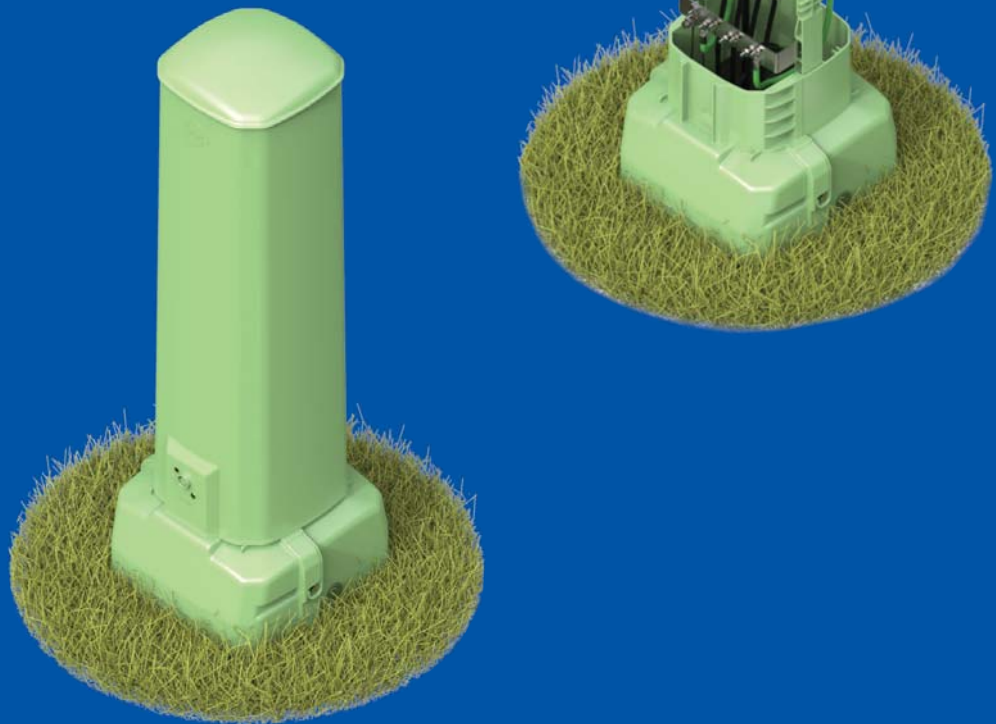


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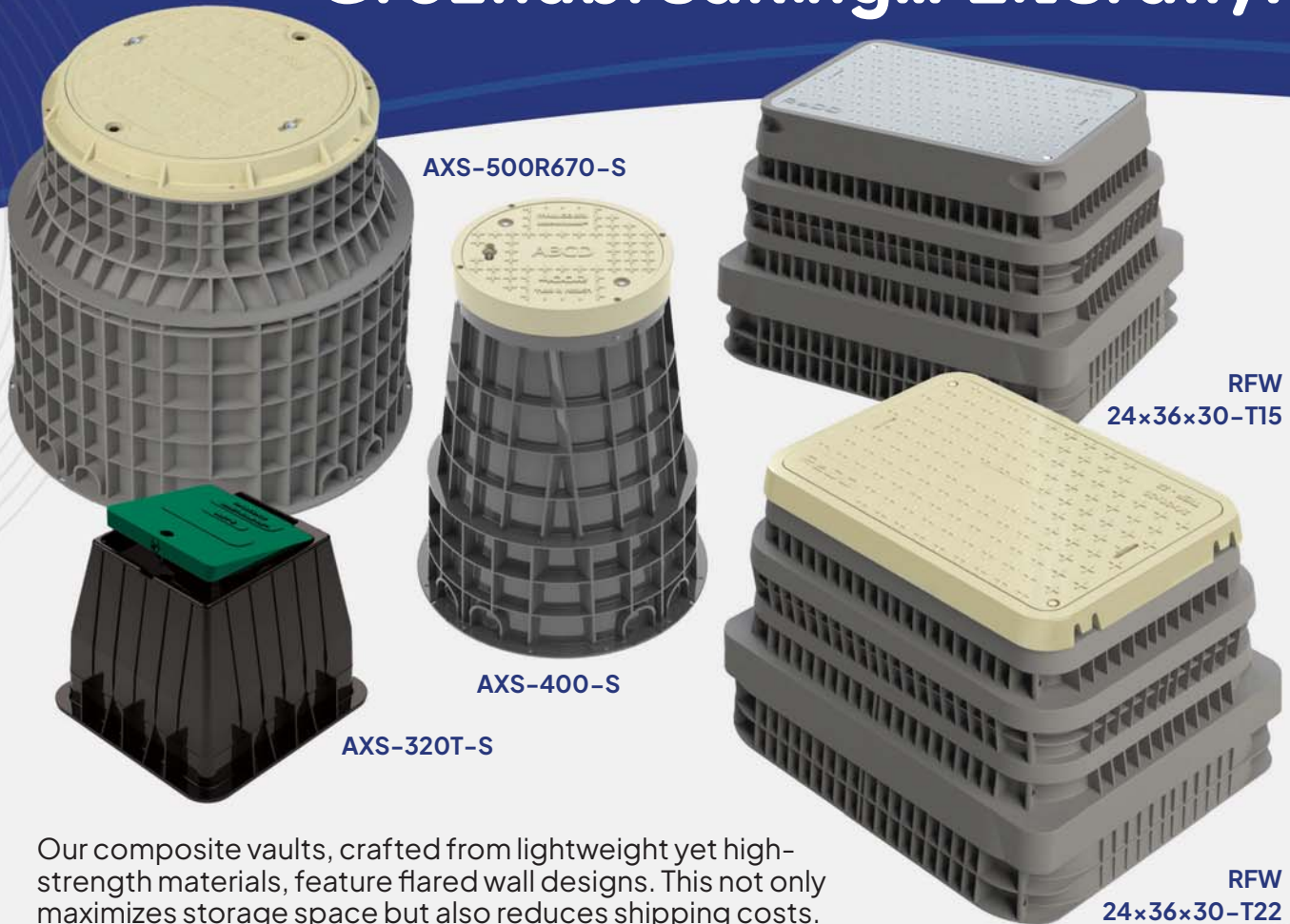


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RFW 24x36x30-T22	24.00" x 36.00" x 30.00"	275	Tier 22	10	150

\*Dimensions are Approximate

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“Training programs and certifications are undoubtedly helpful. However, particularly in rural areas, we need to structure these to allow for on-the-job training.”

JENNIFER PRATHER, CEO, TOTELCOM COMMUNICATIONS, LLC.  
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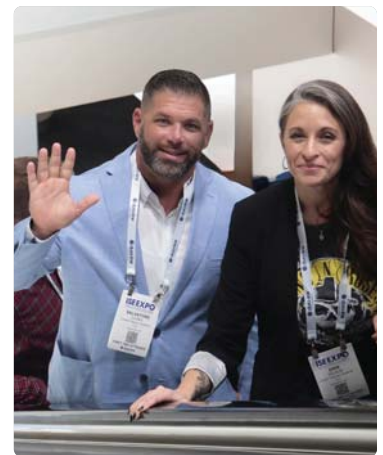
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## ICT Visionary Q&amp;A

# Johnny Hill

## COO, Clearfield



Clearfield's FiberFlex product line allows broadband service providers to embrace network transformation while leveraging the investments they have made in our passive products and position them for the next evolution in network architectures.



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

**ISE:** What are two big challenges Clearfield faces in terms of network evolution/transformation?

**Hill:** I've always tried to keep the passive network architecture as simple as possible. It's just plumbing. Big pipes split and feed smaller pipes until we get the water out of the faucet. The rate of water delivery varies depending on the quality of the network. Leaks occur or break and having a network that allows you to fix those breaks and leaks is critical. Simple. With fiber networks, the technology changes but the media remains the same. Evolving networks are simply network changes as a function of time. Adding network elements (splitters, wave-division muxes, additional fiber runs) are examples of those changes along with the technologies that run over them. Keeping up with those changes and those that come full circle is best served with a modular approach to the network that allows critical network consolidation/distribution points of fiber to be hot swapped as those fiber plumbing architectures evolve into the next best thing. This supports the network transformation we are seeing with network service providers becoming digital service providers by changing their networks into more virtualized, cloud-based architectures. This cloud transformation requires that the "plumbing" changes somewhat to push what makes sense for reduced latency and processing efficiencies to different areas of the broadband delivery system like the network edge. Clearfield's FiberFlex product line allows broadband service providers to embrace network transformation while leveraging the investments they have made in our passive products and position them for the next evolution in network architectures.

**ISE:** What are the best ways to get fiber deployed quickly to the underserved and unserved while reducing costs at the same time?

**Hill:** Network performance, maintenance, and upgradeability must be considered when choosing a deployment strategy. A fiber network build that concentrates splicing in the fewest areas of the network as possible and leverages plug-and-play products where possible promotes a deployment model that utilizes skilled laborers in network environment locations that optimize their time and gains efficiencies. Lower skilled laborers perform the plug-and-play activities of the network with minimal but necessary training. Several network architectures support this model with varying degrees of costs in CAPEX and OPEX. Clearfield Application Engineers are experienced professional resources that are available to help a provider understand the pros and cons of each type of network architecture—helping them to determine the cost/benefit against their short- and long-term goals.

**ISE:** What is the telecom industry missing in terms of recruiting/retaining younger professionals? What is Clearfield doing in this area?

**Hill:** It's safe to say that broadband services are a necessary utility in today's world. Outside of a certification program that the FOA provides, there really is no apprenticeship program that every other utility trade has. In the past, this type of training, experience, and earned certifications were provided by the telco companies who used the BellCore standards to qualify and certify their technicians. In large part, these training organizations have been eliminated and the demand for training now falls on the manufacturers to provide. Clearfield recognized this long ago and invested significant resources in people, training programs, and additional tools like our Bilt app that are designed to align with today's modern technology learners to provide multiple avenues of product and industry certifications that will be seen as a real credible asset for broadband providers. ■

# And the BEAD goes on...

**LAST ISSUE I WAS TALKING ABOUT** the beginning of the new year, but now we're in the thick of it, aren't we? For New Year's resolutions, I'm happy to report I'm still running most days, eating better, and enjoying new hobbies.

But you don't care about my resolutions. What you might care about is how we're doing on the promises made by the industry and by government to deliver the rural broadband promised to so many American families who are at a disadvantage to the rest of us when it comes to connectivity.

BEAD has moved into its next phase and we're all waiting to see how it all plays out. It's another great experiment to see what's possible when the forces of commercialism and government press their rings together to unlock the power of cooperation and attain a goal everyone says they want. How will it end? Without rural broadband access, the country will be divided in two, with only one group reaping the benefits of innovation. We simply can't let that happen.

In one of our features this issue, you'll see what happens when citizens who have been left behind take matters into their own hands, with the first subsea cable company owned by a sovereign Indian Nation.

You'll also learn why U.S. veterans should consider a career in telecom, a feature on why we shouldn't let the workforce gap hinder this "historic opportunity," and much more. Be sure to check out the attendee guide for ISE EXPO, too.

Speaking of ISE EXPO, I want to take this opportunity to personally invite you to submit your application for the ISE Network Innovators' Awards this year. You and your team deserve recognition for the countless hours you've all put into transforming the industry with your work. Now, let us



Joe Gillard

EXECUTIVE EDITOR

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recognize you. I hope you apply, and I greatly look forward to the opportunity to meet the honorees this year at ISE EXPO.

