLabs®

**SPACE IS LIMITED. ADDITIONAL FEE REQUIRED.**

**Kansas City Convention Center**  
**August 28-29, 2023**

#### DAY 1: MONDAY, AUGUST 28

12:00 PM – 7:00 PM

#### DAY 2: TUESDAY, AUGUST 29

9:00 AM – 5:45 PM

Access to online materials and pre-work will be provided to all registrants prior to the event. Participants who finish the program and final exam will earn a Broadband Fiber Installation Certificate with the ability to take a Broadband Fiber Installation professional certification exam to get certified for 3 years. Hands-On Fiber Training will include the below Modules, Hands-On Classroom Activities, Lunch and Refreshment Breaks, and a Welcome Reception.

#### PROGRAM OVERVIEW (subject to change)

**MODULE 01:** Foundations of Installing FTTH

**MODULE 02:** FTTP/FTTx Deployment

**MODULE 03:** Installing FTTH

**MODULE 04:** FTTH Measurements

#### HANDS-ON CLASSROOM ACTIVITIES

- **Fiber Scope and ISO/IES Cleaning**
  - » Mechanical Fiber Microscopes
  - » Digital Fiber Microscopes
- **VFLs and Vendor CPE**
  - » Visual Fault Locator
  - » CPE, Cabinets, etc.
- **Strip, Clean and Cleave**
  - » Safety, Hand Stripping, Mini Cleaver
  - » Straight Splice
- **All-in-One Splice & Connectorization**
  - » All-in-One Splice
  - » SC/APC Connector
- **Calculating Optical Power Budgets**
- **Optical Power Meter, OLS & OTDR**

## EXHIBITORS

ISE EXPO 2023 is thrilled to announce the exciting lineup of exhibitors who will showcase their latest products and services this August. See below for a preview of our growing lineup.

### 3-GIS

A-Aerial,  
a division of Altec Industries

ABS RENTS

Accelight Technologies, Inc.

Actelis Networks

Adams Cable Equipment, Inc.

ADB Companies

Advanced Test Equipment

AFL

American Polywater

American Products

Amphenol Network Solutions

Atkore-United Poly Systems

BHC Engineering

Biarri Networks

Blue Diamond Industries, LLC

Blue Telcom, Inc.

Border States

Buckingham Manufacturing  
Company, Inc.

Budco, Inc.

Bulldog Pipe, LLC

C&C Power

C&D Technologies, Inc.

Cal Am Manufacturing

Calix

Camozzi Automation, Inc.

Centillion Solutions

Challenger Optics

Channell

Charles Industries LLC, an  
Amphenol Company

CHR Solutions

Clearfield, Inc.

Collaborative Synergy

CommScope

Communication Network  
Engineering, Inc.

Comtest Networks, Inc.

Condux International

Copperhead Industries

CORE Telecom Systems

Corning Optical Communications

Craftmark Cable Markers

CyberPower Systems, Inc.

Cyclomedia Technology, Inc.

Danella Construction, Inc.

Dantherm Cooling, Inc.

Dura-Line

East Penn Manufacturing Co.

Emtelle

EnerSys

Enginuity Communications

Ensure

ESPi USA

Esri

ETA International

EXFO

Fiber Optic Solutions, LLC

Finley Engineering

Fremco USA

Fujitsu Network Communications

Full Circle Fiber Partners

Future Infrastructure, a  
Primoris Company

General Machine Products (KT), LLC

Genuine Cable Group (GCG)

GEOGRAPH

Go!Foton

Graybar

GS Yuasa Energy Solutions, Inc.

Harger Lightning & Grounding

HellermannTyton

Hsing Chau Industrial Co., Ltd.

Hubbell Power Systems

Hyesung Cable & Communication, Inc.

Ice Qube, Inc.

Incab America

Innerduct.com

INNO Instrument America, Inc.

Intelligent Mapping

IQGeo

Jameson Tools

Jonard Tools

JSI

KGPCo

KLJ Engineering

Knet

LaMarche Manufacturing

Laser Tech

LEOCH® Battery Corporation

Light Brigade

LYNN Broadband

MacLean Network Solutions

Maverick Corporation

Michels Power, Inc.

Millennium

Milwaukee Tool

MOUNTAIN, LTD.

Multilink, Inc.

Musco

Nanjing Jilong Optical  
Communication Co., Ltd.

NATE: The Communications  
Infrastructure

Contractors Association

National OnDemand, Inc.

NCTI

Netceed

Netcon, LLC

NewCom Technologies

OFS

Oldcastle Infrastructure

OMNI (Opti-Com  
Manufacturing Network)

OneVizion

Orion Cordage

Pelsue

PLP

Positron Access Solutions Corp.

Power & Tel

Powerline Hardware

PowerTec Solutions International

PPC Broadband

Precision Group, LLC

Precision Optical Transceivers

Primex

Prysmian Group

Quest Controls

R&M USA, Inc.

RaDD Network Solutions, Inc.

Rainbow Technology Corp.

Rally Trailer Manufacturing

Raycap

Render Networks

Safeguard Equipment

Saft

Santec USA Corporation

Senko Advanced Components, Inc.

Shinho

Smartlock

Southwire

For the most current list of exhibitors, visit [www.ISEEXPO.com](http://www.ISEEXPO.com).

SPIDA Software  
 Sticklers Fiber Optic Cleaners  
 Sumitomo Electric Lightwave  
 Superior Essex  
 SAM Companies  
 SWCC  
 Taihan Fiberoptics  
 Team Fenex, an Altec Subsidiary  
 Technetix  
 Tellabs  
 Thermal Edge, Inc.  
 Tii Technologies, Inc.  
 TILSON  
 Trident Solutions  
 UCL Swift North America  
 UniTek Global Services  
 U-Teck  
 VeEX, Inc.  
 Vertiv  
 VETRO, Inc.  
 VIAVI Solutions  
 Vitruvi™ Software  
 Vivax-Metrotech  
 Vocom-NWF (Nanjing Wasin Fujikura)  
 Wavenet  
 Wesco  
 Westek Electronics, Inc.  
 Westell Technologies  
 Western Supply  
 Wirewerks  
 WL Plastics  
 Zyxel Communications, Inc.

## INTERESTED IN SHOWCASING YOUR INNOVATIONS?

Display the equipment, techniques, and education your company boasts to help transform, simplify, and automate network services across the wireless and wireline networks. **BOOK NOW!**

Contact: **Robin Queenan**,  
 Sales Director, ISE EXPO  
**rqueenan@endeavorb2b.com**  
**773-754-3255.**

## 2023 SCHEDULE OF EVENTS

ISE EXPO 2023 promises to build off our stellar 2022 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, AUGUST 28

8:00 AM – 5:00 PM	Exhibitor Move-In
12:00 PM – 7:00 PM	Hands-on Fiber Training

### TUESDAY, AUGUST 29

7:30 AM – 2:00 PM	Golf Outing
8:00 AM – 6:00 PM	Hands-on Fiber Training
12:00 PM – 5:00 PM	Registration Open
1:00 PM – 4:00 PM	Help Close the Digital Divide—FTTx Outside Plant Design Training Session
8:00 AM – 5:00 PM	Exhibitor Move-In

### WEDNESDAY, AUGUST 30

7:00 AM – 5:00 PM	Registration Open
7:00 AM – 10:00 AM	Exhibitor Move-In
9:00 AM – 10:15 AM	Seminar Sessions
9:15 AM – 10:15 AM	Women in Telecom (WIT) Panel Discussion
10:30 AM – 11:30 AM	Opening Keynote   Brightspeed Keynote Panel
11:30 AM – 5:00 PM	Exhibit Hall Open
12:00 PM – 1:30 PM	Lunch on Exhibit Floor
1:00 PM – 3:30 PM	Demo Zone Open (on Exhibit Floor)
1:00 PM – 4:00 PM	Seminar Sessions
3:30 PM – 5:00 PM	Networking Happy Hour

### THURSDAY, AUGUST 31

7:00 AM – 2:30 PM	Registration Open
8:00 AM – 10:15 AM	Seminar Sessions
8:30 AM – 10:00 AM	Executive Roundtable (Closed Door)
10:30 AM – 11:30 AM	Closing Keynote   Tech Talk Presentations
11:30 AM – 3:00 PM	Exhibit Hall Open
12:00 PM – 1:30 PM	Lunch on Exhibit Floor
1:00 PM – 2:30 PM	Demo Zone Open
2:45 PM – 3:00 PM	Attendee Giveaway (in Demo Zone)
3:00 PM – 7:00 PM	Exhibitor Move-out

### FRIDAY, SEPTEMBER 1

8:00 AM – 12:00 PM	Exhibitor Move-out
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**SAVE \$245 ON YOUR FULL-CONFERENCE PASS WHEN YOU REGISTER THROUGH AUGUST 11, 2023.**



## NEW YEAR, NEW LOCATION.

ISE EXPO is ready to bring the bandwidth to Kansas City, Missouri.

Kansas City, Missouri, might be most notable these days as the home of the Kansas City Chiefs NFL football team, but the city has always been home to many exciting destinations showcasing the local food, art, and history. Its unique blend of history, culture, and creativity, makes it a cool destination for travelers and residents alike.



**ART & CULTURE:** Kansas City is home to numerous world-class museums, including the Nelson-Atkins Museum of Art, the Kemper Museum of Contemporary Art, and the National World War I Museum.



