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Bruce Moore
CEO, HIGHLINE MIDWEST P. 12

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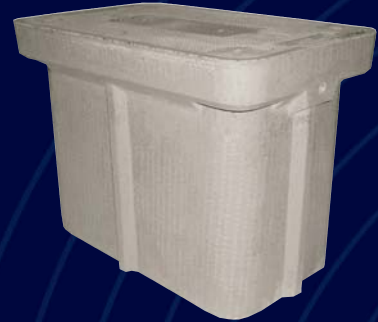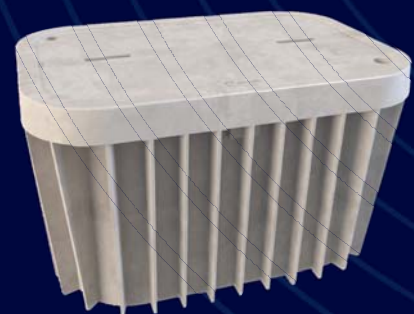
Trends That Really Matter

WELCOME TO A SNEAK PEEK of what will be driving your to-do list in 2023. This issue encapsulates the fascinating trends and realities that will shape network transformation in 2023 and beyond. Don't worry, these trends are not empty marketing lingo about the gunk we get sucked into from the myriad of social media feeds we try not to spend our time on each day.

This content will help you be clear about WHY you do what you do. Its context will help your team understand how they fit in the grand scheme of your company's objectives to succeed in the fourth Industrial Revolution. (No. I'm not being dramatic or joking. We're all in this "Revolution" thing together so it's time to remind ourselves WHY we do what we do—outside of the paycheck of course.)

Kick off 2023 by committing to invest 10 minutes each morning to read about your future BEFORE you get stuck in the day-to-day task list that taunts you. As you whet your appetite with all the great stuff going on in your professional world, pass on an article or two that piques your interest to your fellow team members. You never know, it could spark ingenuity, creative problem-solving and professional mojo that drives your team to meet those 2023 goals you put in writing to your manager.

Speaking of sparking something. We're on a mission to help you and your teams celebrate THEIR collective accomplishments. In March, the ISE brand is launching a new program to honor the amazing efforts of every person on your team who makes network transformation magic happen!

ISE NETWORK INNOVATORS AWARDS

The ISE Network Innovators Awards open in March so it's time to get your submission team organized. Take this month to invite your team to decide which unique product, technology and/or educational offering will make a marked difference to our industry in 2023. Start those bi-weekly touch base calls so everyone gets jazzed to dominate in their respective category. That's the intentional way to kick off this awards season with a bang!

Our well-respected panel of judges will be ready and waiting to review your applications the minute they are submitted. (Believe it or not, they're already asking for the best seats at our inaugural Network Innovators Awards Breakfast at ISE EXPO 2023.)

Don't let 2023 start with lame resolutions that never stick. Commit to four things instead. Read. Share. Inspire. Motivate. Make this year an investment in what really matters for you AND your team—each other.

Sharon

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Follow Sharon on Twitter and LinkedIn for further conversation and insights.
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The Secret to Future Proofing

Technology, Scope, Scale, Capital, Construction or…?

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WHENEVER ANYONE USES the term "future proof," I question them about what they mean, phrasing it for their age. If they were active in tech during the 1970s, the question would be "Did you foresee the way fiber optics would dominate all communications?" For the 80s, "Did you think the personal computer would become something everyone carries around in their pocket?" In the early 90s, "Could you have predicted the impact of the Internet on communications?" After Y2K, it might be about the smart phone, video streaming, FTTH, or a number of advanced communications technologies.

None of us could have predicted the future of those technologies at the time. Our predictions would have been so conservative compared to what actually happened. But many of us saw the potential in those technologies, dove right in and rode the waves!

That's why I always question the term future proofing. That said, I do NOT question the importance of looking to the future even though we know predicting it is difficult if not impossible.

When looking at the scope, scale, and costs of a communications project, it's important to consider those things we can envision, make reminders about the questions we don't yet have answers to, and continue to ask questions about the cost implications of both.