With winter coming to an end, let's thaw out and spring into action. The future of the network in the U.S. begins this year. We all have our roles to play. So, keep reading ISE Magazine, sign up for our new weekly newsletter, *ISE Insider*, if you haven't already, and be sure to check out *Telecom Top 5*, our new podcast. Enjoy the issue!





# FLAT OUT FAST

## Flat Drop Fiber Installation

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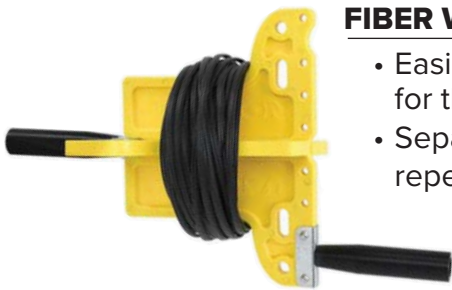
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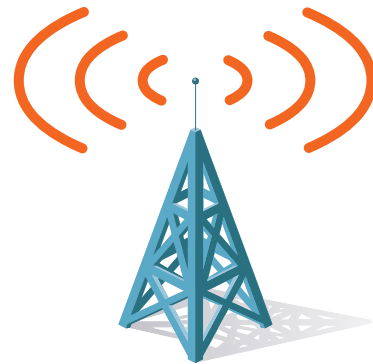




## Who wants to be a trillionaire?

In February this year, AI technology company **Nvidia's market capitalization reached \$1.83 trillion**, surpassing both Amazon and Alphabet.

SOURCE: CNN.com



## IT'S FIXED

Ericsson projects **global FWA connections to increase to 330 million by the end of 2029** or 18% of all fixed broadband.

SOURCE: Ericsson



## FOOTING THE BILL

A Cisco poll found that **77% of respondents in Europe, Middle East and South Africa would pay more for broadband** with a lower carbon footprint.

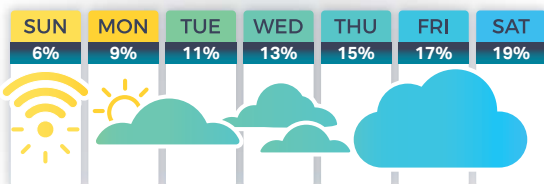
SOURCE: Cisco



## How fast is your internet?

Japan set the **data transmission speed record at 319 terabits/second**—across more than 3000 km.

SOURCE: IEEE



## Forecast is cloudy.

A poll found that more than **half of organizations expect a 6%–19% increase in cloud investment** over the next one to two years.

SOURCE: Deloitte



## NO LIGHTS, NO CAMERA, ACTION!

This year, **OpenAI shocked the industry when it unveiled Sora**, which can generate realistic video clips with only a text prompt.

SOURCE: The New York Times

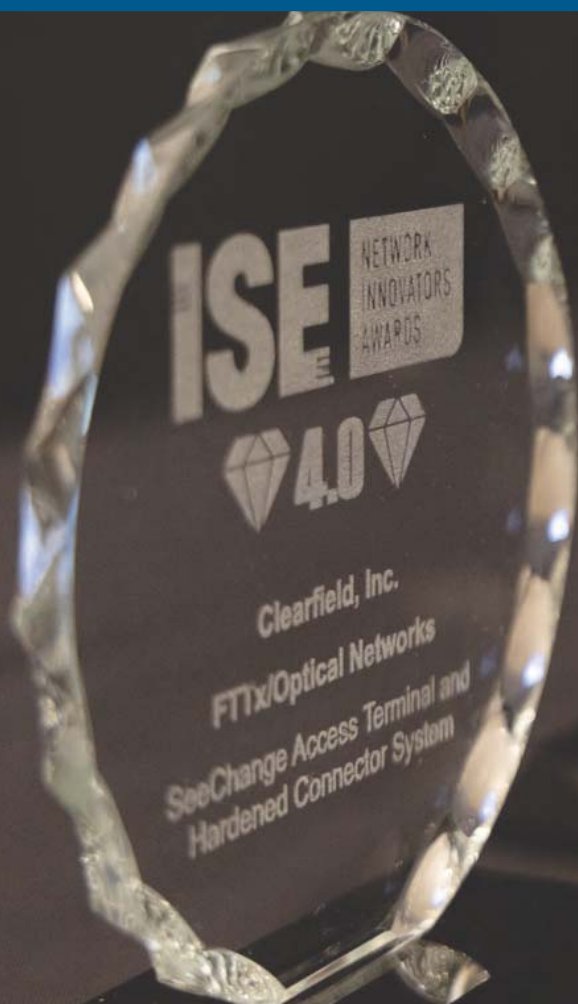


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# 2024 Forecast: Disasters Coming!

**THE WASHINGTON POST NEWSPAPER** for January 4, 2024, had an interesting headline: "Virtually the entire Lower 48 is about to experience extreme weather." The sub-head was "U.S. weather is about to go crazy. From tornadoes to blizzards to massive waves, here are seven things to watch."<sup>1</sup> Perhaps I should have written "scary headline" instead of "interesting headline." Maybe we've gotten used to these kinds of headlines, but I bet everyone reading this has a story to tell about the weather in their region in the last year or two.

Last Summer I received a call from FEMA, the U.S. Federal Emergency Management Agency, looking for information on restoration of fiber optic networks. FOA has quite a lot of information on the website about restoration, originally created based on the fears about "backhoe fade," dig-ups of underground cables (almost a daily occurrence), and damage to aerial cables caused by "target practice" (also fairly common).

FEMA, however, was focused on natural disasters like hurricanes and tornadoes, flooding, wildfires, and other disasters

that are reported almost daily in the news. Over a long call, I learned their response to disaster recovery prioritizes restoring power and communications, both necessary for recovery efforts to be successful. Other priorities like medical assistance, potable water, food, etc. all need power and communications to coordinate relief efforts. Armies of experienced techs are needed to restore the electrical grid and communications networks; coordinating those efforts are a major part of FEMA's work.

Compared to natural disasters, backhoe fade and target practice are minor annoyances. They are localized and a couple of experienced techs can make repairs quickly. In a natural disaster, hundreds of utility poles may be down,

---

**"The question asked was 'how do you thaw up a frozen manhole?'; the answer was 'wait for springtime.'"**

---



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manholes flooded, and sometimes equipment destroyed, flooded, or burned out. Entire towns or regions can be cut off from communications, exactly what happened when Hurricane Otis hit Acapulco last year.

And weather events are getting worse. East coast cities are facing worse weather events combined with sea level rise. Here in California, we have hotter, dryer weather intensifying the wildfire season in parts of the state and flooding caused by monsoon rains in others. We even have record snowfalls in parts of the Sierras burying houses all winter. Don't even mention earthquakes! According to a recent report published by Next Century Cities, the number of "billion-dollar disaster events" has quadrupled in the last 40 years.<sup>2</sup>

Our conversation with FEMA eventually turned to how project design can mitigate disaster effects. One California electrical utility is vowing to move their transmission and distribution lines underground in wildfire-prone areas. The cost is astronomical, but so are the payouts they are making because their aerial cables started past wildfires causing billions of dollars of damage.

Practically every disaster story seems to show pictures of utility poles that have crashed down across roads. Yet many



*A wooden utility pole after a wildfire.* Courtesy of Jim Hayes



*All that remains of two aerial cable plants.* Courtesy of Jim Hayes

service providers I've talked to about fiber broadband projects with the coming Federal BEAD funding are focused on aerial cable plants. The reasoning is almost always the same, aerial costs less than underground. At least until the first time it needs rebuilding.

We know regions that no longer use aerial cable plants, especially in Northern climates where winter icing is common or dry areas where wildfires are expected. Does aerial make sense in an area that expects several hurricanes a year? Or when new technology like microtrenching makes underground construction much easier and less expensive?

It's not just aerial cables that are at risk. We've seen flooding in many areas during this very wet winter/spring and sea rise is threatening many coastal cities. That can cause problems with underground infrastructure if flooding has not been considered in the design, especially for coastal cities where flooding is salt or brackish water.

Winter can bring a special set of problems to underground cables. FOA has been sent photos of splice closures that filled with water and froze, disrupting the network. FOA was even sent a photo of a flooded manhole that froze solid in a very cold winter. The question asked was "how do you thaw up a frozen manhole?"; the answer was "wait for springtime."

Wireless towers are at risk also. Wind, icing, and the combination of both can bring down towers. During last year's California wildfires, several towers were in the middle of the fires but fortunately the owner had created sufficient fire breaks around them to protect them.

Heat is another weather issue to consider. Last year, regions in Arizona and Texas had months of 100+ degree weather and days at 115 degrees. What effect does that have on your equipment? We all know it affects workers, so much that OSHA was issuing heat advisories about dangerous working conditions last summer.

With all the disruptive weather we have been having, others have contacted FOA to ask for advice on planning and designing networks to survive disasters. It's obviously not a simple subject and there will be a wide variety of conditions to plan for, depending on where you live. Planning really takes two paths, how to mitigate damage to your networks in weather disasters and, secondly, how to react when disaster strikes.

While FEMA is concerned and may influence government rules and regulations, local government agencies have also been more actively planning for disasters. But this is not a problem that service providers can ignore; it is very likely to affect their "bottom line" soon. ■



*Some fiber survived. Here is a temporary fix.* Courtesy of Jim Hayes

## REFERENCES

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



# Holistic Cybersecurity

Strengthening every weak link



## Overlooked Fundamentals That Lead to Cyber-Disasters

Two hundred and thirty-eight (238) years ago, Thomas Reid wrote in an essay: *“The chain is only as strong as its weakest link, for if that fails the chain fails together with the object that it has been holding up.”*

However, that thought seems to be lost whenever we open an e-mail or read articles from security experts. They love to give us the top three, five or ten cybersecurity actions to make our company safe. It draws us to slick solutions that promise the end of stress.

## Reality Check: No Short Cuts

The reality is that cybersecurity consists of 100+ potential vulnerabilities—weak links—not a few slick sound bites.

While NIST’s Cybersecurity Framework 2.0 covers 107 topics, it doesn’t come

close to addressing the real scope of cybersecurity in 2024.

That’s why organizations miss the big picture and why cyber-disasters such as MGM, Dallas, etc., happen every day. It’s the lack of an approach covering the entire organization that causes most ransomware, data breaches and disruptions around the world.

**HOLISTIC CYBERSECURITY** is a strategy to discover every vulnerability, strengthening and protecting across the entire organization and beyond. It must be managed and driven by the executive team.

## Why Holistic Cybersecurity?

It’s about the big picture and the inescapable detail. Weak links are located across the organization and beyond—not just inside your IT domain. This is why Holistic



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Cybersecurity is the only approach that examines every potential vulnerability in your defensive chain ... and it’s not that hard.

## The “Who” of Holistic Cybersecurity

This is about ensuring that every functional responsibility is handled—and owned. The article can only be a top-level view (see [cybyr.com/holistic](http://cybyr.com/holistic)).

Your organization may not exactly match these categories—it’s the overall scope that matters.



## EXECUTIVE TEAM

Let’s begin with the most important part of the article. It’s logically impossible to effect security that spans the organization unless it’s managed as an executive imperative.