**BARBECUE:** Kansas City is renowned for its delicious barbecue, with plenty of options throughout the city. Visitors can sample mouth-watering brisket and ribs at popular spots like Arthur Bryant's, Q39, Jack Stack Barbecue, and Joe's Kansas City Bar-B-Que.

**CITY OF FOUNTAINS:** Yes, Kansas City at times is referred to as the "City of Fountains". The city is home to over 200 fountains, it is said to have more fountains than any city except Rome, Italy. Take a stroll across the city's many parks and public spaces and see how many you can count.



### CRAFT BREWERIES:

Kansas City has a booming craft beer scene, with plenty of breweries offering unique and inspired

brews. Visitors can take brewery tours and sample local favorites such as Alma Mader, Boulevard Brewing Company, and KC Bier Co.



**JAZZ:** Kansas City has a rich jazz history, with jazz legends like Charlie Parker and Count Basie calling the city home. Visitors can experience the energetic jazz scene at iconic venues.

## CONNECTING BEYOND THE SCREEN: THE POWER OF IN-PERSON NETWORKING AT TRADE SHOWS



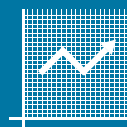
# 95%

of executives said that face-to-face meetings are a key factor in successfully building and maintaining long-term relationships.<sup>1</sup>



# 89%

agreed that face-to-face meetings are essential for “sealing the deal.”<sup>1</sup>



# 79%

said that in-person meetings are the most effective way to meet new clients to sell business.<sup>1</sup>



For every dollar invested in business travel, companies see an average of \$12.50 in increased revenue and \$3.80 in new profits, due to the benefits of face-to-face interactions.<sup>2</sup>

1. Harvard Business Review – Managing Across Distance in Today’s Economic Climate: The Value of Face-to-Face Communications, [https://hbr.org/resources/pdfs/comm/british-airways/hbras\\_ba\\_report\\_web.pdf](https://hbr.org/resources/pdfs/comm/british-airways/hbras_ba_report_web.pdf)

2. Oxford Economics USA Report: <https://www.locomote.com/blog/business-trips-and-the-bottom-line-the-roi-of-corporate-travel>

**HOTELS:** ISE EXPO will be held at the Kansas City Convention Center with numerous hotel options either connected to or in walking distance of the venue.

**Book before July 24 to save on pricing!**  
Visit [WWW.ISEEXPO.COM/TRAVEL](http://WWW.ISEEXPO.COM/TRAVEL) for more information.

### **Kansas City Marriott Downtown**

200 West 12th Street  
Kansas City, MO 64105  
\$189/night

### **Crowne Plaza Kansas City Downtown**

1301 Wyandotte Street  
Kansas City, MO 64105  
\$159/night



## THANK YOU TO OUR 2023 SPONSORS AND INDUSTRY PARTNERS!

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### Industry Partners



### ENTER VACATION GIVEAWAY

Take part in ISE EXPO's Passport-to-Prizes on the exhibit floor and be entered to **win an all-inclusive, 4-night trip for 2 to the Occidental Nuevo Vallarta Resort-Puerto Vallarta Mexico.** The trip includes round-trip travel from home city to destination, 4-night stay all inclusive, with round-trip airport/resorts transportation as well as all meals, drinks, taxes, and tips!

# Listen to “Behind the Solutions” Podcasts Today

*Broadband network evolution leaders and doers share surprising stories about their journeys to create better solutions for our industry.*



Use this QR code to discover our guests, their companies and the air date for each episode.

# Young Network Leaders Spotlight

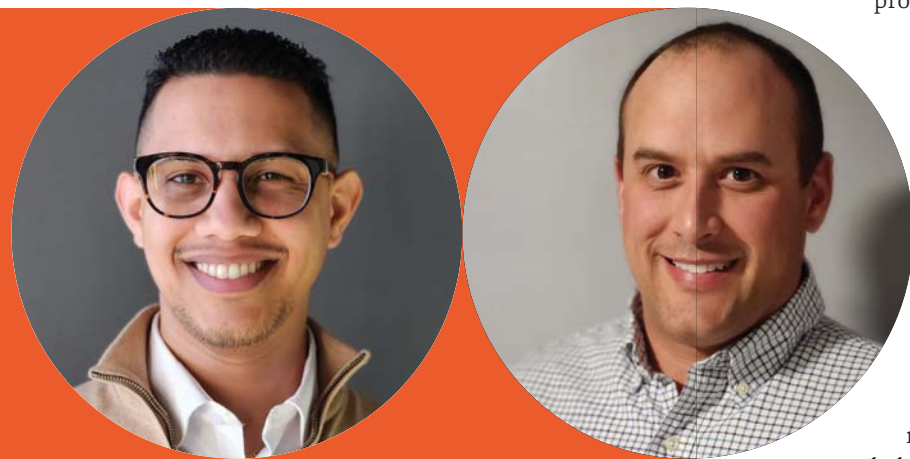


The **REAL** Value  
Prop for BSPs'  
Transformation

BY LISA WEIMER



**H**ow can we attract and retain young talent in our industry? Ask these eight young leaders and they'll give it to you straight. And, from an outsider view, they're not asking for much. Just the chance to learn from the best and the brightest veterans in the industry, be respected for what they can contribute, and enjoy a better work/life balance. What's in the way? You already know.



Read more to learn from these young leaders who can teach us a thing or two about how to move our industry forward in a time when digital natives are the talent to nurture. Should legacy infrastructure and thinking be retired?

**ISE:** What is your greatest contribution to your company and/or the industry to date?

**DeJesus, CROWN CASTLE:** We often have access to a broad range of technologies, but the technologies alone don't guarantee success. It's the novel application of choice technologies that can help move a business forward. My greatest contribution to Crown Castle so far is demonstrating how some strategically deployed geospatial algorithms can be transformative for the business in the areas of service reliability and network architecture review.

**Burbey, HIGHLINE:** Most of my career has been with a larger corporation. I feel my greatest contribution, is being able to combine my knowledge base and previous experiences in telecom with an emerging company like Highline to achieve our business goals. Being able to directly see how my contributions are helping grow a business is gratifying.

**Riffle, HORIZON:** My greatest contribution would be my unique skill set. I began my career as a technician, advanced to a construction manager and now I'm an engineer. Each position gave me a different perspective of the challenges they

face. My leadership skills have expanded in that I am able to anticipate the needs of each area of a project. It has given me a broad scope of knowledge that has helped me increase efficiency while helping my team along the way.

**Hudson, LUMEN:** When I joined my current team at Lumen, we would get a lot of requests for IPs on our management network for new devices. This had to be done manually which was time-consuming and could be error prone. I knew this process could be done better so I collaborated with other teams to migrate to a new IP address management database. Combined with a new GUI, users could request IPs on their own no matter their knowledge level. This saved time for both my team and other users and removed human error from the process.

**Hornberger, META:** My greatest contribution has been to bring service to unconnected communities. My partners and I brought rural Internet to unconnected parts of Iowa and Nebraska with an ISP I founded, Spiral Communications, and continued the journey at Meta. Enabling connectivity to more people helps bring us all together.

**Ward, WINDSTREAM:** One of my greatest accomplishments in the telecom industry thus far was leading a team alongside partner carriers to complete our company's first international 100G circuit from Chicago, Illinois, to Frankfurt, Germany. My team has been at the forefront of delivering 400G circuits cross-country to multiple customers, establishing and upgrading carriers at cell towers, and achieving revenue goals for regional and wave circuits. I'm eager to find solutions and dedicated to delivering fast and flexible service for our customers.

**ISE:** What is the greatest challenge to being a younger and driven professional in the rather mature telecom/ICT industry?

**Burbey, HIGHLINE:** The greatest challenge is understanding the rapid change in our industry. Everything from technology, tools, customer expectations, and our up-and-coming workforce. Breaking the mold of "this is how we've always done it" and acknowledging this pace is essential in today's evolving workplace.

**Riffle, HORIZON:** Being a younger professional often means knowledge of newer technology and processes. The mature professionals have typically found and utilize time-tested processes. The challenge is finding a compromise between the two that allows for efficient workflow and benefits the company.

**Hudson, LUMEN:** There is a lot to learn to catch up in this industry due to it being rather mature. However, at the same

time, the industry is always evolving, and you need to keep learning to not be left behind. It can be a challenge to balance both as a younger person in this field.

**Hornberger, META:** Building credibility can be a challenge and requires the ability to be extremely open and flexible. Open to feedback and learning, open to ideas that challenge your own, and open to your team. There can be a sense of tradition and experience in the space that is usually very hard earned. Being able to take in a large amount of information and justify outcomes to change the status quo is a key skill.

**Bohlman, TDS:** For a communications company to thrive, it must have employees who are constantly looking to innovate, adapt to the evolving marketplace, and incorporate technological advances. I am fortunate to work at a company that strives to stay ahead of the technology curve despite the fact we started 54 years ago as a group of small telephone companies serving rural and suburban areas. The greatest challenge for all of us regardless of age is staying abreast of what is happening in our industry. We all want to give our customers state-of-the-art services and products that exceed their expectations.

**George, VERIZON:** You will have individuals with decades of experience and as a young people leader you might be in a position where they have been in the industry longer than you have been alive. Understandably, that can be difficult for all parties. Ultimately, demonstrating respect, advocating for them, and being keyed into your team's goals is key. You also must be an advocate for change. It's easy to develop a mindset of "this is how it's always been done." Instead, you must respectfully push the team to challenge the status quo and be open-minded to what the future could be.