Fiber optic projects are usually driven by a need for communications *right now*. The initial concept usually comes from those who have no idea what building a fiber network entails.

When that concept needs to be executed, project planners from communications service providers (CSPs), infrastructure contractors, utilities, and/or municipalities are charged with making the concept come to life.

FIGURE 1. *Netly used microtrenching along the curb to install 6 microducts.*

The Options

Thankfully there are several ways to hedge your bets for the future when it comes to building fiber networks:

SOLUTION 1

Install more fiber than you need. Fiber is cheap, cheaper than kite string or monofilament fishing line, according to a friend who studies the fiber optic marketplace. Our own anecdotal research on rural fiber broadband says that fiber optic cable of fewer than 24 fibers is NOT cheaper than one with more fibers. In fact, a lower fiber count is more expensive. When you consider the cost of installation dwarfs the cost of the cable, justifying your purchase of cable with a higher fiber count is easy.

In urban networks, it's becoming commonplace to install high fiber count cables. The most used fiber counts seem to be 864 or 1,728 fibers. That said, higher fiber counts can be problematic in urban areas because of the extremely large bend radius required for service loops.

SOLUTION 2

An alternative to installing higher fiber count cables is installing more fiber ducts. We first saw this idea in New England. When the Massachusetts Turnpike Authority was faced with its third fiber construction project along the Turnpike, they required the contractor install about a dozen large fiber ducts. This ensured that the next company wanting to install fiber along the Turnpike would not require disruptive construction. They would simply pull fiber through the empty ducts. That idea spread quickly. In 2021, the "Dig Once" policy became H.R.3703 – Nationwide Dig Once Act. (Source: https://www.congress.gov/bill/117th-congress/house-bill/3703/text.) Microcables, microducts, microtrenching, and cable blowing makes "Dig Once" even easier.

Case Study

When Netly Fiber Optics started building their network in the city of Solana Beach, California, they used these strategies as part of their business model. They microtrenched along the seam between the roadway and the curb and dropped in a 6 microduct assembly. For their initial installation, they blew in a 288 fiber microcable, leaving 5 open ducts. When they need additional capacity, they only have to blow in more 288 fiber cables, to a total capacity of 1,728 fibers along any street in the city. (See Figure 1.)

What Netly did in Solana Beach was much more radical than planning for future cable installations. Netly's business model is to create an open-source fiber optic network where every potential user in the town has their own dedicated fiber. Their headend office has a fiber connection to every potential user, not just FTTH customers, but businesses, government offices, traffic lights, current, or future cell sites, etc.—about 30,000 fibers for a town of 6,000 residences.

|||||||||||||||||||||||||||||||||

"Perhaps that's the bigger picture of future proofing. It's not all about technology."

Netly is not a service provider, they are a fiber provider. Their headend can host equipment from multiple ISPs, CATV companies, cellular providers, and others in addition to the city departments. Connecting to a service point just requires running a patchcord from the service provider's equipment to the appropriate fiber for the customer. Changing service providers is as simple as changing patchcords. (See Figure 2.)

That open-source model, coupled with the use of standard singlemode fiber enables upgrades to terabit speeds, a thousand times faster than most current networks. That has led to Solana Beach being called the first "Terabit City."

FIGURE 2. *Netly's headend in Solana Beach can host any service provider and connect them to any user in the town.*

Future Proof?

How long will the Solana Beach network be able to handle traffic? Today's singlemode fiber technology is already 40 years old and still going strong, even as network speeds have increased almost a million times. Today's cables are likely good for a lifetime of another 40 years. It's anybody's guess what communications networks will look like in 2063, so calling Solana Beach 'future proof" is still premature.

We also know most fiber deployment projects are constrained by a budget. The Netly business model attempts to address this in a different way. With the cost of fiber optic cable being a small fraction of the construction costs, this alternative model opens leasing to multiple service providers, utilities, munis, and others. This approach helps rationalize that CAPEX. What's more, the company is backed by venture capital.

Perhaps that's the bigger picture of future proofing. It's not all about technology. ∎

Jim Hayes is a VDV writer and trainer and the president of The Fiber Optic Association. For more information, email jeh@jimhayes.com or visit www.jimhayes.com. To learn more about The Fiber Optic Association, visit www.thefoa.org.