Given new and upcoming legislation, this approach also becomes a competitive and legal necessity. The rest flows from this initial choice—without which it will fail, and the organization will remain at risk.

## SECURITY ACCOUNTABILITY

Ideally part of the executive team, the person accountable for the organization’s security should be separately budgeted and not report to IT since it’s critical



that their responsibility spans the entire organization. Key duties are creation of both security policy and an ongoing implementation plan together with ongoing measurement, reporting and oversight of all aspects of the organization's security.

## HUMAN RESOURCES

The role of staff and contractor evaluation, implementing insider threat and social engineering strategies is critical. Overseeing employees' privilege levels and constant training with viable anti-phishing software is also essential. Care must be taken to verify the security of external recruiting companies to ensure access to sensitive data is managed and verified.

## DISTRIBUTED WORKFORCE

Another HR-related function is the management of staff at home, remote offices, working with IT to manage/ban the use of non-corporate devices, etc.



## SALES AND MARKETING

Monitoring of CRM sales tools (salesforce.com, etc.) is required to ensure databases use micro-segmentation, are encrypted, and disallow the use of unverified plug-ins or APIs. Similarly with website CMSs, ensuring they use firewalls and do not use unverified plug-ins (WordPress has 50,000!) that can cause much disruption.

## CUSTOMER SERVICE

Customer service is especially vulnerable to social engineering abuse and must use systems that protect customer information.

## PRODUCT AND SERVICE DEVELOPMENT

Whatever the product or service, it must be developed with security in mind. Where any service or product employs third party content, it must be verified. Special care must be taken to protect intellectual property from corruption or theft (see [cybyr.com/delegate](http://cybyr.com/delegate)).



## MANUFACTURING AND OPERATIONS

Not everyone will have these areas but for those in critical infrastructure, decisions on security for network infrastructure, IoT separation and integrity are critical (see [cybyr.com/critical](http://cybyr.com/critical)).

## LEGAL GOVERNANCE

The proper written positioning of cybersecurity policy and strategies provide competitive positioning. They provide legal defense should breaches occur and reduce cyber insurance costs. Also important is verification and governance of third-party supply chain contracts.

## FINANCE AND ADMINISTRATION

Physical security is often handled here, and many functions involve third parties that must be vetted. Another key role is in the cost-evaluation of which assets require protection. Outside CPA and tax service companies must also be verified.

## INFORMATION TECHNOLOGY

Finally, IT provides skills, resources, and technical oversight for the above. Where services and software are outsourced, properly delegating is critical.

## The "What" of Holistic Cybersecurity

The following gives you a taste of some actions related to implementing an effective program to reduce risks to your organization (see [cybyr.com/holistic](http://cybyr.com/holistic)).



Key is to understand what assets you have, how they should be protected from disaster and recovery and what it would cost if they were destroyed or ransomed. Only then can you form and cost out a security plan to remove weak links over time. It will also shape data and network strategy.

Use of multi-cloud assets adds new levels of complexity to security to be addressed.



Verifying the security of all your suppliers is a critical step to safety and to avoid threats before they happen. Lack of verification quickly becomes abdication of responsibility.



Deploying solutions that embed the principles of Zero Trust is the only way to protect your data and services in 2024 and beyond. Applying the Zero Trust mantra of verifying everything is the mindset that complements Holistic Cybersecurity.



Security and automation go hand in hand. Automate everything possible, especially the continual verification of device and software updates, access privileges, etc. Unless you continually monitor, you are effectively only protecting the past. Take special care with vulnerable IoT devices, ensure all assets are only accessible to authenticated, authorized users. Be ready should problems occur, keep measuring and reporting your progress. Keep cyber-aware at [cybyr.com/breaking](http://cybyr.com/breaking).

## Summary

My intent has been to convey why Holistic Cybersecurity makes a huge difference—but we just scratched the surface! I make no apology for not boiling it down to a few quick bullet points. Contact me for help with step-by-step implementation to keep reducing your organizations' cybersecurity risks. Visit [cybyr.com](http://cybyr.com) for the latest on cybersecurity. ■

**Mark Fishburn** is CEO of [cybyr.com](http://cybyr.com) and a provider of strategic network, cybersecurity, and marketing services.

A woman with long brown hair, wearing a blue dress and a dark blazer, is speaking and gesturing with her hands. She is holding a small object in her right hand. An American flag is visible in the background on the left.

# EXECUTIVE Jenn

Jennifer presenting to  
legislative staffers on rural  
broadband realities.

# INSIGHTS WITH

# Jennifer Prather

## CEO, Totelcom Communications, LLC

### This Rural Leader Shares Candid Insights Others Don't

BY SHARON VOLLMAN

**N**ow, more than ever, it is imperative to acknowledge the obstacles that hinder progress in deploying high-speed broadband to rural communities. That's why this interview with Jennifer is so refreshing. She openly addresses the issues and suggests solutions to bridge the digital divide and bring equal opportunities to rural areas.

Take a few moments to soak in **how** Jennifer shares her opinion in a way that allows us to hear her message. I respect how she embraces what Ruth Bader Ginsburg, a Supreme Court Justice, once said, "Fight for the things that you care about but do it in a way that will lead others to join you."

#### **TOPIC: Telecom Trends**

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

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

Edge computing is an opportunity for rural carriers because we already have empty real estate with robust air conditioning, backup power, and resilient large-capacity networks in our old

switch remote locations. All these emerging technologies require larger data capacity, only furthering the need for robust, resilient, and future-proof connections in rural America. To be ready for whatever comes next, we need fiber deployed and ready.

#### **TOPIC: FWA and FTTP**

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

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

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

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



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

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

### **TOPIC: Permitting and Easements**

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

**Prather:** Permitting challenges have proven to be a significant barrier for some of our fiber deployment projects. One major point I see is the lack of the permitting authorities, including fellow utility providers or federal or state regulatory agencies, to adequately prepare for the staffing levels needed to process the increased permitting applications in our current environment. This delays projects and increases costs, as many are turning to third-party consultants who do a lesser-quality job at a much higher price.

We have had third-party assessors turn in expensive yet inaccurate make-ready assessments that ultimately impacted the safety of our construction crews. This cannot continue. More can be done and is being done to address the issue with a sensible approach, such as expedited approvals for previously disturbed areas and updates to prior infrastructure. Continuing with this kind of common sense and cooperative approach will still help, even if a little too late.

### **TOPIC: Operational Realities**

**ISE:** 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 cost-efficiently improving network life cycle management for complex fiber and legacy networks. How is Totalcom reducing its OPEX?

**Prather:** We must be efficient with CAPEX due to the low density of the areas around us that remain un-served or under-served. However, OPEX is a real and constant challenge for us because of the economic reality of providing a high-quality service to low-density areas. There is only so much revenue per mile that can come from some of our capital plant investments because there are only so many potential customers!

At Totalcom, we focus on doing projects right the first time, constantly improving and streamlining our processes, and increasing the quality and reach of our virtual support offerings. This year, we have seen great success in doing more remote installs where customers receive a product such as an updated ONT with a QR code launched video to self-install their equipment. Changing our processes has also required our employee team to think outside the box and look for new ways to serve our customers better and more efficiently. We are always trying to balance being efficient in our expenses while continuing to give our customers the experience they demand.

Another thing I am proud of at Totalcom is our forward-looking approach to network capacity. This was really brought to our attention during the instant and intense network growth we saw during the COVID-19 pandemic. We had been preparing our network for this. Being ready instead of reactive costs much less than responding to the extra demand in a crisis. Everything we can do today to prepare for tomorrow decreases the strain of tomorrow's unanticipated curveballs.

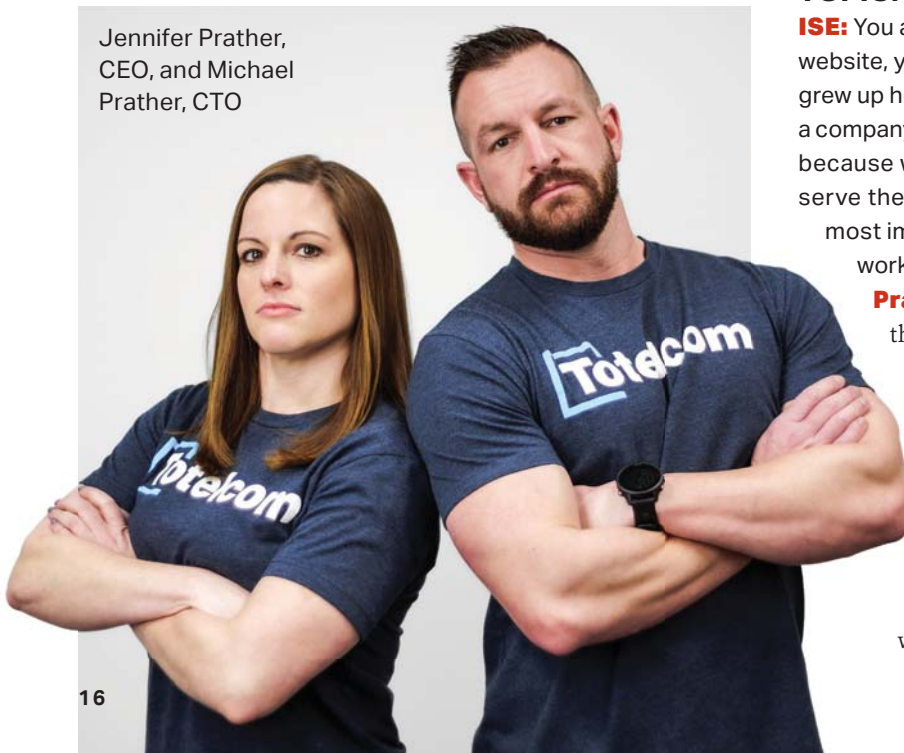
### **TOPIC: What Matters Most**

**ISE:** You and your brother are the chiefs of Totalcom. On your website, you concisely explained why you do what you do: "We grew up here, we're raising our families here, and we're building a company here. We're deeply rooted and passionately invested because we love our part of Texas and believe its people deserve the same opportunities found elsewhere." What is the most important thing you can share with other leaders who work to advance their rural communities via broadband?

**Prather:** What we do is so cool, fun, and important to those around us. If you find yourself lucky enough to be in a similar position, keep that passion and remember why we work for our consumers. There is nothing better than seeing our service impact the lives of our friends and neighbors. At Totalcom, we don't have shareholders or equity partners who dictate what we do—we have community members we see at the grocery store and school events.

We see our service's impact on the lives of those we love most. I keep them in mind when advocating for

Jennifer Prather,  
CEO, and Michael  
Prather, CTO



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changes that positively impact our ability to serve more consumers with robust broadband and connect to the world.

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

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

**Prather:** One thing the industry is still hesitant to address is the ongoing need for operational expense support for low-density coverage and the cost-sharing that should come from all who benefit from universal connectivity. There will only be an economic market case to serve these areas with some form of smart, transparent, accountable, and ongoing support. Preparing for the post-BEAD era—in which the continued viability of rural connectivity that began with BEAD and other federal programs—will rely on an ongoing support mechanism.

Also, security practices for IoT devices are a serious issue that will cause consumer problems in the future. These devices are ripe for intrusion into a home network. For example, when did you last do a security patch on your Wi-Fi-connected washer? It's a hard balance for an end user to ensure home network security while still being able to use the devices they want without a network engineering degree.