**Ward, WINDSTREAM:** I find one of the greatest challenges in the mature telecom world is the rapid pace of demand. As a young professional, I strive to implement innovative ideas and drive efficiencies. It's important to not remain static with systems that have been in place for years with the rapid digital evolution. My attention to detail and passion for understanding the industry drives high caliber design output from my team in a fast-paced environment. I consider myself a "forever student" and stay in tune with the industry's latest technology through continued coursework, our latest architecture certifications, and professional development.

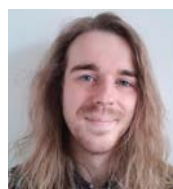
**ISE:** What is the secret sauce for retaining and engaging young talent like you?

**DeJesus, CROWN CASTLE:** I could write a whole essay on this, but I would say there are two critical ingredients: business engagement and mentorship. I like to know how my efforts generate value for the business because it's hard to find meaning without knowing the value I'm delivering. I can only produce my best unit of work if I know how my work fits into the larger whole. Additionally, informal mentorship networks have been critical to my growth. The short feedback loops help me recalibrate and make me want to bring my best foot forward every day.



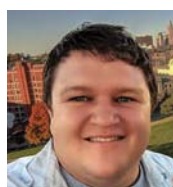
**Kelly Bohlman**  
DIRECTOR, NETWORK CONSTRUCTION  
TDS TELECOMMUNICATIONS, LLC

Follow her on LinkedIn: [www.linkedin.com/in/kelly-bohlman-0a597617](http://www.linkedin.com/in/kelly-bohlman-0a597617) and visit [www.tdstelecom.com](http://www.tdstelecom.com).



**Jeremy Hudson**  
NETWORK ENGINEER  
LUMEN

For more information, visit [www.lumen.com](http://www.lumen.com).



**Justin Hornberger**  
DIRECTOR, NETWORK DEPLOYMENT & SUPPORT  
META (FORMERLY FACEBOOK)

For more information, visit [www.meta.com](http://www.meta.com).



**Courtney George**  
MANAGER - STRATEGIC BUSINESS OPERATIONS  
VERIZON

For more information, visit [www.verizon.com](http://www.verizon.com).

**Burbey, HIGHLINE:** Acknowledgement and knowing exactly how my efforts keep our company successful. Constructive feedback is important to me so I can adapt and grow my role with the business.

**Riffle, HORIZON:** The most valuable part of my job is the culture. While competitive wages are important, anyone can find a higher paying job. Not everyone can find a company and career where you enjoy contributing to its mission and vision. The comradery I have found here is second to none. As a younger professional, we are often navigating major life changes like starting a family. A good work/life balance ensures both the employee and the company reap the most benefits and perform at their best.

**Hudson, LUMEN:** I think having a culture that promotes friendly and inclusive teams is important to engaging newcomers to the industry. Joining Lumen with little networking



**Katelyn Ward**  
MANAGER OF TRANSPORT ENGINEERING CUSTOMER  
PLANNING, WINDSTREAM

Follow her on LinkedIn: [www.linkedin.com/in/katelyn-ward-3842b26a](https://www.linkedin.com/in/katelyn-ward-3842b26a) and visit [www.windstreamwholesale.com](http://www.windstreamwholesale.com).



**Aaron Burbey**  
VP, OPERATIONS  
HIGHLINE

For more information, visit [www.highlinefast.com](http://www.highlinefast.com).



**Jose DeJesus**  
PRINCIPAL ARCHITECT  
CROWN CASTLE

Follow him on LinkedIn: [www.linkedin.com/in/josedaviddejesus](https://www.linkedin.com/in/josedaviddejesus) and visit [www.crowncastle.com](http://www.crowncastle.com).



**James Riffle**  
FIBER ENGINEER FTTH  
HORIZON

For more information, visit [www.horizonconnects.com](http://www.horizonconnects.com).

knowledge, I had a lot to learn. However, it has been the welcoming people I have met during my time here who made the difference. They guided me as I progressed in my career and helped me feel at home.

**Hornberger, META:** A company should enable change and allow, or better yet, encourage young leaders to take smart risks. Breakout technologies, processes, and organizational techniques create opportunities to save capital or use it more efficiently and giving young leaders the authority and responsibility to take guided and supported risks can really attract strong team members.

**Bohlman, TDS:** I believe young professionals want a variety of opportunities to explore what they like doing and what they're good at. At our company, we have TDS Telecom University to give associates three years to try out 3-4 different positions. The program started in 2018 to invest in associates who

display the aspiration, ability, agility, and engagement to be the next generation of TDS leaders. Graduates gain a greater depth of understanding and appreciation of the business. One recent graduate, who started in field services and then became an analyst, is now a manager of outside plant construction after her time in the program.

**George, VERIZON:** What energizes me in my career at Verizon is the opportunity to continuously learn and try new things. I've had many roles in my journey, and each has exposed me to a different side of the business and given me the opportunity to learn new things and build new skills. Also, empowering young people to make decisions and take risks is crucial. Lastly, it's essential to have people genuinely invest in your career development. Whether it's a formal mentorship program or something more informal, having the guidance and feedback of someone experienced in your industry is invaluable, especially for a young person navigating their career.

**Ward, WINDSTREAM:** Our secret sauce to retaining talent has been creating a competitive and flexible work environment. With most of the team working remote positions, hosting lunch-and-learns, in-person meetings, and events to collaborate over technology and build friendships has been key. I enjoyed attending a SWE conference and participated in leadership talks with executives sharing experiences and answering questions. Collaboration across our company with different roles provides many opportunities to learn and enhance our everyday work environment. A few examples I have been involved in are creating inventory reports, revenue projections, and project closure notifications.

**ISE:** What is it we don't know about you that we should?

**DeJesus, CROWN CASTLE:** I love languages and how they enable me to communicate across cultural contexts. While I am multilingual, I don't just mean languages in the traditional sense. Business and technology have languages of their own and often things can be lost in translation. What I bring to the table is the ability to lower the language barriers that often exist between technologists and business leaders. With more effective communication, we can drive better business outcomes.

**Bohlman, TDS:** I began my career in Human Resources. My career path took an unexpected turn when instead of leaving for another company, I was offered a position in the technical field. I received on-the-job training as well as external training and education. Eleven jobs later, four of them being developmental positions, I'm Director of Network Construction. I'm grateful TDS made an investment in me. Our leadership believes that if you have the aptitude, attitude, and drive, you'll be given the opportunity to grow and be challenged. That's why TDS is as successful as it is today.

**George, VERIZON:** I'm very passionate about getting more women in STEM careers. Verizon is very involved in introducing the opportunities of STEM to women at a young age. Beyond just getting involved in STEM, more women in these fields will help shape the generation of tech leadership. ■

# THE ART & SCIENCE OF Fiber Optic Troubleshooting

## The Right Tools Make It Easier

BY STEVEN R. HARRIS

Fiber optic networks can encounter problems such as signal loss, attenuation, and interference, which can affect performance and reliability. Therefore, it's important for those working with fiber networks to acquire knowledge in optical measurements so they can understand the full scope of installing, maintaining, and troubleshooting those networks.

Fiber optic troubleshooting requires identifying and resolving issues quickly. Let's do a quick review of the prevalent optical measurement tools used by operators to troubleshoot their fiber networks today:

### 1. Fiber Optic Inspection Microscope

The first place to start when troubleshooting fiber optics is with the connector. To examine fiber optic connectors for cleanliness, according to the International Electrotechnical Commission (IEC) standard #61300-3-35, a fiber optic inspection microscope is utilized. (See Figure 1.)

The IEC standard verifies that four zones of a fiber optic connector or port are free of contaminants. These microscopes are designed to accommodate various fiber optic types, including single mode fiber (SMF), multiple mode fiber (MMF), and multiple-fiber push on (MPO) style connectors. They can be manual, using a mechanical focus dial, or automatic, utilizing a PC as a viewing screen with a USB scope adapter.

Since dirt can migrate, it's crucial to ensure that the core, cladding, adhesive (epoxy), and contact (ferrule) zones of the fiber are free of contaminants. If any of the zones do not meet that requirement, it is essential to perform port cleaning. After cleaning, it is then necessary to re-examine the connector to confirm that it is free of contaminants or permanent damage.

Shockingly, improper cleaning methods can cause failure rates as high as 50% or more. That's why fiber scoping and cleaning are an essential part of fiber optic maintenance.



FIGURE 1.  
Jonard  
Fiber Scope

### 2. Passive Optical Network (PON) Power Meter (PPM)

A passive optical network (PON) power meter (PPM) that's specifically designed for testing and troubleshooting optical networks with multiple wavelengths. (See Figure 2.) A PPM is used to measure the optical power levels at various points in the fiber network, including at the optical line terminal (OLT), the optical network terminal/unit (ONx), and in the optical distribution network (ODN). These power meters typically measure optical power in units of decibels (dB) and can detect power levels as low as a few microwatts ( $\mu$ W). While a standard optical power meter (OPM) provides measurements at specific wavelengths, such as 1550 nm, the PPM is designed to test multiple wavelengths, including 1577 nm and 1490 nm, using wave division multiplexing (WDM) filters to separate and measure individual wavelengths.