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EXECUTIVE INSIGHTS WITH
Bruce Moore

CEO, Highline Midwest

How a Rural Michigan RDOF Winner Delivers on Its Commitments

BY SHARON VOLLMAN
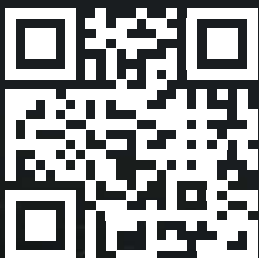
TOPIC: Advocating for Rural Providers

You've done significant work advocating for the needs of Michigan communities that are underserved.

ISE: Share some of the unique challenges you face in terms of network deployments, labor challenges, supply chain and ROI. What can the industry do to help other providers (and you, of course) with those challenges in the future?

Moore: Highline Midwest is an example of an RDOF award winner that is living up to its responsibility to serve its unserved households. Our thousands of subscribers live in very rural, agricultural terrain where it's challenging to deploy fiber underground. This translates to 1,000s of right-of-way miles that were never permitted for fiber construction.

The key to fiber deployment success is developing relationships with County Road Commissions and mapping out how best to construct a network that will pass an average of 8 homes per mile.

Another challenge we face is the scope and expansiveness of our tasks given a construction window that is very short due to weather. We also require construction significant resources like plows, drills, etc. to accomplish our goal of constructing 1,000 miles each season.

TOPIC: Hearing Your Customer

ISE: What do your customers expect? And what do your potential customers call you about the most?

Moore: Reliability is what customers expect. Streaming is cool but reliability is priority one. Fiber brings a new level of reliability expectation. Even though Highline is providing the fastest Internet they have ever experienced, tolerance for any network outage is low. Our potential customers can't help but ask, "When are you getting here?"

It's tough matching customer interest with the ability to build a rural fiber network fast enough! They want it today and we have to communicate longer timelines. Managing expectations is an art and a science.

TOPIC: State Support for Fiber Deployments

This summer, Lt. Governor Gilchrist visited Ford River Township to see some of the network elements you're employing to deliver gigabit speeds to Michigan's rural communities. The PR on your website shared the following: "Bruce Moore, CEO of Highline Midwest, has been promoting the growth of Broadband in Michigan to all townships, counties, and political advocates to ensure that they understand that Highline is willing to build to every county with the help of additional Michigan grant money that will be available this year, and subsequent years. Having the infrastructure in place and connecting to a core network means that expansions into additional counties is easier for Highline than a new entity coming in and having to start their construction from scratch."

ISE: What will Highline do related to network transformation to secure those funds? What preparation is necessary to prove your ability to scale in rural areas?

Moore: We need to offer education, education, and more education to the community stakeholders. We need to educate them about

> " *"How can our industry fulfill the promise of Internet to all? We ALL need to be good stewards of funding from any sources. Only when we are good stewards and deliver on our promises should we be eligible for future funding."*

Highline's current obligated areas and how we are positioned to extend our network more efficiently and cost effectively with additional grant funds and public private partnerships.

We also must communicate that the initial network we are building for RDOF is designed for future scalability. With the changing definition of unserved households and future federal and state grant opportunities, Highline is well positioned to efficiently invest these grant dollars to immediately serve the households which were not included in the RDOF program. Because of poor mapping, many non-RDOF households are literally across the street! We embrace the plan of Internet for All!

Finally, we must over-communicate about how our network is designed to offer 1 Gig symmetrical services for the future multi gig needs of consumers and businesses.

TOPIC: Fiber Deployment

Aggressively deploying fiber across rural communities is no easy, nor cost-efficient, task.

ISE: What are two of Highlines best practices you can share with other providers on a mission to help their communities?

Moore:

- Spend the time to create a network that is capable of delivering

a reliable IP address. And provide the customer premise router to provide the services. As I said before, Wi-Fi is the Internet in the minds of consumers!

- Invest in pre-construction due diligence to fully understand the route miles of fiber placement.

TOPIC: Priorities

ISE: What are two of Highline's network-related priorities for 2023?