“Permitting challenges have proven to be a significant barrier for some of our fiber deployment projects. One major point is the lack of the permitting authorities including fellow utility providers or federal or state regulatory agencies to adequately prepare for the staffing levels...”

### **TOPIC: BEAD**

**ISE:** Share your take on it and the realities for rural providers like Telcelcom.

**Prather:** Telcelcom sees BEAD as a potentially exciting opportunity, but with great concern, as we approach it. I appreciate the understanding that it will take public money to adequately close(ish) the digital divide that still exists across America—and not just in rural America. Allowing the money to be administered by the individual states creates opportunities and challenges as the plans are starting to roll out.

However, it sure seems to be getting bogged down by a lot of red tape that will prohibit many of the community-based rural providers from participating—the exact kinds of companies building in the hardest-to-reach and most cost-prohibitive areas already. I worry that not enough education for regulators and policymakers has been obtained from these types of companies, but instead by lobbyists from the companies that left these areas behind in the first place.

The rules should reflect what has worked in the many parts of rural America where robust broadband can be found today. Unfortunately, taking the cheap way out and creating more but subpar connections today will make for a continued problem into tomorrow. It will require a balance to address the number of consumers who remain unconnected with the overall cost guardrails of the program, and I'm glad it's not my job to figure that out.

### **TOPIC: Converting Fiber Homes Passed to Homes Connected**

**ISE:** Telecom providers still have trouble converting “homes passed” to “homes connected.” Only 20 countries worldwide currently have more than a 50% fiber penetration rate. What's a feasible solution?

**Prather:** One thing that we see is a continued need for more affordable connections for low-income consumers. This is generally our surveyed highest response regarding a lack of subscription where connectivity is available. Unfortunately, the American Connectivity Program (ACP) seems destined to expire. This program has made a sizeable impact on our consumers. The reality is we are serving a combination of low-income and low-density areas, creating a bad math problem of revenues vs service costs.

While proud of our efficiency, we still require revenue to keep the services available. Other consumer utilities are all priced higher than our service, but a floor remains for us to remain operable. We do what we can to provide low income options, but we need the support of programs like the ACP to do what we can on our own. Low income broadband programs may be one of the only social programs that have a tangible impact on a consumer's upward economic progress, as there are few jobs today that can be applied for without a connection to the internet. Discontinuing the ACP will only worsen the “available yet unconnected” problem.

### **TOPIC: Workforce Training Challenges Continue**

**ISE:** McKinsey shared that our industry will experience significant talent challenges by 2027. Thankfully, training programs are now in place. How will these be effective and sustainable without an industry “standard” or “certification?” What should our industry do to remedy this?

**Prather:** Training programs and certifications are undoubtedly helpful. However, particularly in rural areas, we need to structure these to allow for on-the-job training. The statistics show that when students leave the area, they rarely return. Our industry should work more closely with local high schools and allow students to work in high-tech jobs right out of school, potentially even bypassing trade schools. Suppose they can learn while on the job. In that case, we can utilize the talent immediately, and their job duties and colleague interactions enhance their education through remote or virtual reality-based training programs. Upon completion of a certification, they would be eligible for promotions or pay increases and can continue in their career path while remaining local to the area.





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## Welcome to the Totalcom Digital Literacy Learning Center



Totalcom digital literacy class in session.

This can be especially important for rural areas where it may not be financially feasible to go far to the nearest trade school or training center. Recently, VR Solutions company Transfr has been working with rural telecom experts to develop the rapid training simulations we need for our future workforce. They have created

hands-on simulation training in several industries, providing an immersive learning environment and giving trainees real-world experience. What an excellent use case for our rural connectivity to provide the training needed to keep our workforce skilled!

#### **TOPIC: 5G**

**ISE:** Share Totalcom's role in deploying fiber for 5G.

**Prather:** Deploying 5G across rural America has a way to go, with many still waiting for any "G" coverage. We serve many mobile access points across our area and know that still more will be necessary to provide the ability for shorter-range services such as 5G with their required backhaul. Those fiber deployments will complement our ongoing work to reach even more rural end users with a premise fiber connection as we create networks that can service the ever-increasing consumer demand and enable complementary services like 5G.

#### **TOPIC: Digital Inclusion**

**ISE:** Share Totalcom's initiatives in this area.

**Prather:** It's one thing to give someone access to the internet, but it's useless if they don't know how to use it or don't see a reason to do so. Early on in Totalcom's broadband era, we began offering classes to the community, free of charge, in computer skills, e-mail skills, and streaming options. A particularly popular class

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showcased how to share family pictures and operate video chats with grandkids. We have also done trainings for online cattle auctions! My mom still does training and has been invaluable to those wanting to take advantage of all connectivity has to offer.

We also love to sponsor similarly themed activities by our local schools and senior citizen centers. We have more ideas and plans than we can offer right now, so I'm hopeful the federal dollars allocated for digital inclusion plans will be helpful to continue this work.

### **TOPIC: Constant Growth**

**ISE:** What must you do as a leader to improve, build, or acquire to execute Totalcom's 3 to 5-year plans?

**Prather:** Advocate, advocate, advocate. We must tell our own story—we tell it at all levels of government, from federal to state, to local, to our community members, local businesses, and our colleagues. I am very passionate about continual education for those regulating our industry regarding today's reality and how projected changes will impact our company and our communities.

Rural hardships can be unique, and we must lean into those specific challenges and advocate for what works to achieve the collective goals. The broadband environment has drastically changed over the last five, even three years! We must keep active and vocal about what is working—and what isn't.

Our regulators need to hear the rural perspective from those who successfully operate today, not just those after the coming BEAD dollars. We also must be vocal partners with our local communities and our customers. We must work together to ensure that a variety of industries in rural America are thriving and have the support they need, including, but not limited to, robust broadband service from a provider they trust.

### **TOPIC: Out-of-the-Box Thinking**

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

**Prather:** At Totalcom, we have evolved to focus on our customer experience. For our management team, this also means focusing on our employee experience. If we want our employees to provide a positive experience and environment for our customers, they must also have one for themselves. We have worked hard to bring in more fun, including office-wide games, contests, and food. Right before Christmas, we had a multi-day gingerbread man scavenger hunt with daily prizes for the winners.

We strive to do better each day in our communication with employees. We share information much more readily and completely than before to empower our employees to do what is best for our customers. We have also started a passport program where all new employees visit each department to see what they do. Everyone gets to go on an install, visit a construction site, and answer customer phone calls. This brings an understanding that it takes the entire team to make things run smoothly, and all roles are important.

Our branding has also evolved to bring in more of this fun. Our "Beefy Broadband" campaigns and updated website showcase our community involvement and the positive experience we want everyone to have with Totalcom.



### **TOPIC: Rural Broadband**

**ISE:** What's your greatest joy and challenge related to ensuring your community's residents can live a big life in a small community?

**Prather:** Our services allow for a rich, rural life. Robust and reliable broadband is as essential as quality roads connecting areas to the economy and society. The challenge is we can't just patch the potholes in the road by investing in broadband that is "good enough for today." We must make ongoing investments to keep our digital infrastructure solid and ready for whatever new rural adventures are to come. It's always a challenge to be one of the smaller voices at the table, but we make up for what we lack in scale with a genuine service commitment to our communities.

### **TOPIC: Personality Trait**

**ISE:** What's an essential personality trait someone needs to succeed in a company like Totalcom?

**Prather:** To succeed at Totalcom, our employees need to adapt and see the end goal. We must change how we operate as we grow, and our services evolve. If an employee can focus on the result of a positive customer experience, they'll have a long and happy career with us. The best part is those skills can be learned and strengthened! ■

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**Jennifer Prather**, CPA, is the Chief Executive Officer of Totalcom Communications, LLC, a rural broadband and telecommunications company headquartered in De Leon, Texas. For more information, email [jennifer.prather@totalcom.com](mailto:jennifer.prather@totalcom.com) or visit [totalcom.net](http://totalcom.net). Follow Totalcom on Facebook: [facebook.com/profile.php?id=100063877902613](https://facebook.com/profile.php?id=100063877902613), LinkedIn: [linkedin.com/company/totalcom-communications](https://linkedin.com/company/totalcom-communications), and Twitter @TotalcomLLC.





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# IN THE Shadow of Shannon

Keeping up with bandwidth demands

BY PAUL MOMTAHAN

**A**s demand for bandwidth continues to double every two to three years, network operators need to find cost-effective ways of scaling optical network capacity. There are essentially only two ways of increasing capacity: increased spectral efficiency and spectrum expansion.

## Pre-Coherent Capacity Gains from More Spectrum and Better Spectral Efficiency

In the pre-coherent era, both techniques were used at different times. Spectral efficiency and fiber capacity saw a fourfold increase as the industry moved from 2.5

Gb/s direct-detect wavelengths to 10 Gb/s direct-detect wavelengths. Spectral efficiency and fiber capacity were also doubled by moving from 100 GHz channel spacing to 50 GHz spacing, which enabled the number of wavelengths in a given amount of C-band spectrum to double. There was even some limited adoption of 25 GHz spacing, which enabled the number of 10 Gb/s wavelengths to double again.

The amount of spectrum also increased. Outside of Japan, DWDM networks have traditionally used C-band fiber spectrum. The C-band was preferred over the L-band for its lower noise and more power-efficient EDFA amplification, and at the time for its lower chromatic dispersion.

Over time, the amount of C-band spectrum supported in DWDM systems evolved from 3.2 THz to 4 THz to 4.4 THz to 4.8 THz—the extended C-band.

## Recent Fiber Capacity Gains Have Come from Coherent Technology

However, since the adoption of 100 Gb/s coherent transmission began in the early 2010s, fiber capacity gains have primarily come from coherent optical engine spectral efficiency improvements. 100 Gb/s coherent provided a tenfold increase in spectral efficiency and therefore fiber capacity relative to 10G direct-detect. 200G coherent transponders leveraging PM-16QAM modulation doubled the total number of bits per symbol from 4 to 8, doubling spectral efficiency and fiber capacity again, though at the expense of reduced relative reach by moving to 16QAM's higher-order modulation versus QPSK.

600 Gb/s and 800 Gb/s coherent transponders leveraging PM-64QAM increased the number of bits per symbol from 8 to 12, enabling an up to 50% improvement in spectral efficiency at shorter distances. 400 Gb/s, 600 Gb/s and 800 Gb/s also leveraged higher baud rates to increase wavelength capacity-reach with significant benefits in terms of cost per bit, power consumption, and footprint. However, as



the amount of spectrum occupied by the wavelength is linearly proportional to the baud rate, higher baud rates in and of themselves do not improve spectral efficiency. Additional coherent innovations that have enabled improved spectral efficiency include probabilistic constellation shaping, Nyquist shaping, subcarriers, enhanced forward error correction, and improved nonlinear compensation.

### The Shannon Limit

A 1948 paper published by Claude Shannon, the mathematician, electrical engineer, and information theorist who then worked at Bell Labs, established what became known as Shannon's law, otherwise known as the Shannon-Hartley theorem. This law/theorem puts a limit on the amount of information that can be communicated over a channel with a given bandwidth and amount of noise. This is described by the famous equation  $C/B = \log_2(1 + \text{SNR})$ , where  $C$  is the maximum achievable channel capacity,  $B$  is the bandwidth, and SNR is the ratio of signal power to noise power.