They may also include additional features of a PPM, such as the ability to measure optical return loss (ORL) and the ability to perform automated tests for pass/fail analysis. PPMs are an essential tool for technicians to ensure the performance and reliability in PONs, as well as other fiber networks like



FIGURE 2. Tempo and Jonard Optical Power Meters

remote PHY (R-PHY) or fiber deep networks. The latest PPM designs feature a pass-through port that allows an ONx to hear the OLT, enabling measurements to be conducted out of band (OOB) in both the upstream and downstream. Additionally, an attenuation by substitution test, which uses an optical light source (OLS) to generate a signal instead of the fiber optic equipment, is often used with PPM before activating operator equipment in the network. These tests are crucial in maintaining and troubleshooting fiber optic networks, making OPMs and PPMs an essential tool for fiber optic technicians.

### 3. Fiber Optic Visual Fault Locator (VFL)

This troubleshooting tool is used by technicians to locate breaks, flawed splicing, or faults (e.g., macrobends) in a wide range of fiber optic cables. A VFL works by emitting a high-powered laser beam (e.g., 650 nm) that is directed into the fiber optic cable. (See Figure 3.) If there is a break or fault in the cable, the laser light will leak out and become visible at the point of the fault, allowing technicians to pinpoint the location of the problem. A VFL can save time and money by reducing the amount of time required to locate and repair faults. In addition, a VFL can help to improve network reliability by ensuring that faults are identified and repaired quickly, reducing downtime, and improving overall network performance. A technician can perform fiber identification by using different types of VFL pulses. Many other tools like OPMs and OTDRs have a VFL feature as well.



**FIGURE 3.** Tempo Visual Fault Locator

### 4. The Optical Time Domain Reflectometer (OTDR)

The OTDR is an extremely valuable troubleshooting testing instrument used to characterize the performance of a wide variety of fiber optic cables in a network. To ensure accurate measurements and overcome blind spots in OTDR testing, technicians typically use a launch cable, also known as a pulse width suppressor.

An OTDR works by sending a high-powered laser pulse into the fiber and measuring the amount of light that is reflected. By analyzing the reflected light, an OTDR can determine the length of the fiber, identify splice locations (e.g., fusion and mechanical), attenuation (loss), connectors, and locate any

faults or breaks in the cable at the PHY layer. The OTDR software characterizes network anomalies as events and traces the fiber. (See Figure 4.) Distinguishing the events and traces allows a technician to quickly identify and repair problems, reducing downtime and improving network performance. Many OTDRs support automated testing capabilities, allowing technicians to perform tests quickly and easily without requiring advanced technical knowledge. Newer OTDRs feature data storage capabilities, allowing technicians to save, upload (e.g., cloud) and analyze test results over time, helping to identify trends and potential issues in the network.

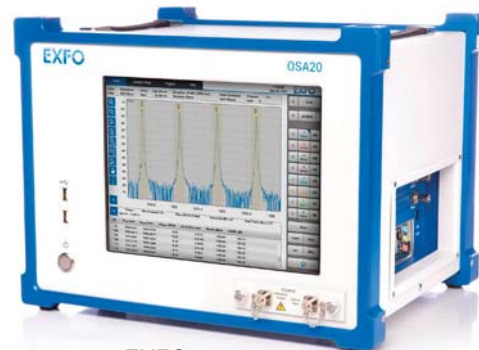


**FIGURE 4.** Jonard Optical Time Domain Reflectometer

width, directly related to the pulse's optical power, can be adjusted to increase the dynamic range of the test, reducing the spatial resolution, or decrease it to increase spatial resolution but reduce the dynamic range. OTDR test results depend on the ODN topology being tested. For example, a centralized split FTTH topology will show a large attenuation event at the optical splitter. OTDRs are also useful for final acceptance testing of fiber cable reels and for validating wavelength continuity in WDM networks. Newer small form-factor pluggable (SFP) transceiver modules come with integrated micro OTDRs.

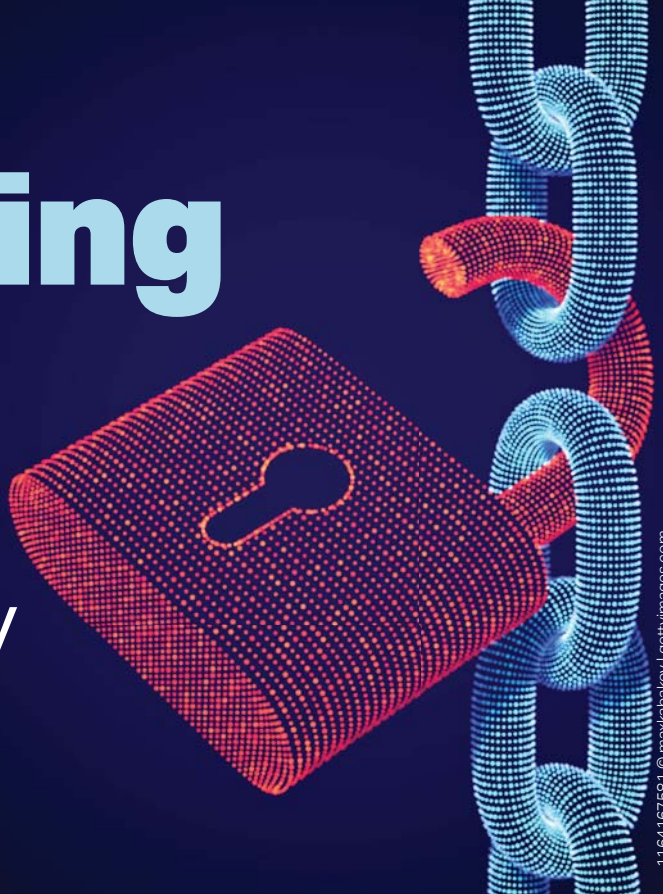
### 5. Optical Spectrum Analyzer (OSA)

An OSA is a device used to measure the power and multiple wavelengths of light in a fiber optic system. (See Figure 5.) An OSA is not common for technicians, however facility and field engineers use OSAs to perform comprehensive measurements of the network. The OSA operates by separating the optical signal into its individual wavelength components



**FIGURE 5.** EXFO Optical Spectrum Analyzer

# No BEAD-ing Around Cybersecurity & Cyber Supply Chain Risk



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## NIST Says: Identify, Protect, Detect, Respond, Recover

BY MEGAN BERESFORD

It has been a year-plus since President Biden signed the Bipartisan Infrastructure Law (PL 117-58) dedicating funds to ensure every American has access to high-speed Internet. Of this massive investment, \$42.45 billion was allocated to the NTIA Broadband, Equity, Access, and Deployment (BEAD) program. The BEAD program allocates funds to all 50 states and six territories to enable them to bridge the digital divide through the development of state grant programs.

The BEAD program has a long timeline. Last summer, all 50 states and six territories asked for planning funds, and awards have been rolling out since last fall. These initial funds are meant to help states determine the unserved and underserved areas in their territory, build up their broadband offices, and conduct intensive community surveying. At LDA, we have a common refrain—while the states plan, you plan.



...it's time to read the NIST framework. While it seems overwhelming, it is important to review all of it, down to the 108 subcategories.

Already, many states have been considering the rules and regulations they will implement for their BEAD-funded grant programs. While we can't know all the specifics, we do know some. The BEAD Notice of Funding Opportunity outlines certain rules that states must require of their subgrantees (the grant applicants). Tucked into the middle of the 98-page guidance are two crucial components—cybersecurity and cyber supply chain risk management.

### The High-Level Low-Down

To receive BEAD grant funds, each sub-recipient must attest that:

- There is an operational or ready to be operational cybersecurity plan.
- The plan reflects the latest version of the National Institute of Standards and Technology (NIST) Framework for Improving Critical Infrastructure Cybersecurity.
- The plan will be reevaluated on an ongoing basis.
- The plan will be submitted to the state prior to the allocation of funds.

In addition to the above, each sub-recipient must attest that:

- There is a supply chain risk management plan that is operational or ready to be operational.
- The plan is based on key practices outlined by NIST and specifies the supply chain risk management controls that are implemented.
- The plan will be reevaluated on an ongoing basis.
- The plan will be submitted to the state prior to the allocation of funds.

## NIST and Why We Care

The National Institute of Standards and Technology (NIST) has been a federal agency since 1901 and is currently a part of the Department of Commerce. As the name indicates, NIST is charged with creating the measurements and standards used in science and technological innovation. When it comes to BEAD, not only does this agency perform the pre-award risk assessments for NTIA grants and handle the grant award management, their published frameworks and articles serve as the basis for grant requirements.

Many established and new companies may have cybersecurity plans in place already. This is an excellent practice given that one source, Check Point Research, revealed cyberattacks increased 38% from 2021 to 2022, with a prediction that 2023 may see similar or worse numbers. Ransom demands have skyrocketed; and both large and small companies, public and private, are targets. As the risk rises, it behooves every organization to revisit any cybersecurity plans to assess their alignment with the NIST framework. For those without a plan, it's time to create one.

## Framework Nuts and Bolts

The NIST framework is on version 1.1, with version 2.0 predicted to be released late in 2024. The BEAD NOFO directs sub-recipients to have a cybersecurity plan that reflects the most current version. Our prediction is that 2.0 will provide refinements and address new challenges. The nuts and bolts that hold the framework together will remain the same—meaning, the current framework is still a great guide. It is loose enough to fit a variety of organizations and industries while rigid enough to direct you through the creation of a cybersecurity plan or assess and revise the one you currently have.