Moore: Continue deploying IPv6 addresses and continue our 2022 priority of network redundancy.

TOPIC: BEAD Funding –
A Burdensome Process?

Recently the Senate Commerce Committee argued that rules regarding fund release requirements around pricing, labor and technology requirements are arduous and go against the intent of the program. Fierce Telecom reported that members of the committee shared their concern over certain requirements being unnecessarily burdensome on the states and service providers receiving the money. (Source: https://www.fierce-telecom.com/telecom/more-dozen-senators-press-commerce-chief-rethink-bead-rules)

ISE: Share your opinion about this.

Moore: It is a challenging proposition for government agencies to determine timelines on building a reliable fiber network. Realities of the construction process can't be viewed in a theoretical manner. They must be rooted in reality because each build is unique. There is no broad-brush solution.

> **"Reliability is what customers expect. Streaming is cool but reliability is priority one. Fiber brings a new level of reliability expectation. Even though Highline is providing the fastest Internet they have ever experienced, tolerance for any network outage is low."**

TOPIC: Labor Shortage

The US telecommunications industry employs a total of 672,000 workers, with average annual wages of $77,500. It's forecasted that 5G rollout and other technologies could create 850,000 more "new direct broadband and 5G jobs" through 2025.

ISE: Clearly our industry needs workers. How can we attract and retain field talent in the future?

Moore: High schools, community colleges and traditional skill centers are now offering telecommunications trade skills courses that focus on fiber splicing and installation. As

Highline announces its first Smart Rural Community designation to Ford River Township in Delta County with the help of Michigan's Lt. Governor Gilchrist. (Pictured left to right: Bruce Moore, Bethany Leiter, Steve Nelson, and Lt. Governor Garlin Gilchrist.)

Communications Service Providers (CSPs), our job is to create mutually beneficial relationships with these organizations and then share job openings that pay well and offer great culture. This type of community collaboration will create a workforce for future industry demands.

TOPIC: In-Home Network Reliability

Consumers want higher-speed in-home networks. They also want high network reliability and low latency so their smart home devices controlling home security, climate or even sprinkler systems are not at risk. Toward that end, some CSPs and MSOs say their goal is to make Wi-Fi as reliable as a hard-wired connection.

ISE: What is Highline doing to make this a reality?

Moore: Consumers believe that Wi-Fi IS the Internet. Therefore, we must provide state-of-the-art Wi-Fi 6 routers and applications with advanced home management and security features.

TOPIC: Your Forecast for 2023

ISE: What's your crystal ball saying will be most important to Highline's success in 2023?

Moore: We are on a mission to serve the unserved households in our serving area. We will continue with our plan to pass 8 homes per mile with fiber and aim to complete that by the FCC deadline in 2027.

How can our industry fulfill the promise of Internet to all? We ALL need to be good stewards of funding from any sources. Only when we are good stewards and deliver on our promises should we be eligible for future funding. This is where state and federal grant programs should support proven CSPs that have delivered on their commitment to connect communities.

TOPIC: Proactive Network Management

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

ISE: What are some proactive approaches you recommend to control OPEX?

Moore: Hiring staff who are closest to the customer and negotiating cost effective backhaul connectivity.

Moore: Building optical networks today for future bandwidth demands of residential customers.

TOPIC: Retaining and Retraining Top Talent

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

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

Moore: Four principles we embrace:
- Let the talented people perform at a high level!
- Don't micromanage.
- Reward employees based on the success of the company.
- Remember to say Thank You.

TOPIC: Team Members

ISE: What's the primary concern of your team members for 2022 and how are you addressing it?

Moore: They express concerns about managing work and creating a work/life balance (managing work/life balance). The way we help is to ensure they understand the vision of the company and their role in the grand scheme of that vision.

TOPIC: Advice

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

Moore: Treat others as you'd like to be treated. Always do your best to bring level-headed leadership to your team. ∎

First customer ribbon cutting for Highline's Michigan business at the Escanaba Chamber of Commerce. (Pictured left to right: Matt Dale, Bruce Moore, Linda Budkis, Kirt Hooten, and Ed Legault.)