At higher SNR values, where we can ignore the 1 in the equation, increasing spectral efficiency by adding 1 bit per symbol to the spectral efficiency requires us to double (+3 dB) the required SNR, thus halving the reach. This provides an upper bound on the maximum spectral efficiency that can be achieved.

Optical conference proceedings also sometimes include papers referring to the "nonlinear Shannon limit," with bold claims of having exceeded this limit. This is not to be confused with the (linear) Shannon limit described above, which places a hard upper bound on maximum spectral efficiency, and including Shannon in the limit's name is not without controversy. This lower bound is based on nonlinear penalties and is arrived at by simulations. New nonlinear mitigation techniques can then beat this lower nonlinear "limit," but they can never beat the (linear) Shannon limit or the true, currently unknown, upper limit that would be a function of both linear and nonlinear penalties.

### How Close Are We to the Shannon Limit?

Today's high-performance embedded optical engines that leverage 7-nm CMOS DSPs, such as Infinera's ICE6, are typically between 1 and 2 dB from the Shannon limit, meaning that future spectral efficiency gains are likely to be incremental. The maximum spectral efficiency improvement is then anticipated to be in the 30% to 40% range, with the next generation of high-performance transponders, leveraging 5-nm or 3-nm CMOS DSPs, typically targeting spectral gains in the 10% to 20% range.

### More Spectrum, Please

If we want to increase capacity and we are reaching the limits of spectral efficiency, as outlined in the prior section, then we must create more transmission spectrum. This can be done in the following ways:

- A. Lighting multiple parallel fiber pairs
- B. Expanding the amount of spectrum used on a fiber pair beyond the extended C-band
  - i. Leverage the L-band (C+L)
  - ii. Extend the C-band to Super C
  - iii. Super C + Super L
  - iv. Novel bands (O-band, E-band, S-band, U-band)

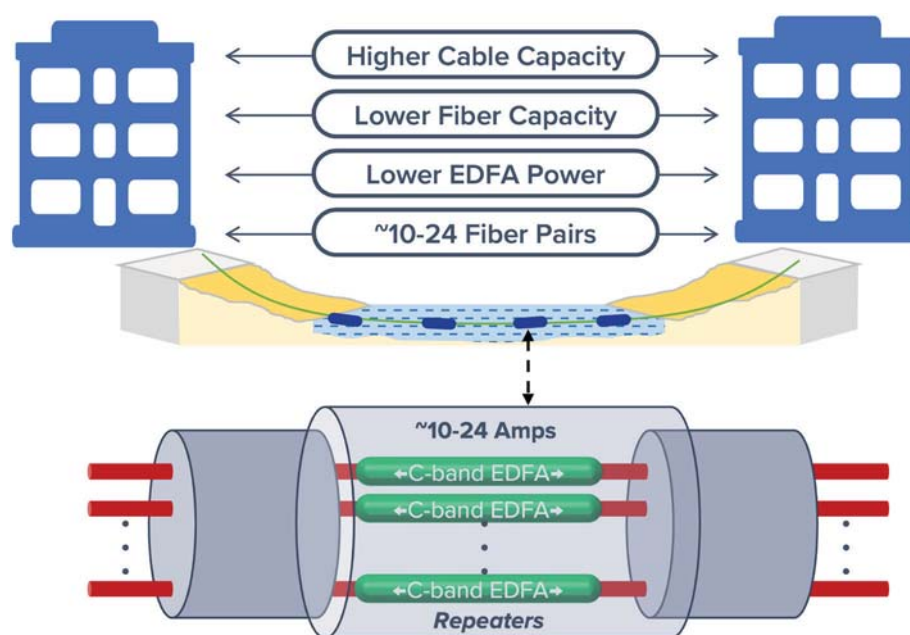
C. Deploying novel fibers that increase the spectrum with multiple cores (multi-core fibers)

D. Deploying novel fibers that increase the spectrum with multiple modes (multi-mode fibers)

Options A, B-i, B-ii, and B-iii provide short-to medium-term solutions and will be the focus for the rest of this article. Option B-iv (O-band, E-band, S-band, U-band), C (multi-core fibers), and D (multi-mode fibers) are longer-term solutions, with the S-band and uncoupled multi-core fibers gaining the most traction.

### Multiple Parallel Fiber Pairs

Multiple fibers per cable is an approach gaining considerable traction in submarine networks. Prior to 2020, submarine cables were deployed with two to eight fiber pairs per cable. Since 2020, new space-division multiplexing (SDM) cable systems, shown in Figure 1, have increased the number of fiber pairs in a cable to between 12 and 24, with 32 fiber pairs likely to be the next evolution. With these SDM submarine cables, each individual fiber pair operates with less total power for amplification and therefore a lower individual fiber pair capacity, but



**FIGURE 1.** SDM submarine cables increase total capacity with more fiber pairs per cable system.

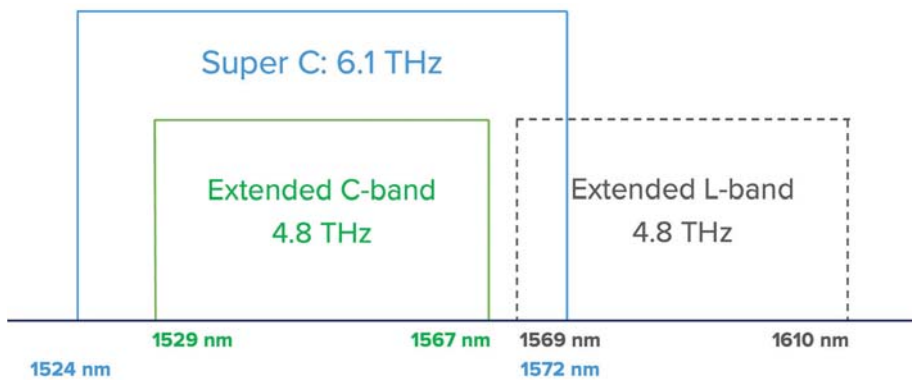


FIGURE 2. Super C provides 6.1 THz.

the additional fibers increase the total capacity of the cable system.

Deploying multiple parallel fibers is also an option for fiber-rich terrestrial network operators. However, the cost of laying or leasing and then lighting new fibers is very high and can be subject to lengthy delays. For some terrestrial network operators, new fiber may not even be an option. For many of these operators, fiber is therefore one of the most valuable assets, and there is an ongoing requirement to maximize the capacity of their existing fibers.

### Leverage the L-band with C+L

Another approach that has seen market adoption is expansion into the L-band, doubling the amount of transmission spectrum from 4.8 THz to 9.6 THz with C+L. However, C+L transmission comes with several economic and technical challenges. C+L networks typically require doubling the number of components such as amplifiers and wavelength-selective switches (WSSs), which increases the cost, though some C+L line systems provide the option to initially deploy a C-band-only system, then add the L-band hardware while in service when the extra capacity is required. Technical challenges of C+L relate to stimulated Raman scattering (SRS), which causes both the C-band and the L-band to tilt, with power going from the C-band to the L-band. SRS creates challenges in terms of C+L recovery speed, provisioning speed and complexity, and the topologies

that can be supported. And while some C+L line systems overcome these challenges with tools including sophisticated link control software and ASE idler hardware, this hardware also adds incremental cost to C+L solutions.



“Another approach that has seen market adoption is expansion into the L-band, doubling the amount of transmission spectrum from 4.8 THz to 9.6 THz with C+L. However, C+L transmission comes with several economic and technical challenges.”

### Extend the C-band with Super C

If you don't need the full 9.6 THz spectrum of C+L, a more cost-effective alternative is expansion of the C-band into Super C. Super C, shown in Figure 2, increases the amount of C-band spectrum by 27% to 6.1 THz, without the need to double the number of amplifiers and WSSs and without the need to add ASE idler hardware to combat the previously described SRS challenges. Super C requires enhanced wavelength-selective switch and EDFA and Raman amplifier technologies that are capable of supporting a 6.1 THz C-band. In addition, Infinera's Super C amplifiers leverage some thoughtful engineering to deliver a cost-effective solution with better performance than best-in-class extended C-band amplifiers. In Infinera simulations of 300 long-haul routes, moving

from extended C to Super C on average enabled 29.5% more capacity for only 27.6% more transponders.

### Super C + Super L

If Super C and even C+L are not enough, some Super C line systems will provide the option to further increase the total amount of spectrum with an additional 6.1 THz in the Super L band, giving a total of 12.2 THz. Super C plus Super L can enable total fiber capacity in excess of 100 Tb/s over shorter distances.

### Final Thoughts

While bandwidth is doubling every two to three years, the Shannon limit means that future transponder spectral efficiency improvements will be incremental. Keeping up with bandwidth demands

will therefore require more spectrum. In submarine networks and some fiber-rich terrestrial networks, this can be achieved with more fiber pairs; however, for many terrestrial networks, the realistic short-term options are C+L with 9.6 THz or the more cost-effective Super C that provides 6.1 THz, with Super C + Super L (12.2 THz) a medium-term option, and S-band and uncoupled multi-core fibers gaining traction as potential longer-term options. ■

**Paul Momtahan** is a Solution Marketing Director at Infinera (based in the U.K.), focusing on next generation optical technology, including Infinera's 800G per wavelength ICE6 optical engine. To learn more about Infinera, visit [www.infinera.com](http://www.infinera.com). Follow them on Twitter @Infinera and LinkedIn: [linkedin.com/company/infinera/](https://www.linkedin.com/company/infinera/).

# Vet Secrets to Success in Telecom

Q&A with Doug Sullivan, Vice President, Network & Field Operations, Verizon

BY SHARON VOLLMAN

**ISE:** Why did you join the military? Please share your service branch, date of enlisting, and where you served. Please share any medals, awards, or citations you earned.

**Doug Sullivan:** I joined the military as I grew up in a patriotic family with a deep love and appreciation for our country. My father served in the Marines, always reflected on that experience very positively, and credited his future success to the foundation established with his military service.

I attended the U.S. Naval Academy immediately after graduating from high school. After graduating and being commissioned as an Ensign in the Fleet, I was assigned as the Boilers Division Officer onboard the USS Cleveland (LPD-7) out of San Diego, California. I later served as the Navigator on the same platform.

The USS Cleveland (LPD-7) was deployed in support of Operation Desert Shield and Desert Storm, and upon returning to the States, it was deployed in support of Counter Narcotics Operations in the Pacific and Caribbean.

My second tour on active duty was at the National Security Agency.

After being honorably discharged as a Lieutenant Commander, I was hired by Bell Atlantic Communications, which eventually became Verizon after several mergers. While working for Verizon, I continued to serve my country as a Naval Reservist and was activated in support of Kosovo operations and the Second Gulf War.

In the Service, I was awarded the following: the Joint Service Commendation Medal, The Joint Service Achievement Medal, three Navy Achievement Medals, The National Defense Service Medal, The Southwest Asia Service Medal, the Outstanding Volunteer Service

Medal, the Armed Forces Reserve Medal, the NATO Service Medal, Liberation of Kuwait Medal, and an Expert Pistol Medal, along with the following Ribbons: the Joint Meritorious Unit Award, The Navy Unit Commendation, Navy E, Navy Sea Service Deployment, and the Navy Overseas Service ribbons.

**ISE:** What was your job assignment? What key activities did you perform, and in what circumstances/conditions? What people or resources were you responsible for in this role?