The framework is organized by five key components: Identify, Protect, Detect, Respond, Recover.

- **Identify:** Your cybersecurity plan should do more than identify the hardware and software that your company uses. Identification means determining your critical processes—business activities, including collecting customer data or receiving payments—are absolutely vital for you to remain functional. Identification also includes documenting how information flows in your company, determining the threats, vulnerabilities, and risks you face, and establishing clear policies and roles for your cybersecurity activities.
- **Protect:** Consider and document in your plan how you protect your organization. A robust cybersecurity plan has safeguards in place for the devices your organization uses, but also fewer tangible things. The protection part of your plan should outline how you backup your data, how you protect sensitive data, and how you manage access to data by different employees. You should outline any cyber insurance policies you hold. Equally as important is describing how you train your employees. According to an IBM study, 95% of cybersecurity breaches are caused by human

error. Your plan should outline the steps you take to combat this statistic.

- **Detect:** While we may do our best to protect, cyberattacks happen, and detecting them quickly is critical to mitigate harm. Your cybersecurity plan should discuss your detection processes, software, and practices. Include an outline of your testing procedures, their frequency, and the tracking of anomalies in your system. By working through the Identify and Protect part of your plan, you will have documented your company's baseline data flows, which will make it easier to detect anomalies.



**...cyberattacks increased 38% from 2021 to 2022, with a prediction that 2023 may see similar or worse numbers.**

- **Respond:** What do you do when your organization experiences a cyberattack? Your cybersecurity plan should outline each action taken in the event of a breach. Not only should you outline the internal responses and actions, but also information on external communication. Consider legal reporting requirements and which stakeholders must be contacted. NIST suggests testing your plan to make sure all players know their role and to spot areas for improvement.
  - **Recover:** Your cybersecurity plan should outline how you recover from an attack. Include the activities required to repair damages and how you can be resilient moving forward. An important consideration in recovery is public relations—how do you maintain your organization's reputation in the event of a cyber breach? What other communication should take place, and how will it be handled? These considerations will guide you through your recovery and help you avoid reactionary responses that may exacerbate the crisis.
- The nuts and bolts outlined here are a great starting point for your cybersecurity plans. Next, it's time to read the NIST framework. While it seems overwhelming, it is important to review all of it, down to the 108 subcategories. Keep in mind the fierce competition for BEAD funds—the more your plan adheres to the framework, the better your chances of success.

## What About Supply Chain?

The BEAD supply chain requirements do not refer to the physical components of your network (though I encourage you to address your plans to combat those shortages in your grant narrative). Rather, this requirement looks at the cyber supply chain—the organizations, technologies, hardware and software that your company uses and connects to. According to a NIST study, 59% of companies experience a data breach caused by one of their third parties.

Your cybersecurity plan may already address Cyber Supply Chain Risk Management (C-SCRM), or you may be planning to include it in one you create. While the BEAD guidance calls out C-SCRM separately from the cybersecurity plan, you may combine them into one document. LDA predicts the NIST framework 2.0 will address C-SCRM in more detail, so incorporating it into your overall plan now will put you ahead of the curve.

Whether it is a separate document or embedded in your cybersecurity plan, your C-SCRM plan should describe what your supply chain is, what cybersecurity practices your suppliers use, what cybersecurity criteria you require for new suppliers, and what supplier communication plans you have in place in the event of a breach. In addition, consider how you will ensure business continuity if a supplier has a cyberattack, what security controls you have in place for suppliers, and what data your suppliers may have from your organization. Open, transparent discussions with your suppliers will be required for this. Doing this early will also foster a better working relationship with them.

### Do the Homework

Plain and simple—you cannot receive a BEAD funded grant if you do not have a cybersecurity plan that aligns with the

NIST framework complete with a C-SCRM plan. Drafting these plans will take time and involve multiple individuals, so don't put this off to the last minute. We estimate that creating a plan from scratch can take upwards of 50 hours for a small company. The larger the organization, the longer it will take. Use your time wisely and ensure your company is cybersecurity ready for BEAD funds. ■

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**Megan Beresford** is Director of Broadband Programs at Learn Design Apply, Inc. For more information, email [megan.beresford@learndesignapply.com](mailto:megan.beresford@learndesignapply.com) or visit [www.learndesignapply.com](http://www.learndesignapply.com). Also, follow her on LinkedIn: <https://www.linkedin.com/company/learn-design-apply-inc/>.

## FTTX TROUBLESHOOTING

*continued from page 41*

and measuring the power at each wavelength. This information is then displayed on a high-resolution graph known as a spectrum. OSAs are capable of measuring the power and wavelength of light with high accuracy, making them an essential tool for characterizing, optimizing and troubleshooting fiber optic networks. Modern OSAs can perform automated measurements quickly and efficiently, allowing engineers to quickly identify and troubleshoot issues in the network. OSAs can be used with a variety of fiber optic components, such as amplifiers, filters, and multiplexers, making them a versatile tool for testing and troubleshooting fiber optic systems. Like OTDRs, many OSAs feature data storage capabilities, allowing engineers to save, upload and analyze test results over time, helping to identify trends and potential issues in the network.

To continuously monitor multiple fiber links, an operator's network assurance team may rack OSAs in the facility. Facility OSAs are capable of measuring wavelengths, optical signal power distribution, WDM, noise power characteristics, and optical signal to noise ratio (OSNR) measurements of light waves.

The OSNR is particularly useful for long-haul fiber optic networks that contain active components, such as amplifiers, which can add noise to a fiber link. It is defined as the ratio of the optical signal power to the noise power of the link. By performing an OSNR test, engineers can identify why an optical signal that falls within acceptable optical power levels is

not being received. Additionally, OSNR tests can measure the Q-factor, which indicates the minimum signal-to-noise (S/N) ratio required for a specified bit error ratio (BER). Operators aim for a low BER that provides a high Q-factor and OSNR, indicating better receiver performance.

While there are many tools to troubleshoot fiber networks, it's important to understand fiber fundamentals in order to use those tools to their fullest capabilities. If you're a technician and/or engineer, consider enhancing your optical troubleshooting skills and knowledge by taking a certified course such as the SCTE Broadband Fiber Installer<sup>1</sup> (BFI) program. It increases your employability, career advancement opportunities, earning potential and credibility in the rapidly growing field of fiber optic technology. ■

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**Steven R. Harris** is VP, Global Market Development, for SCTE®, a subsidiary of CableLabs®. For more information, email [sharris@scte.org](mailto:sharris@scte.org) or visit [www.scte.org/BFI](http://www.scte.org/BFI). Follow on Twitter @stevenharrisnj and @scte, Facebook @TheSCTE, and LinkedIn: [www.linkedin.com/company/scte](https://www.linkedin.com/company/scte).

# The Nagging Wi-Fi Headache

Cloud Management Can Help Reduce the Pain

BY LASZLO GYALOG

End-users' broadband experience is largely determined by the last couple of meters in the home and in 95% of the cases, that is the Wi-Fi connection. That means, a bad Wi-Fi connection can ruin the whole broadband experience, no matter how many gigabits you bring to the home. Hence, a solid and reliable Wi-Fi connection is paramount for a good broadband experience.

In addition to providing a solid and reliable connection, there are more requirements for Wi-Fi, especially if one looks at the various applications and services people run over their Wi-Fi networks.

Video traffic is, and will remain, the dominant traffic type in the years to come, and its throughput demand in the home will keep growing towards 1 Gb/s with the emergence of more sophisticated technologies like 4K and 8K video.

Simultaneously, interactive applications relying on high-quality video and demanding both high-throughput and low-latency are proliferating. Those that pose the

most stringent requirements are augmented and virtual reality (AR/VR), gaming, remote office, and telepresence. (See Figure 1.)

To satisfy the digital needs and enable a smooth user experience of its occupiers, a residential home network must provide a multitude of reliable and high-capacity wireless links.

Each of these links should be capable of delivering more than 100 megabits per second (Mb/s) with less than 20 ms latency. In addition, a growing number of sensors and smart home devices will populate the home and present more connectivity challenges.

## Wi-Fi Headaches

End-users are still struggling a lot with their Wi-Fi. The problems can be grouped in three categories: performance, coverage, and complexity.

Typically, the Wi-Fi performance is hampered by interference. We oftentimes deal with our neighbors' Wi-Fi interfering with our bandwidth. But we may underestimate, or be unaware, that other things impact Wi-Fi signals like microwave ovens and Bluetooth devices on Wi-Fi.

Additionally, we expect high Wi-Fi speeds, not only in the living room, where typically the residential gateway or router is installed, but in every corner of the home.

And while we think we understand the complexity of Wi-Fi; it remains a difficult technology for the average end-user to master. There are quite a few parameters to consider if we truly want to optimize our Wi-Fi.

These end-user problems (and more) have a severe impact on service providers. In fact, according to Omdia,<sup>1</sup> 60% of all help

	Bandwidth	Latency
Streaming Ultra HD (4K) video	15-30 Mb/s	20 ms
Streaming Ultra HD (8K) video	40-100 Mb/s	20 ms
Real-time imaging (healthcare)	≥30-100+ Mb/s	≤200 ms
Online gaming	3-6 Mb/s	20-40 ms
HD videoconferencing	5-7.2 Mb/s	20 ms
Standard AR/VR (entertainment)	≥130 Mb/s	≤20 ms
Advanced AR/VR (training)	>80 Mb/s	15 ms
Perfect AR/VR	≥1.5 Gb/s	≤8 ms

FIGURE 1. Estimated use case needs for quality video services in terms of bandwidth and latency.



desk calls are Wi-Fi related. Unfortunately, many help desk agents have no visibility into specific in-home networks. That translates into a Wi-Fi related help desk call typically taking between 20 and 30 minutes to resolve.