TOPIC: Vendor Collaboration

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

Moore: Reliability, high level support, and software upgrades that keep up with the pace of our business.

TOPIC: The Elephant in the Room

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

ABOUT BRUCE MOORE

As Highline's Midwest CEO, Bruce is responsible for the leadership of Highline's FTTH business plan and team that delights customers with life-changing Internet service. His 34-year telecommunications career started with Century Telephone introducing dial-up service in 1996, Bresnan Cable Television launching cable modem service in 1998, leading a WISP in one of the nation's first fixed wireless deployments beginning in 2005, and now leading Highline's FTTH Midwest business starting in 2021. When not helping resolve the rural Internet problems in Michigan, Bruce enjoys golf and is a 25-year registered high school basketball official. For more on Highline, visit https://highlinefast.com/. Follow them on Twitter @Highline_Fast, Facebook: https://www.facebook.com/HighlineInternet/ and Instagram: https://www.instagram.com/Highline_Internet/.

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Lobby B
Four Seasons Ballrooms 1 - 4
600's, 700's Meeting Rooms

Exhibit Halls C, D
Lobby C, D
Bellco Theatre

500's Meeting Rooms

Stout Street

ROUNDTABLE EXECUTIVES [PICTURED LEFT TO RIGHT]

Michael White, SVP Sales & Marketing, Congruex
Randall René, Industry Solutions Director – Telecom & Cable, Esri
Annie Bogue, Chief Operating Officer, Fujitsu Network Communications
Dan Levac, National Sales Manager, Communications Markets, PLP
Sam Pratt, CEO, Render Networks
Joe Jensen, Director Market Development, FTTH, Corning Optical Communications

AT MATTERS MOST FOR 20 23

BY JANICE OLIVA

Six Executives Explore Future Network Transformation Challenges at ISE's Exclusive Roundtable Event

T ISE EXPO 2022, I had a LIVE and candid conversation with industry executives from Congruex, Corning Optical Communications, Esri, Fujitsu Network Communications, PLP and Render Networks.

Face-to-face, we discussed challenges in design and planning, workforce and timelines, funding, technology, and more. I know you'll find their responses insightful and pointed about what's needed to prepare our industry for the future.

Happy learning!

ISE: What is the biggest challenge to transforming the fixed and mobile networks for the future?

White, Congruex: The single biggest challenge to transforming these networks is the workforce planning and development required to successfully complete the volume of work needed to meet demands. Hiring from the existing talent pool

Michael White
SVP SALES & MARKETING
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does not scratch the surface of resources needed to complete the work at hand. As such, it is important for the ICT industry to attract and develop new, additive talent pools. The company that solves for this problem will be the most successful in delivering for its clients in this new ICT environment.

Jensen, Corning: Building a network is a very complex set of decisions that requires careful thought to ensure that the network does the job well today and tomorrow. To appreciate this burden, consider the process of building a custom home for your family where the number of decisions are exhausting ranging from size and location down to the tone/color of the vanity fixtures and countertops. As operators take on these complex projects, they often need help to understand which

> **"BEAD is a very exciting opportunity for the industry, and it will help address the Digital Divide."**
> **– JOE JENSEN, CORNING**

choices and tradeoffs make sense for them. Architectural decisions can affect the cost, speed, maintenance, flexibility, and adaptability of the network for many years. Further, one set of choices may work well for suburban builds but as networks begin to scale into rural areas a different set of choices can and often will make more sense. So, it's important to work with a trusted, experienced provider to ensure you get the desired outcome.

René, Esri: One of the biggest challenges that comes to mind revolves around intelligent capital and expense management. Our industry is seeing growth and competition like never before, and service providers are having to do more, faster,

Randall René
INDUSTRY SOLUTIONS
DIRECTOR – TELECOM & CABLE
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and often with less people, than ever before. Additionally, teams throughout organizations are having to leverage legacy and complex workflows to get the job done.

Take for instance the magnitude of densification efforts that must occur to meet current and future consumer needs. More fiber, more small cells sites for 5G and fixed wireless, mixed with increased capacity demands, community growth and movement, and increased IoT devices. Everything needs fiber.