**Sullivan:** Starting my career in the Fleet as a Boilers Division Officer on the USS Cleveland (LPD-7), we deployed from San Diego, California, to the Persian Gulf to support the first War with Iraq. The team I led worked through some of the most challenging conditions I have ever seen, but they never relented in their commitment to the mission, which was very inspiring. Being a part of that team showed me that while the U.S. Navy had incredible technology and capabilities, it was the people who were the true strength of the organization. In my second career at Verizon, I have made the same observation. While we have the best network, we also have



Garage visit and all hands call in Harrisburg, PA. Pictured left to right: Ricky Urena, Jeff Harmon, Teonna Proctor, Doug Sullivan, and Dan Schopf.





2024 Mid-Atlantic North Region Kickoff and Networking Event. Pictured left to right: Nicole D'Amour, William Lesiak, Cary Skinker, Doug Sullivan, Tom MacNabb, and Eva Teggart.

the best people dedicated to their jobs and to supporting each other to ensure that we deliver for our customers.

A quick comment to put some context around the working conditions that those working onboard the ship in the engineering department would routinely endure. While deployed in the Persian Gulf, the Boiler Room would get so hot that the watch teams would have to wear cool vests with ice packs inserted to keep their core body temperature from overheating, and the amount of time that they could medically be approved to stay in the space was restricted to short durations. Performing such physically and mentally challenging work in a dangerous environment for months was awe-inspiring. It elevated my appreciation for the men and women serving our great country in many capacities.

**ISE:** Why did you choose telecom as a career? How did your service and experience affect your career choice?

**Sullivan:** Completing my second rotation as a commissioned officer at the National Security Agency, I was approaching a rotation back out to the Fleet. When looking at options in the civilian world, I interviewed with several companies and was fortunate enough to receive some attractive offers. I was intrigued by Bell Atlantic. They valued leadership and continued investing in their network, technology, and people. It was a natural fit, and I enjoyed an amazing journey with them. Even after serving in the Navy on behalf of my country, where I got to see the world, I have worked in more countries as an employee of Verizon than I did in the service. The opportunities to work in engineering, wholesale, enterprise, global repair, regulatory, and field operations, to name just a few, have all contributed to what has been an amazing journey.

**ISE:** Share your role at Verizon now, your primary responsibilities, and why you recommend other vets enter the Telecom/ICT industry.

**Sullivan:** I lead the Business Operations Support team for Field Operations within Verizon's Wireline Network. My primary responsibilities include the support of our 20,000+ field forces, including the construction, installation, and maintenance technicians, as well as our central office technicians and our customer and operations support centers.

The Telecom/ICT industry is a great environment for veterans to pursue a career. The industry always needs veterans, as their knowledge, background, training, and leadership experience are all skills that immediately translate and bring value to the organizations they join.

Verizon has been ranked the #1 *Military Friendly Company* three times and #1 *Best for Vets* twice, amongst several other awards, which we take great pride in.

Military service imparts both hard and soft skills that are highly valuable. Those skills include engineering, communications, intelligence, cybersecurity, supply chain management, and finance experience. At Verizon, such knowledge translates into a variety of critical jobs. For example, we seek military-trained engineers to build our best-in-class networks and protect them from cybersecurity attacks. We also find that veterans generally excel as project managers, particularly in coordinating supply chains and logistics.

In addition to technical expertise, veterans bring essential interpersonal skills to the table. The military is a melting pot of highly qualified candidates from across the country and requires individuals with different backgrounds, cultures, and experiences to work alongside each other. During their tenure, service members also learn situational awareness and understanding of the geopolitical and cultural dynamics around the world. This exposure to a wide variety of environments trains service members to adapt rapidly to changing circumstances. Today, more than ever, these qualities are invaluable in the business world. We enthusiastically recruit, retain, and engage the military community.

**ISE:** How does your experience in the military aid your ability to work under pressure?

**Sullivan:** I am incredibly thankful for my military experience, which has helped train, develop, and provided me with experiences and opportunities to learn, grow, and evolve my leadership skill set. One of which is how to handle pressure. Through real-world engagements around the globe at a very young age that helped me try, fail, succeed, develop, and grow, I learned how to handle pressure and deliver results.

**ISE:** Share 1-2 work-related accomplishments you are particularly proud of. What is the “secret” to your success?

**Sullivan:** Regarding work-related accomplishments, one of the efforts I am most proud of is working with the team to improve the quality and performance of our Fios network significantly and leading an incredible team that set performance targets far beyond what was considered achievable and then surpassed those targets, increasing our customer satisfaction and delivering significant savings to the company. The secret to that success was embracing change, challenging the status quo, and always keeping sight of the customer.

**ISE:** McKinsey’s study on “The Next Telco Battleground”<sup>1</sup> shares that the network engineering talent of operators needs to move beyond specializing in radio capabilities. With virtualization becoming prevalent, differentiation will rely on a broader range of tech skills and capabilities. Operators and recruiters can and should seize this opportunity by empowering the digital natives they may already have on their teams. Share how Verizon works to meet talented digital natives where they are and retain their talent for longer than 2-4 years.

**Sullivan:** Digital natives want to work somewhere with a mission and purpose they believe in. I think the strength of Verizon lies in our mission to create the best networks that connect people as well as our company’s culture of diversity and inclusion.

When it comes to retention, employees who are given the opportunity to challenge themselves, grow, and develop will be more likely to stay with the company. At Verizon, we have many growth and development resources. Our company culture strongly encourages employees to grow their careers—vertically and horizontally—by joining different teams to understand the business from a new perspective.

My organization has a strong college internship program based on relationships with top universities. I assign meaningful projects and provide executive coaching from day one. As a result, we have been very successful transitioning exceptional interns into exceptional employees.

**ISE:** How do you measure success in your career, and what’s next on your career roadmap?

**Sullivan:** I measure my career success by the team’s growth, development, and advancement. As stated earlier, throughout my career, I have had the great pleasure of working for two technological titans:

the U.S. Navy and Verizon. However, the most impressive commonality was the quality of the people. Investing in and developing our people is how I measure our success—leading and inspiring teams to achieve more personally and as a team than they thought possible. Throughout my career, I have seen time and time again that the investment and development of the team yields amazing results regardless of the business unit, project, or initiative.

**ISE:** The AI Network Intelligence market is forecasted to grow 40% by 2029.<sup>2</sup> By 2035, it could improve construction profitability by 71%. Many providers use AI to tame network complexity, reduce OPEX, and enhance network performance management. How is your team using AI now, and how do you expect it to be used across the network soon?

**Sullivan:** Verizon is very experienced in the use and development of AI. Beyond using the technology for many years, in 2019, Verizon launched an AI and data business unit staffed by a Chief Data Officer to oversee how we develop, manage, and implement AI at the enterprise level.

We use AI for force models to predict growth and capacity needs to ensure that we have the right resources in the right places; we use AI for predictive analytics and insights into network trends so we can proactively address issues before they occur; we use AI to understand customer insights so we can better respond to their needs. We also use it to analyze data and correlate information to predict and avoid network outages more accurately. Another way we leverage AI effectively is to seamlessly incorporate it into our frontline digital tools and system applications that help us better serve our customers. The digital tools we provide to our service reps and technicians help them make the best decisions for troubleshooting and streamlining our installation processes.

Among some notable use cases, Verizon used our own AI platform<sup>3</sup> to help build our 5G network.<sup>4</sup> The AI models, designed by in-house data scientists, factor in multiple variables that can alter the strength of 5G signals, the position of the transmitter, as well as other nearby transmitters.

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

**Sullivan:** When I talk to customers about their home broadband service, they usually describe their in-home Wi-Fi. This is becoming increasingly important to our customers, with the average number of wirelessly connected devices within the home increasing significantly yearly. So, I’m most interested in seeing how the next generation of Wi-Fi protocol will improve the speed, efficiency, and management of more connected devices.

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

**Sullivan:** It’s moving in the right direction. However, the industry needs to focus on network quality and reliability as the primary metrics rather than the maximum speed a user could get in a perfect-world scenario.

I believe it's a more indicative metric of the customer's user experience. This becomes even more important in rural or remote areas where physical broadband connection is the only way customers can connect to the internet, stream video content, or make phone calls.

**ISE:** Share three things you recommend to other network professionals who want to follow your path.

**Sullivan:** Three recommendations:

- Take the toughest job. You will learn and grow beyond your expectations, and additional opportunities will come your way.
- Lead by example. Model the behaviors you would expect of others.
- Share success and invest your time, focus, and efforts in your people. I have never regretted investing my time and efforts in my team. Their success is my greatest achievement professionally.

**ISE:** What's the most significant professional risk you've taken?

**Sullivan:** The most significant professional risk I have taken is identifying the most significant business challenges and volunteering to take them on. Doing so required me to join a completely different business unit, step outside my comfort zone, and build my reputation from scratch with a new team and organization.

While risky, I have found these opportunities enriching and they have helped position me for roles of increasing scope and responsibility.

**ISE:** Please share ONE word that encapsulates your leadership style. And ONE word that describes you as a person.

**Sullivan:** One word that encapsulates my leadership style is transformational. One word that describes me as a person is passionate. ■

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# Let's Not Allow the Workforce Gap to Jeopardize a Historic Opportunity

Thoughts on a unique year for broadband

BY MELISSA NEWMAN

**W**hat do the American Interstate Highway System, Golden Gate Bridge, Hoover Dam, and Empire State Building all have in common? They are among the most important construction projects in our nation's history, all of which helped shape us into the world economic power we are today. As we turn to 2024, the telecommunications industry is preparing to embark on one of the largest, most important construction initiatives in not just our industry's but more importantly our country's history—yet there is a major hitch that threatens it: will we have the adequate workforce to deliver it?

This year, states across the country will ramp up major construction projects to deliver high speed digital services to unserved and underserved communities in rural areas spanning all corners of the U.S. If successful, this initiative could have far-reaching effects on cities and towns across our nation, with critical impacts ranging from improved economic development to increased educational opportunities to dramatically increased quality of life, just to mention a few.

The Broadband Equity, Access and Deployment (BEAD) program is a federal grant program administered by the National Telecommunications and Information Association (NTIA) and its mission is to close the digital divide with over \$42 billion in funding from the Infrastructure Investment Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law. BEAD is designed to provide every state with the funding and resources they need to finally bring high speed internet to all Americans, regardless of where they live.

## **Critical Factor to Success: Closing the Worker Shortage Gap**

If the BEAD program is going to be successful in its mission, it will require a capable workforce to build and deploy these next-generation communications networks. Estimates vary on how many workers will be needed. For example, the Government Accountability Office (GAO)

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forecasts there will be nearly 34,000 jobs<sup>1</sup> needed this year to adequately support the U.S. government's broadband deployment programs, while the Fiber Broadband Association (FBA) estimates that there will be more than 200,000 jobs<sup>2</sup> needed over the next five years to fill the broadband worker gap, and other organizations calculate there will be more than 800,000 jobs required through the end of the decade.

Regardless of what the actual figure is, all can agree that we need more broadband workers if the BEAD and other broadband expansion programs are going to succeed. But the question is: how do we close the broadband worker gap?

### Taking a Step Back: Why Work in Broadband?

There are many misconceptions about broadband-related jobs and the opportunities they offer economically, professionally, and personally. For example, let's take the profession of broadband technicians. Many believe that broadband technicians have both limited earning potential and limited paths for career advancement. There are also the widespread beliefs that rural areas (where broadband technicians are needed most) lack the economic and social opportunities of urban and suburban parts of the country.