This adds up to a huge operational expense for the service provider. The only way out is for service providers to offer a managed Wi-Fi service, where they manage the Wi-Fi on behalf of the end-users.



**“Wi-Fi 6 needs to be dynamic in its constantly changing environment. It is always adjusting for interference from neighboring Wi-Fi networks, household appliances being switched on and off or even the user moving around.”**

### Keeping Up

The current generation of Wi-Fi, called Wi-Fi 6, is certainly equipped with a set of features designed to meet current demand. Concurrently, IEEE 802.11 and Wi-Fi Alliance are also preparing for Wi-Fi product upgrades and evolution. This will happen through the ongoing Wi-Fi 6E certification program, which has an objective to add to the existing 2.4 GHz and 5 GHz bands as well as the recently released 6 GHz one.

This ongoing evolution matters because Wi-Fi 6 is the first new generation of Wi-Fi that increases the peak rate and adopts features that are primarily aimed to help heavily loaded networks. These features improve capacity, spectrum efficiency and latency in dense deployments whether they be private or public.

The key features of Wi-Fi 6 are:

- Uplink and downlink orthogonal frequency division multiple access (OFDMA) tightly orchestrates how the spectrum is accessed by all devices in the network, reducing contention, increasing determinism and reliability.
- OFDMA subdivides a channel into small frequency allocations so multiple users, typically up to 30, can use the same channel quasi-simultaneously. This increases efficiency and lowers latency for both downstream and upstream traffic.
- Multi-user MIMO (MU-MIMO) allows multiple streams of data to be transferred at the same time in the same channel. This allows several high-bandwidth applications to run concurrently, increasing the network capacity and efficiency. Wi-Fi 6 extends downlink and uplink MU-MIMO to transmit eight spatial streams simultaneously to eight devices.
- Beamforming, which improves signal strength and reduces interference is enabled through the basic service set (BSS) coloring mechanism. This mechanism enables a device to quickly discard a packet when it's not the intended receiver. The better interference control and improved signal strength

provided by the previous four features can be further exploited by a higher modulation mode (1024 QAM), which enables higher peak speeds.

- A wider channel capability of 40, 80 and optionally 160 MHz offers the possibility for higher peak rates but reduces the number of noninterfering channels in the band. Additionally, targeted wake time (TWT) schedules sleep and wake times for longer battery life, which is particularly beneficial for IoT applications.

### A Mesh to Manage?

Most Wi-Fi households have a single access point (AP), which is likely tethered to their broadband modem via Ethernet or integrated into their residential gateway.

A single AP home may benefit from the latest Wi-Fi technology, such as Wi-Fi 6. Then, it can be extended with a second AP, commonly known as mesh Wi-Fi or whole-home Wi-Fi. Mesh Wi-Fi improves Wi-Fi coverage and the quality of the customer experience. But the need for managed Wi-Fi grows exponentially with mesh Wi-Fi (multiple mesh APs), because it adds another layer of complexity that requires management of the mesh backhaul between two mesh APs.

That's why a service provider managed Wi-Fi solution ensures the best possible broadband experience for end-users. It does this by automating the Wi-Fi optimization process as much as possible, resulting in a self-optimizing network; by dynamically adjusting Wi-Fi settings to mitigate any potential issues and provide the highest throughput to all devices. It also provides CSPs the tools to effectively manage Wi-Fi-related problems when they occur.

To put it simply, Wi-Fi needs to be dynamic in its constantly changing environment. It is always adjusting for interference from neighboring Wi-Fi networks, household appliances being switched on and off or even the user moving around. A surprising challenge is the weather radar. If they begin scanning, regulations may call for neighborhood Wi-Fi access points to stop using the needed frequencies.

As such, it's critical that Wi-Fi APs have embedded algorithms to detect and mitigate these real-time issues. Should there be interference, the algorithm can select an alternative channel. This process of band steering is similar to client steering because it needs to happen in real-time, and is referred to as real-time, reactive Wi-Fi optimization or “self-optimizing” Wi-Fi.

### Optimizing Cloud-Based Wi-Fi

Through computational power and data collection, additional cloud-based algorithms can complement local optimization to create thorough, proactive Wi-Fi optimization.

In this situation, GDPR-compliant data is anonymously collected without any ties to personal information. By analyzing the data, the algorithms can change Wi-Fi parameters or enforce specific policies—providing valuable alerts and reports.

Better yet, the cloud allows visibility into neighboring Wi-Fi Aps—mitigating the impact of the Aps on each other. Examples of proactive Wi-Fi optimization include long-term frequency planning, transmitting power control, and load balancing across channels and bands.

Just recently, Nokia launched its new flagship Wi-Fi device, called the *Nokia WiFi Beacon 10*, which supports Wi-Fi 6E and allows mesh networking to extend the coverage to any size home with a Wi-Fi throughput of up to 10 Gbps.

All of the aforementioned needs to be considered when establishing a solid and reliable Wi-Fi connection. By overcoming these challenges, CSPs can deliver Wi-Fi 6 and ensure their FTTx home deployments result in end-user delight. ■

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**Laszlo Gyalog** is the Marketing Director - Broadband Devices at Nokia. For more information, email [laszlo.gyalog@nokia.com](mailto:laszlo.gyalog@nokia.com) or visit [www.nokia.com/networks/fixed-networks/home-wi-fi](http://www.nokia.com/networks/fixed-networks/home-wi-fi). Follow him on Twitter: [www.twitter.com/Laszlo\\_\\_G](https://twitter.com/Laszlo__G). Follow Nokia on Twitter, LinkedIn, and Facebook @Nokia.

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## 8

# Steps to Net Zero

Real-Life Recommendations to Help Reduce Data Centers' Carbon Footprint

BY KIM GUNNELIUS

A little less talk. A lot more action, please.

When it comes to reducing carbon emissions and implementing sustainability focused operations, this is the sentiment felt across the data infrastructure industry—and across the entire global business world for that matter. As data centers continue to gobble up more and more of the world's electricity, the time for talk is over. The time to act is now.

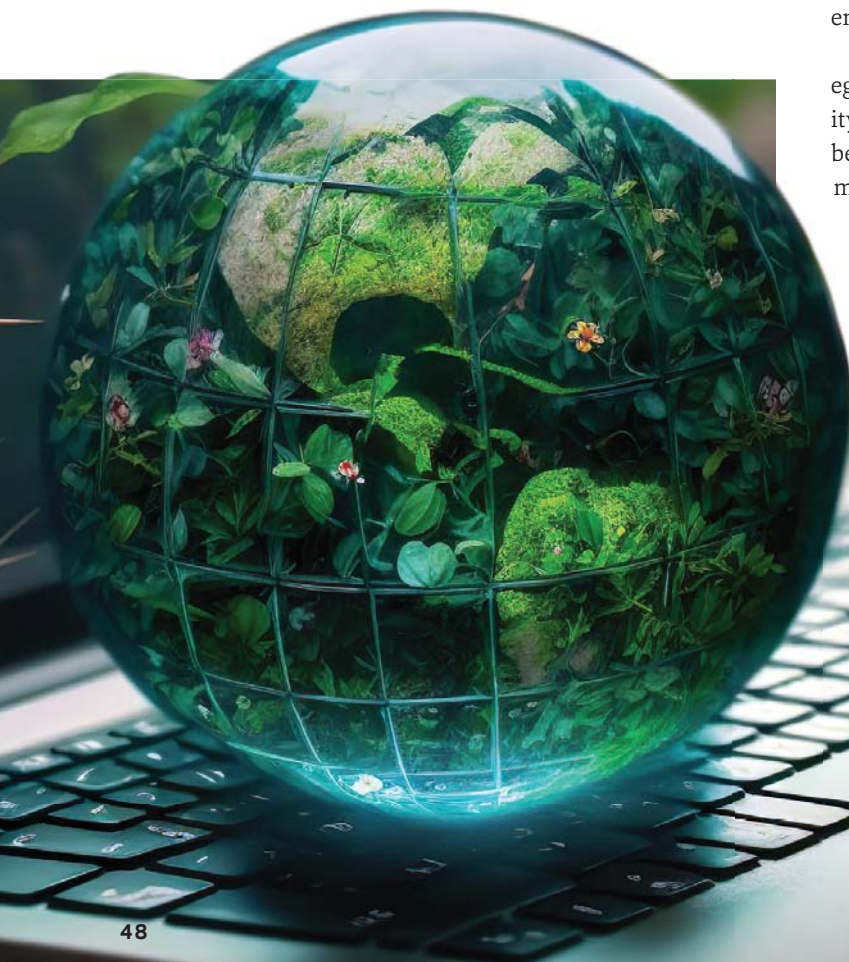
But what does that actually mean? How can data centers and telecom companies turn this demand for change into real actionable steps that deliver carbon-reducing results? Data center leaders know something must be done, but it can be daunting to know where to start. The good news is, any action, whether large or small, can have a significant impact on making the world a greener place. With any new business challenge we face, you just have to start somewhere. So, let's go. We've compiled eight key recommendations to help you get started on your carbon-neutral journey.

## 1. Set a Sustainability-First State of Mind

First thing's first. To make sustainability the top priority in every conversation and every decision, it has to start with establishing the right frame of mind for not only you, but every employee within your organization. From your executive leadership team to middle management to entry-level employees, getting buy-in across your entire team will ensure sustainability is a key focus at every turn.

Start by developing an internal communications strategy that clearly and effectively explains your sustainability goals and why they are important. Gaining buy-in can be challenging, but clear communication will help get your message across. And if you can find a way to show how your new strategy impacts employees on a more personal, individualized level, your teammates will be more apt to recognize their role as a true driver of change.

Monetary costs may also be a barrier to overcome as far as buy-in goes. However, your sustainability



strategy should not be thought of as just a box to check off your list or another line item in the annual budget spreadsheet, and it most definitely should not be thought of as a hindrance to achieving solid financial gains. In fact, establishing an effective sustainability strategy can bolster the success of your business and strengthen your reputation in the marketplace. Putting resources toward going carbon neutral is an invaluable investment that will not only appeal to your customers and investors but will also have a lasting impact on the health of our planet and how we leave it for the next generation.

## 2. Understand Your Carbon Emission Sources

To ensure the actions you take are measurable and the sustainability goals you set are realistic and achievable, it's a good idea to assess where your company currently stands in terms of emission sources and their scope across your business operations. Be sure to look at the direct emissions your business activity creates and indirect emissions that come from the electricity or heat your company uses. Most importantly, do not forget to factor in the emissions that come from all other indirect business activities produced by your suppliers, partners, and vendors. These indirect sources can account for a large percentage of your overall emission impact and can include emissions generated from travel, construction components used, and even your customers' use of your facility throughout its entire life span.

## 3. Seek Out Green Energy Sources

Consider changing up your company's energy sources. Depending on your data center location, you may be able to harness the power of wind turbines or solar power for cooling during warmer times of the year.

Also consider employing emerging green energy sources, such as hydropower or green hydrogen, which involves the process of using renewable electricity, such as wind or solar power, to split water and produce hydrogen in an environmentally responsible way.

## 4. Optimize Energy Consumption of New Builds and Existing Facilities

Whether you are looking to optimize energy consumption at an existing data center, acquire a new facility or build a new one, make sure to look at the ratio between the total energy consumption of your facility and the energy consumption by your IT equipment, aka the Power Usage Effectiveness ratio (PUE). Once you have a solid understanding of your optimization potential, it will be much easier to identify the best ways to cut energy consumption.

## 5. Utilize Free Cooling and Reuse Waste Heat

A cooling system is one of the most important—and one of the most massive—systems inside a data center. It also has the ability to consume a significant amount of energy. So, how do you optimize the energy usage of your cooling process? One way is to utilize a modular structure within your data center to leverage “free cooling”. This practice consists of establishing cold and hot aisles where only the area currently in use needs to be cooled.

Another way to optimize cooling is to take advantage of naturally cool climates and temperatures rather than using mechanical refrigeration. While this may not be a realistic option for data centers located in warmer climates, those that are located in colder areas, such as northern US states or some European countries, can significantly reduce energy use, even if it's only feasible within three or four months out of the year.

Beyond cooling solutions, data centers can conserve energy by reusing waste heat. Rather than releasing excess heat into the atmosphere, waste heat can be used to warm local homes, businesses, greenhouses and even swimming pools.

The Air, a Verne Global Finland data center, located in Helsinki, is the first hyperscale-level, climate-certified data center in the Nordics utilizing green energy and heat reuse technologies.



## 6. Recycle Relentlessly

Everyone knows recycling can go a long way in helping organizations reduce their carbon footprint, and establishing a deep commitment to recycling is critical to any sustainability strategy. The key is to make sure your waste is disposed of properly and is recycled. Pay close attention to how your electronic waste is disposed of and how much waste is generated from data center equipment packing materials. It is also worthwhile to evaluate your suppliers and vendors to ensure they are using environmentally responsible materials and are implementing green practices across their own operations.

## 7. Monitor Energy Usage in Real Time

While it may take some time and technical savvy to set up, establishing a way to monitor electricity usage in real time is a great way to keep tabs on what's happening in your data



The Rock, a Verne Global Finland data center, located in Pori, built inside Finnish bedrock in an underground network of tunnels and equipped with its own solar power plant.

center. Also, when customers have the ability to monitor their servers' workloads, electricity usage and the associated costs tied to it, they are better able to make decisions related to efficiency and their environmental impact.

## 8. Get Involved with Like-Minded Companies

And finally, another way to kick start your journey to net zero is to collaborate with other companies that share your passion for sustainability and dedication to acting. As they say, there is great power in numbers, and working together toward a common goal can result in a bigger win overall.

For example, last year, our Finland-based data center and colocation company<sup>1</sup> (previously Ficolo) joined forces with Verne Global<sup>2</sup> as part of Triple Point's Digital 9 Infrastructure<sup>3</sup>. Working with these sustainability-focused companies that share our deep commitment to the environment, we have been able to combine our resources and expertise to accelerate global connectivity and drive progress toward carbon negativity.

Attend sustainability focused tech conferences and join environmentally focused associations and movements, such as The iMasons<sup>4</sup> or Greener Data<sup>5</sup>. If you get the chance to participate on a panel or have the opportunity to be interviewed about your sustainability journey, take it! The more you share your story, the more companies you will inspire to create their own goals to go green.

## Begin Your Sustainability Journey Today

From recycling to leveraging green energy sources to partnering with like-minded companies, there are many simple yet powerful actions you can take to begin your journey toward achieving net zero. As leaders in the tech and digital infrastructure space, we typically don't shy away from innovation or blazing our own trails. And becoming an innovative agent of sustainable change is no different. You just have to take the first step. ■

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**Kim Gunnelius** is Managing Director of Verne Global Finland (formerly Ficolo). To learn more, visit [finland.verneglobal.com](https://finland.verneglobal.com). Follow them on Twitter: <https://twitter.com/VerneGlobalFI>, LinkedIn: <https://www.linkedin.com/company/verne-global-finland>, Facebook: <https://www.facebook.com/verneglobalfinland>, and YouTube: [https://www.youtube.com/channel/UCz9mcm8IMSAfn\\_IUSvJSbiw](https://www.youtube.com/channel/UCz9mcm8IMSAfn_IUSvJSbiw).

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# Being **Street Smart** About 5G Densification

## Eight Creative Solutions

BY FERGAL LAWLOR

**W**ith 5G rollouts multiplying worldwide, it's no surprise that there is a growing need to densify deployments. At the same time, pursuing a traditional deployment approach is difficult because new macrocell sites are becoming scarcer and more challenging. As a result, network operators in many locations are increasingly relying on small cells—particularly in dense urban environments—transforming the way networks are built and perform.

However, many municipalities, city residents and suburbanites are opposed to the potential clutter and construction disruptions that additional network deployments can create, making the process of securing new site locations increasingly complex. To address this challenge, smart city innovators are turning to new form factors and more aesthetically pleasing solutions that allow network infrastructure to be hidden in plain sight.

Beyond the complexities of obtaining zoning permits, other hurdles include the fact that macrocell sites in many cities are already saturated, as well as the disparities of 5G spectrum propagation characteristics. For example, using mid-band or mmWave frequencies to quickly increase capacity means that a traditional macrocell site plan is not feasible.

In an effort to adapt to these new deployment realities, many network operators worldwide have transitioned to street level small cells. The downside is that when small cell deployments are undertaken with an ad hoc approach, this can lead to excessive clutter due to separate street facilities, unsightly equipment tacked on to existing street works, and repeated civil works costs and disruptions. This issue is particularly glaring when existing streetlights are retrofitted with externally mounted radio equipment, as opposed to installing integrated equipment.

### Dublin Gets Street Smart

Like many other metropolitan areas, the Irish capital city of Dublin has experienced a post-pandemic resurgence, driving the need for greater mobile capacity to serve a population of workers, residents and tourists that exceeds one million. Subscriber data demands are still growing, but existing network topology is already significantly dense.

Although the Dublin City Council was keen to increase network capacity in the urban center, there were very real concerns about the potential for unsightly infrastructure deployments throughout an historic tourist destination. To avoid such an outcome, a smart connected waste bin solution was deployed as part of a Telecom Infra Project (TIP) Connected



**FIGURE 1.** New small cell deployments in Dublin included a smart connected waste and recycling bin, the Big Belly Telebelly, which conceals radios, power, and transmission equipment discreetly within a sensor-equipped enclosure.

Photo source: Alpha Wireless

City Infrastructure project, enabling increased connectivity and improved services as part of a Smart Dublin initiative.