But let's look at the facts. As of November 2023, the average yearly pay for telecommunications technicians in the U.S. was \$60,190,<sup>3</sup> and annual salaries are reaching nearly \$200,000, according to ZipRecruiter. A six-figure salary would put young technical workers in the top echelons of STEM earners (whose average salary is \$64,000), and well ahead of non-STEM earners (whose average salary is \$40,000).<sup>4</sup> Furthermore, the allocation of \$42.5 billion in BEAD funding specifically for underserved communities opens countless possibilities for economic growth, social development, and an enhanced quality of life in rural areas.

Given the growing diversity of broadband services (gaming, telehealth, virtual reality, etc.) in demand, applicants filling these more technical roles can also garner

a wide range of experience as they progress in their careers. Whether working on multi-family homes or small businesses, rural technical workers can learn highly valuable and transferable skills when building out broadband networks.

And while major cities continue to be coveted destinations for tech workers, rural areas offer compelling advantages often overlooked. The cost of living in rural America, including essentials like housing, groceries, and healthcare, is generally significantly lower than in major cities. Beyond economics, rural communities foster deeper connections among residents, aided by smaller populations and more open space. The closely knit community lifestyle contrasts sharply with the increased loneliness often found in crowded urban settings, as noted by a 2023 World Economic Forum study. Furthermore, the mental health benefits of rural life have been well-documented, demonstrating positive correlation between time spent in nature with improved health and well-being.



**“As of November 2023, the average yearly pay for telecommunications technicians in the U.S. was \$60,190, and annual salaries are reaching nearly \$200,000, according to ZipRecruiter.”**

### FCC Recognizes the Workforce Gap Challenge Early On

In 2019, the Federal Communications Commission (FCC) created the Broadband Infrastructure Deployment Job Skills and Training Opportunities Working Group<sup>5</sup> to address ways to democratize and improve job skills training and development opportunities for the broadband infrastructure deployment workforce. The working group identified key challenges related to the broadband workforce issue including the lack of awareness of broadband career opportunities; the need for standardized nationwide training programs; and the dwindling skilled

workforce due to retirement and other reasons. After identifying these challenges, the working group submitted specific recommendations including:

- promoting the formation of (or a coalition of) broadband-related trade associations to jointly advance workforce development initiatives and to centralize and coordinate industry efforts,
- undertaking a targeted outreach initiative to ensure that broadband workforce training programs are being implemented and promoted both in rural and urban areas equally, and
- designing and promoting initiatives focused on outreach (especially to under-represented communities), on-campus recruiting, mentoring new hires, and recognizing the existing workforce.

### A Coalition is Needed

In addition to the challenges and recommendations identified by the FCC's working group, there is also an urgent need to bring all key stakeholders required to build these next-generation communi-

cations networks together and present a unified front to address the broadband workforce shortage issue. Key stakeholders include government, industry, and academia. Each will play a critical role:

- **Government.** Focused effort on workforce development programs that will provide the needed training and education in coordination with the telecommunications industry.
- **Industry.** Expanding the training opportunities across the country and offering competitive pay/benefits, development, and career advancement opportunities.
- **Academia.** Working with all key stakeholders, develop and promote more broadband-specific curriculum.



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### WORKFORCE

#### **Broadband Nation: A Single Coordinated, Consolidated Initiative**

The Telecommunications Industry Association (TIA) is committed to closely collaborating with our government, industry, and academia stakeholders to support the mission of connecting all Americans.



“...without a workforce skilled in broadband, millions of people in unserved and underserved communities will continue to be shunned from opportunities that the rest of the country enjoys without a second thought.”

We have been actively supporting our stakeholders by providing education and resources to implement the requirements for the BEAD program and are continuously working to overcome the challenges that hinder the realization of this historic opportunity.

In line with this commitment, we are intensifying our focus on addressing the workforce gap issue. TIA has established Broadband Nation ([www.broadband-nation.org](http://www.broadband-nation.org)) with the support of Fierce Telecom, owned by Questex, a National Workforce Development Program, to attract, train and deliver the next generation of broadband talent at the local, state and national level.

Through an online portal,<sup>6</sup> this program will be a one-stop shop that will provide access to available training and job opportunities within the broadband industry. Furthermore, it will bring together key stakeholders from government, industry, and academic institutions to tackle workforce challenges head-on at the Broadband Nation Expo to be held in Washington, D.C., in October. As recommended by the FCC's Broadband Infrastructure Deployment Job Skills and Training Opportunities Work Group, Broadband Nation represents a “single coordinated and consolidated initiative through a single coalition” to fill the gaps in the U.S. broadband workforce.

Every citizen in the U.S., regardless of education or income level, should

be united in the mission to connect all Americans to high-speed, reliable broadband. But without a workforce skilled in broadband, millions of people in unserved and underserved communities will continue to be shunned from opportunities that the rest of the country enjoys without a second thought. Will the success-

ful deployment of the BEAD program be added to the list of our nation's most historic “construction” projects? With all the key stakeholders working together to address the workforce shortage issue, I firmly believe it will. ■

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**PREVIEW  
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# WHAT MAKES ISE EXPO SPECIAL?

Preview what's in store for the 2024 year

## Educational Conference

On average, attendees can earn up to 7 CECs from leading industry credit providers such as BICSI and ETA.

### » ENHANCED FOR 2024

#### General Conference Sessions

ISE EXPO will deliver the latest telecom education to guide professionals to success in their careers and business ventures. To better accommodate you while on-site, we have extended our education offering on Tuesday, August 20, freeing up your Wednesday, making it easier for you to embrace all the areas that make ISE EXPO special.

The conference program will be announced Spring 2024.

#### Keynote Presentation

Join Scott Mispagel, Senior Vice President, National Engineering and Operations, Frontier

Communications, for ISE EXPO's 2024 keynote presentation.



Additional details on Scott's keynote presentation will be available Spring 2024.

### » NEW FOR 2024

#### Executive Panel Discussion

Join industry leading titans as they gather to guide a compelling, content-rich conversation to share personal insights, and discuss the latest ICT trends and challenges. Here you'll be able to establish meaningful connections and listen to valuable perspectives.



#### Women in Telecom (WIT) Panel

The WIT Panel returns for its 3rd year! 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 in this must attend session. Plus, complimentary breakfast will be served. You won't want to miss this insightful session, all are welcome!



#### Innovative Equipment, Products, & Solutions

200+ Vendor Exhibit Floor

From industry trailblazers to up-and-coming innovators, the 2024 exhibit floor will be packed with experts ready to talk through their innovative equipment, products, and technologies.



#### Tech Talks

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 opportunity to shake their hands after their keynote.

Stay tuned as we announce our 2024 Tech Talk presenters Spring 2024.

### » ENHANCED FOR 2024

## DEMOS & DONUTS

Get your hands on the latest ICT products and technologies in the new rotation style, interactive Demo Zone. Our exhibitors will be showcasing their innovative products through interactive demos, giving you the chance to experience them firsthand. Plus, there will be coffee and donuts! Limited to first 50 attendees at the door.



## Networking Events

» NEW FOR 2024

### CONNECT COLLABORATE™

Solutions Based Networking

Grab some lunch and stop by the Collaboration Corner Wednesday and Thursday for a fresh networking engagement opportunity, located right on the show floor! Here, you can connect with other like-minded decision-makers in small groups to explore industry challenges ranging from topics such as Improving Customers' Home Experiences to Creating a Responsible Roadmap for AI and the Intelligent Network. Participants will walk away with solutions and brand-new connections, in an intimate conversational environment. This event is open to full conference attendees, speakers, and exhibitors.



### On-Site Networking Happy Hour

Building connections and meeting with fellow members of the ICT industry is what ISE EXPO is all about. All attendees are invited to join us for a special Networking Happy Hour Wednesday, August 21, 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.

» CAPACITY INCREASE FOR 2024

### 3rd Annual Golf Tournament

#### ISE EXPO ADD-ON

Registration is separate.

Whether you are looking for additional networking opportunities, hosting a team of your customers, or wanting to try a new course, the ISE EXPO Golf Tournament is a great way to tee off ISE EXPO week. Join us on Tuesday, August 20, at Tension Highlands Park Golf Club, for a fun-filled day on the course. Don't delay registering—the tournament sells out early every year!



## Pre-Conference Training Workshops

### Light Brigade Workshop: Help Close the Digital Divide – FTTx Outside Plant Design

#### ISE EXPO ADD-ON

Registration is separate and can be added onto Full Conference Passes.

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.



The 2024 ISE Network Innovators' Awards will honor the best telecom infrastructure/network innovations that solve Communications Service Providers (CSPs) AND end-users pain points in a cost-effective manner. Honorees will be announced at ISE EXPO in Dallas, TX, August 21, 2024. Program opens March 4, 2024.

» ENHANCED FOR 2024



#### ISE EXPO ADD-ON

Registration is separate and can be added onto Full Conference and Exhibits Plus Passes.

The Society of Cable Telecommunications Engineers (SCTE) and ISE EXPO are committed to educate and provide real-world fiber training to those looking to grow in the industry. For the 2nd year, Hands-on Fiber Training will provide attendees with the fundamental knowledge needed for working on the fiber-to-the-premises (FTTP) networks being deployed by MSOs. **Plus, we're adding new educational tracks which will include Wi-Fi and fiber design.**



# 2024 SCHEDULE OF EVENTS

ISE EXPO 2024 promises to build off our stellar 2023 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 19, 2024

8:00 AM – 5:00 PM	Exhibitor Move-in
12:00 PM – 7:00 PM	Hands-on Fiber and Wi-Fi Training with Networking Reception— <i>Require separate registration</i>

## TUESDAY, AUGUST 20, 2024

7:30 AM – 2:00 PM	Golf Outing
8:00 AM – 5:00 PM	Exhibitor Move-in
9:00 AM – 5:45 PM	Hands-on Fiber and Wi-Fi Training— <i>Requires separate registration</i>
12:00 PM – 5:00 PM	Registration Open
1:00 PM – 4:00 PM	Light Brigade Workshop— <i>Requires pre-registration</i>
1:15 PM – 4:45 PM	Seminar Sessions

## WEDNESDAY, AUGUST 21, 2024

7:00 AM – 5:00 PM	Registration Open
7:00 AM – 10:00 AM	Exhibitor Move-in
8:00 AM – 9:00 AM	ISE Network Innovators' Awards Breakfast
8:00 AM – 10:15 AM	Seminar Sessions
9:15 AM – 10:15 AM	Women in Telecom (WIT) Panel Discussion (open to all)
9:15 AM – 10:15 AM	Demos & Donuts— <i>limited to first 50 attendees</i>
10:30 AM – 11:30 AM	Opening Keynote   Scott Mispagel, Frontier Communications
11:30 AM – 5:00 PM	Exhibit Hall Open
12:00 PM – 1:30 PM	Lunch on Exhibit Floor
12:00 PM – 1:30 PM	Connect & Collaborate: Solutions Based Networking
1:30 PM – 3:30 PM	Exclusive Hands-on Fiber Training Show Floor Tour
3:30 PM – 5:00 PM	Networking Happy Hour on Exhibit Floor

## THURSDAY, AUGUST 22, 2024

7:00 AM – 2:30 PM	Registration Open
8:00 AM – 10:15 AM	Seminar Sessions
9:15 AM – 10:15 AM	Executive Panel Discussion
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
12:00 PM – 1:30 PM	Connect & Collaborate: Solutions Based Networking
2:45 PM – 3:00 PM	Attendee Vacation Giveaway in ISE EXPO Rebooking Booth
3:00 PM – 7:00 PM	Exhibitor Move-out

## FRIDAY, AUGUST 23, 2024

8:00 AM – 12:00 PM	Exhibitor Move-out
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# CLOSING THE DIGITAL DIVIDE IN Indigenous Communities and Beyond

"This is about more than just the internet." Toptana, the first subsea cable company owned by a sovereign Indian Nation is taking matters into their own hands.