When planning new 5G densification strategies, there are a number of various factors broadband service providers should consider as they work with cities. Several include:

1. Target areas of network congestion in shopping areas, mass transit locations and public parks.
2. Be aware of key aesthetic requirements for heritage districts and other high-value real estate.
3. Find ways to minimize the number of disruptions and costs of future civil works projects.
4. Leverage multi-purpose street works to reduce street clutter and deliver improved services for enhanced community experiences and economic development. Consider creative options like smart connected waste and recycling bins. One example is called Telebelly. It conceals radios, power, and transmission equipment discreetly within a sensor-equipped enclosure that also serves to collect trash. The sensor within it can communicate real-time status to waste collection crews to ensure optimized efficiency of trash removal. (See Figure 1.)
5. Be sure the antenna fits the smaller site footprint and improves aesthetics. Canister antennas can be mounted on masts integrated into the smart bin. The use of an omnidirectional canister antenna solution not only enables increased coverage in a compact form factor, but it also allows compliance with strict size limits for small cell sites as outlined in Article 57 of the European Electronic Communications Code (EECC).
6. Be sure your urban network densification plan has the fiber access and power requirements it needs. These resources are often reliant on legacy infrastructure systems that are available or not available to particular locations. In the case of the Dublin project, fiber resources were readily available, due to a large number of data centers operating in the general vicinity. Access to power, on the other hand, was particularly difficult. The city's existing streetlights relied on an unmetered power supply that the city purchased according to a fixed dusk-to-dawn tariff. This legacy system was unable to accommodate additional connections and billing for the new sites attached to unmetered street works infrastructure. Ultimately, the Dublin utility had to develop a new system to support power for the small cell deployments.
7. Another issue network operators have faced for several years is gaining community support for new 5G network deployments. In order to overcome potential concerns related to the safety of 5G technology, a public information campaign was implemented to educate Dublin residents. In a similar manner, educational campaigns can help city officials better understand how street works sites can be deployed at scale with minimal disruption to the urban landscape, and without impacting the city's infrastructure or the residents that live there.



**FIGURE 2.** Pictured is a multi-band, tri-sector antenna deployed by Cellnex in the village of Vicarstown, County Laois, Ireland. Photo source: Alpha Wireless

8. Educate, educate, educate. The more facts you share about the benefits of multi-use solutions, the more likely communities will embrace future smart use cases. One being explored in Dublin is using IoT enabled monitoring sensors to map the city's air quality.

## A Smart Future in Sight

Connectivity demands and changing regulations around tower deployment are giving rise to new site deployment approaches in many urban and suburban areas. One solution is leveraging a neutral host model that enables rapid and affordable build-out of 5G sites with multiple operators sharing the costs. (See Figure 2.) This has the potential to reduce CapEx budgets and offset significant investments in spectrum licenses. Shared sites can also lower the barrier to market entry for greenfield operators that do not have an installed base of legacy infrastructure.

This transformation is driving the adoption of innovative solutions and smart, multi-purpose street works deployments that are economically viable, visually appealing, and capable of providing public service benefits for the community.

After completion of the initial small cell deployments in Dublin, the TIP Connected City Infrastructure project group created a *Mobile Connectivity Playbook for Cities* that can help city governments and mobile network operators develop a more cohesive approach for the installation of street assets as part of their 5G network densification initiatives. The playbook helps both stakeholder groups improve their networks to advance their smart cities and be good stewards for their communities. ■



**Fergal Lawlor** is the CEO of Alpha Wireless, which he founded in 2007. For more information, email [sales@alphawireless.com](mailto:sales@alphawireless.com) and visit [www.alphawireless.com](http://www.alphawireless.com). Follow them on LinkedIn: [www.linkedin.com/company/alphawireless](https://www.linkedin.com/company/alphawireless).



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# How Does Your 5G Site-Candidate Interview?

Telecom Solutions: Learn How Software-Assisted Mobile Site Acquisition Can Vet Your Candidates the Right Way

BY DARIA BATRAKOVA

**A**s data consumption surges, mobile network operators (MNOs) are tasked with increasing network bandwidth and capacity. To achieve this, 5G deployments must be accelerated. Rolling out new 5G radio access networks (RANs) will give networks the additional bandwidth needed to transmit massive amounts of data with minimal latency. Yet, they also

add to the demands of the backbone network infrastructure.

Since 5G radio doesn't broadcast as far as older 4G versions, many more sites are needed to fill in coverage gaps. These sites include the entire set of equipment needed to receive and transmit radio signals for cellular services, as well as equipment to process these signals. A typical cell site will include

antenna systems, RF units, power amplifiers, combiners, filters, a baseband unit (BBU), a power supply, and network interface modules.

Keep in mind, there is a rigorous selection and build process behind each cell site, and only one candidate out of multiple alternatives will be considered for build. The types of sites needed within the network vary greatly, from small cells to distributed antenna systems (DAS) to macro towers. Every site candidate must be evaluated to ensure it is fit for the purpose. For example, towers may have to adhere to height restrictions while small cells, which operate at higher frequencies, are subject to strong emitting power limitations. Additionally, every potential site must tick multiple checkboxes before the design and build can even start. Approval from local authorities—in the form of environmental, safety, and building permits—is an absolute precondition.

As project managers research locations, factors including the line of sight to users, access to power supply and a backbone transport network (or wireless line of sight), and contract terms with the property owner, all must be considered. When multiplied by the tens of thousands of sites that a 5G mobile network needs, the complexity of mobile site acquisition increases.

## Utilizing Software to Support RAN Rollout Processes

Data pertaining to the possible sites must be collected in an organized manner and stored in a central location so that all candidate information can be easily accessed, shared, and evaluated. After a site candidate is selected, the planning and procurement of site assets can begin. Due to their complexity, these assets need highly sophisticated rollout management. After all, there will be hundreds, if not thousands, of configuration parameters per site, per technology.

Fortunately, software solutions can make it easier to find, plan, and

document all facets of the RAN rollout process. Features that will yield the biggest benefits include one central database, GIS-based location intelligence, analytics, and an information bank.

### A CENTRAL DATABASE

Rollout project managers must know exactly which sites are available and have access to detailed information about them. A solution that provides a verified inventory of all sites, their infrastructure assets, active equipment, cabling, power, cooling, and configurations is business critical.

All physical, logical, and virtual resources, along with acquisition data, should be stored within a central data-

The combination of location intelligence with site data, site equipment, and network infrastructure details enables planners to streamline the fiber and microwave deployments needed to connect sites.

### 2. Accurate Reporting and Analytics.

Configurable reports that provide real-time data can help MNOs determine if a site meets certain criteria. Making these determinations is more efficient and accurate when aided by interactive dashboards that analyze theoretical sites and candidates with their relations. These dashboards can take care of the heavy lifting and deliver reliable, objective answers to the evaluator's most pressing questions.

### 3. "Friendly Site" Information Bank.

As new sites can be added to the network at any time, site information should always be retained. Look for a solution that can store information collected about sites that were not selected and make it available for later profiling and rating. Real estate and facility documentation should be stored within its content management system, similar to how technical information about infrastructure assets and resources is documented.

### Site Selection Made Easy

Overall, site selection is a complicated process that can be made easier with software. One example is FNT Command. Figure 1 illustrates how software can be used for the planning and storing of site candidates.

Before any work can begin, a nominal site must first be created in the software. A nominal site represents the

search area for a future site. It must be supplied with its geo-coordinates and a search radius.

Assuming that the "friendly sites" were populated into the software's database independently from nominals, you can now search for the best site candidate. The ideal software will perform a radius search of a nominal, which will yield candidate sites, which are your buildings, poles, and existing partner sites. (See Figure 2.)

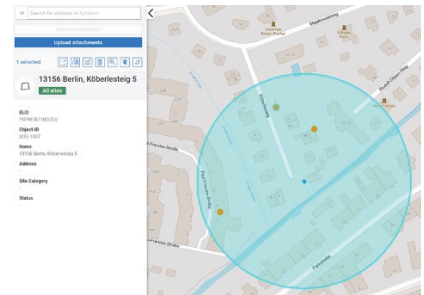


FIGURE 2. Nominal and candidate view.

Each candidate can then be supplied with a variety of additional information needed for profiling and rating. Such information includes existing contractual relations with owners and site sharing information.

Based on the best match to certain criteria, one site candidate will be selected for further development. At this point, a physical location can be linked, and the user can drill down to the details of the sites.

With a software solution that supports the integrated management of telecommunication infrastructures, IT assets, and data centers, all necessary information will be available to streamline site selection processes. ■

base and managed holistically. This will give project managers a complete view that can assist with decision-making and enable network engineers to concentrate on planning the new backhaul links, POPs, and edge data centers—all using the same database. Three components of this database can also serve as a digital twin of the network.

**1. Geographic Information System (GIS).** A combination of GIS-based location intelligence and network infrastructure details can streamline site selection and management.

A solution that integrates GIS-based location intelligence with a digital twin of the network takes site management to another level by enabling users to visualize sites and site candidates on maps and analyze information about site acquisition status. With the right solution, POPs, along with RAN, can be viewed on the same map.

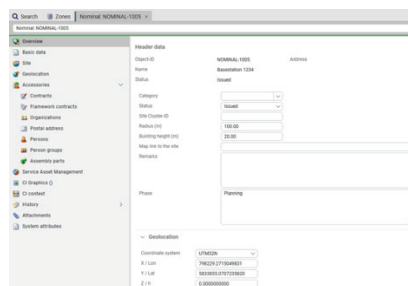


FIGURE 1. Main nominal tab in navigator in FNT Command.

Daria Batrakova is Director, Business Line Telecom Solutions at FNT Software. For more information, email [marketing@fntsoftware.com](mailto:marketing@fntsoftware.com) or visit [www.fntsoftware.com/en](http://www.fntsoftware.com/en). Follow Daria on LinkedIn: [www.linkedin.com/in/dariabatrakova/](https://www.linkedin.com/in/dariabatrakova/). Follow FNT Software on Twitter: [twitter.com/FNTsoftware](https://twitter.com/FNTsoftware), and LinkedIn: [www.linkedin.com/company/fnt-software/](https://www.linkedin.com/company/fnt-software/).