BY TYSON JOHNSTON

**R**eliable high-speed connectivity is essential to thriving in the modern economy. But many communities, including many Tribal and other rural communities, don't have it.

Recent studies have shown<sup>1</sup> that less than one-quarter of households in indigenous communities have access to quality, high-speed internet. Thirty-three percent (33%) of reservation residents<sup>2</sup> rely on cell phone service for at-home internet.

My community, the Quinault Indian Nation (QIN), is all too familiar with the digital divide. We are a community of over 2,000 people and over 210,000 acres of land, including 27 miles of Pacific coastline. Approximately one-third of our QIN community lacks internet access of any kind, creating challenges in vital areas such as economic development, education, emergency response, and telehealth.

To address this issue, we have taken matters into our own hands. Through the launch of Toptana Technologies—the first subsea cable company owned by a sovereign Indian Nation—we are building an open and neutral cable landing station to provide diverse, transpacific network capacity from the U.S. to the Asia-Pacific market. This will be the first new cable landing station in Washington State since 1999.

Our new fiber optic backhaul network will enable secure and reliable access from the coast of Washington out to the I-5 corridor with onward connectivity to Seattle, Washington, and Hillsboro, Oregon. By developing first-mile (ocean fiber) and middle-mile (regional) connectivity, we are providing the critical infrastructure to make last-mile (fiber-to-the-home) development possible for the benefit of QIN as well as surrounding communities.

## Challenges to Developing Infrastructure

The process of obtaining permits to build new cable landing stations and lay submarine cables is often long and complex, with obstacles ranging from regulatory issues to environmental considerations.

Deploying backhaul fiber optic cables is also a challenging process that often requires obtaining permits and permissions from various government agencies, which may have different requirements and processes—creating additional delays and complexity.

Once installed, these cables require ongoing repair and maintenance to ensure optimal performance. Maintenance can be expensive and time-consuming, particularly in remote or hard-to-reach areas.

Courtesy of the Quinault Indian Nation



## Toptana's Approach to These Challenges

Toptana Technologies aims to overcome these challenges.

The sovereignty of the QIN, our abundance of underdeveloped land, and our adjudicated ocean rights 30 miles into the ocean are key reasons we've been able to move forward with a cable landing station where others have been stymied since 1999.

With careful consideration of environmental resources and concern for the fishing industry, we determined that QIN territory was a highly feasible landing point and one which uniquely overcame the aforementioned challenges. In 2019, we began to find industry partners that could help us balance technological progress, develop a sustainable economy, provide stewardship of land and waters, and ultimately bring a positive impact for countless generations ahead.

The intent of having as little environmental impact as possible has carried





“...less than one-quarter of households in indigenous communities have access to quality, high-speed internet.”

throughout the entire development process. We’ve worked with industry experts to explore the impact of the submarine cable, cable landing station and backhaul network on natural resources in the area, and through extensive studies, we validated the minimal impact of the infrastructure.

### Ensuring Connectivity for All

We’re building this digital infrastructure because it’s essential, and we’re uniquely able to solve the challenges that have stymied developers for over 20 years.

But we can’t do it alone. Collaborations between the government and private sector could combine public resources with private expertise to accelerate the

development of broadband infrastructure. Streamlining the permitting and approval process could help to reduce costs and accelerate the deployment of new infrastructure, while policies that require broadband providers to allow other service providers to use their infrastructure could help to reduce costs and promote competition.

Historic public funding for broadband internet is now rolling out, but there are barriers that make it particularly difficult for smaller communities and companies to compete for funding. Despite our progress, the fact that we will connect the currently unconnected, and the cooperative nature of the development between QIN and the private sector, Toptana remains fully funded by the QIN.

This is about more than just the internet. It’s about the opportunities high-speed internet enables that allow us to be actively involved in modern society—leading to additional preservation of our way of life parallel to increased sharing of our gifts and traditions with the global community. ■

### REFERENCES

1. Digital Equity for Indigenous Communities, [www.socialconnectedness.org/digital-equity-for-indigenous-communities](http://www.socialconnectedness.org/digital-equity-for-indigenous-communities)
2. Tribal Technology Assessment, [api.asu.edu/sites/default/files/tta\\_fact\\_sheet\\_compressed.pdf](http://api.asu.edu/sites/default/files/tta_fact_sheet_compressed.pdf)

**Tyson Johnston** is the Chairman of the Board and Head of Development for Toptana Technologies. Follow him on LinkedIn: [linkedin.com/in/tyson-johnston](https://www.linkedin.com/in/tyson-johnston). For more information regarding Toptana, visit [www.toptanatech.com/](http://www.toptanatech.com/). Follow them on Twitter @Toptana Tech and LinkedIn: [linkedin.com/company/toptanatech](https://www.linkedin.com/company/toptanatech).



# Smart Home Management Apps Can Open Up New Revenue Streams

How broadband service providers are uniquely suited to capitalize on smart home technology.

BY PAUL HENDRIKS

The interconnected smart home is very much a reality. The number of connected devices inside our homes has increased dramatically over the last few years and, particularly, since the global pandemic. The likes of smart speakers, doorbells, and cameras are becoming regarded as less of a luxury and are becoming more established in homes every day.

These devices, as well as next-generation applications such as virtual reality and artificial reality, are taking broadband network capacities to the brink. As a result, broadband service providers (BSPs) are not only looking to benefit from greater control and management, but they are also seeking to monetize and unlock greater value through the differentiated services they can offer. The key to success is seamless smart home management.

## Tooling Up with Smarter Routers

Customer Premises Equipment (CPE) and other Internet gateway devices present BSPs with an opportunity to activate and manage third-party applications for their end users. This includes enhanced



Courtesy of Gangee

security solutions, video delivery, Wi-Fi motion sensing, and gaming.

But customer churn has long been a key concern for BSPs, affecting the Average Revenue Per User (ARPU). Online safety concerns, buffering calls, poor network coverage, and limited control preventing prioritization of network traffic all impact customer loyalty. Calling customer support or dealing with online support tools add to customer frustration, as they want to fix the problem themselves and quickly.

Broadband service operators are looking to offer subscription-based services rather than simply providing connectivity. This agility for end-users to pay for services if and when they want them will subsequently reduce customer questions, complaints, and truck rolls. When customer churn decreases, operators will be perfectly placed to scale their business offerings to serve each customer uniquely and cater to their growing and varying needs.

## A Smarter Opportunity to Prosper

Smart home management is the most vital frontier for BSPs missing out on new revenue opportunities. Leveraging a value-added service platform on top of the home router network is a game changer. Only by delivering a seamless, simpler digital user experience will we see a more widespread adoption. Users will all benefit from easier navigation and a streamlined way of installing and setting up a home Wi-Fi management app.

Innovations, such as artificial intelligence and machine learning, will play a key role in the years ahead in smart homes, with devices adapting to user behavior and preferences. In turn, our home networks will integrate seamlessly with the likes of augmented reality and virtual reality to fuel a more interactive experience.

BSPs find themselves at the front of the queue in terms of benefiting most from

the potential of the smart home compared to start-ups and others vying to prosper from the lucrative potential on offer. This is in no small part thanks to their existing pool of customers and access to internet connectivity via routers already inside the home. They are therefore ideally positioned to reap the rewards.

### Intelligence Built-In

The smart home of the future will use the power of Wi-Fi for far more than simply broadband connectivity. More Wi-Fi does not necessarily amount to better Wi-Fi as more interference can be encountered. But the right management app can help end-users effectively utilize the Wi-Fi at their disposal.

Services such as home security, care services, and energy savings are among the applications that can be provided over Wi-Fi if end-users have a home or mesh network with the app intelligence built-in. Differentiation of products from others

in the marketplace will be made possible with access to new services and applications in one all-inclusive and engaging app.

### Engaging with Your Customers

An app with a rich feature set can act as a digital smart home platform, tackling in-home Wi-Fi issues and seamlessly managing Wi-Fi, users, and devices, allowing service providers to engage with their customer bases.

An application that is fully integrated with the end-user is a powerful engagement tool that can initiate product-led growth. While starting small, perhaps offering a free service, it can hook and engage users. The next step can be trialling other elements and triggering users to pay for more recurring subscriptions and packages.

While a smart home management app is nothing new, the key is making sure people use it. Apps such as WhatsApp and Instagram are popular and heavily used

because users are constantly engaged and digesting updates from their friends, family, and celebrities. If an app is hidden away however, it might as well not exist. But if users can view it as part of their lives and smart homes, then this digital platform becomes incredibly valuable to them.

Consumers care about personalized experiences that bring value and do not waste their time. BSPs and router suppliers can therefore revolutionize home networking and unlock new revenue streams and upselling opportunities by using a smart home management app which can double up as a customer engagement tool.

### Allocating and Prioritizing Bandwidth

The Gamgee app is a hardware-independent solution and can provide great insight into consumers' smart homes. While it is important to collect as much data as possible, it must be used wisely to access valuable insights for customer support. This

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can be made available in the Gamgee Partner Portal where BSPs can gain a detailed understanding of their customers and use this knowledge to personalize their offering and improve customer satisfaction.


The app is utilized on users' mobile devices, provides an overview of all the devices connected to the router, and measures Wi-Fi traffic and performance. Bandwidth can be allocated and prioritized for certain devices when needed, such as a laptop for a work meeting over another user in the home network streaming videos on a tablet, or gaming.




**Detects**  
Wi-Fi signal  
disruptions



**Distinguishes**  
between  
human and  
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motion




**Sends instant**  
alerts upon  
detection



**Define (Your)**  
Alarm Zones

Using the app,  
customize and map  
your home's secure  
zones.



**Pinpoint Intruder's**  
Location

Instantly identify the  
room an intruder is  
detected in.

Courtesy of Gamgee

The IT Manager of Your Home

Services such as cybersecurity, identity protection, VPN service, a special and dedicated secure home office network, and a home alarm system can be among the feature set. The app will make the router smarter, and arm users with the tools to seamlessly manage the routers inside their homes and extend the lifetime of deployed and aging hardware for operators.

The more digital our households become, the more challenging the situation becomes for the existing home network. Deploying the right smart home management solution can make complicated technologies easier to manage, and everyone can be the IT manager of their own home, controlling their digital life from the palm of their hand.

For BSPs, value-added resellers, and router suppliers, there is a twofold opportunity: increase the revenue per user and position yourselves as leaders in the smart home arena. The journey to redefining user experience and deriving optimal value for your customers, begins now. ■



**Paul Hendriks** is Chief Executive Officer of Gamgee. He has a long-standing career in telecommunications and cybersecurity. For more information, visit [www.gamgee.com](http://www.gamgee.com). Follow Gamgee on Facebook and LinkedIn @gamgeebv.

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