Since everything in the telecom industry happens somewhere, service providers need to be able to leverage location as the common thread. By doing so, organizations can be fiscally mindful in their capital and expense management as they work to design, deploy, and manage their networks.

Bogue, Fujitsu: A few things immediately come to mind. Capital is the first challenge. Providers of all sizes are seeing decreased cash flow from users due to current-term inflation and the possibility of a long-term recession. Anytime there is a downturn on a macro level, companies re-prioritize projects and strategies, seeking to maximize cash flows from existing assets and safe service offerings. I'm hopeful the economic situation will stabilize, and network transformations will continue.

The second challenge is risk from operational change. I've built my career on listening to the operations folks and I know we must help them minimize the risk that comes with change. Providers are always seeking to balance risk with return, but

Annie Bogue
CHIEF OPERATING OFFICER
FUJITSU NETWORK COMMUNICATIONS

FUJITSU

where return is not clearly identifiable, they will usually opt for the technology that better aligns with their existing operating structure. Vendors can play a pivotal role in identifying innovative technology and implementing it in a way that minimizes operational risks.

WHAT LINKS COMMUNICATIONS TO COMMUNITIES?

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Rejuvenation Strategies

ISE: What do you do for personal enjoyment and to refresh yourself to be a better executive?

White, Congruex: Recently relocating from San Diego, CA, to Boulder, CO, has given me the opportunity to explore a new state. I love spending weekends in CO with my family hiking, biking, and swimming—there is no shortage of things to do! Given the current state of our industry, it can be easy to neglect a work/life balance. The best way to ensure I can show up for my team, and be a better executive, is by committing time and planning meaningful activities with the people that motivate me to be my best—my family. I return to work on Monday rested, focused, and ready to attack the week.

Jensen, Corning: The quest for work/life balance is elusive for many of us. I try to respond in a couple ways. First, I leverage my spouse as a life coach for work issues, which helps me talk through challenges I'm facing and helps provide balance to issues I'm dealing with. Secondly, a mentor of mine once said "be where your feet are". With three kids and my spouse I try to apply this logic and ensure I make time to reenergize and focus, which means unplugging as often as you can. In my spare time, I enjoy doing projects around the house or outdoor activities to help recharge.

René, Esri: First and foremost, I try to focus on mental and physical well-being. I truly know in order to best serve and support others, I need to take care of myself first. I enjoy traveling, getting outdoors, mountain biking, riding my motorcycle, and getting out on the water for kayaking or stand-up paddleboarding. I also enjoy good movies, writing, or playing games with friends and family.

Bogue, Fujitsu: I am a devout yogi. I practice several times a week to keep my body and mind healthy. I'm also a devout wine drinker, which I practice several times a week to refresh myself (also a great COVID-19 self-test). And I enjoy traveling with my husband so I'm happy that COVID-19 restrictions are mostly lifted. We have a trip to Argentina later this year with friends that was rescheduled from 2020 to 2021 to 2022.

Levac, PLP: Continuing to learn more about the industry we serve is key. I enjoy being a part of the organizations that further the common links in our industries. I proudly serve as a member of the PCCA, where I am on the Government Affairs Committee; the FBA, where I serve on the Deployment Specialists Team; and the Buckeye chapter of the SCTE, where I serve as the secretary on the board of directors. I find it revitalizing to continue to learn from others in the industry. I believe that the industry is just like life—you get out of it what you put into it.

Levac, PLP: There are two big challenges to transforming networks for the future that everyone needs to be mindful of. The first is how to ensure that networks are deployed in the most efficient and cost-effective manner that easily enables future growth. This includes ensuring the network and components are easily adaptable, compatible, scalable, and future proof. The second large hurdle is workforce. This includes current and future workforce availability, retention, and development.

Sam Pratt
CEO
RENDER NETWORKS

Render

Pratt, Render Networks: I thought Ken Paker, SVP of Information and Network Technologies and CTO, TDS Telecom, was spot-on in his welcoming ISE EXPO 2022 keynote session where he put forward that the biggest challenge and opportunity to transforming networks solving is for digital construction. A handful of quality communications networks have already been delivered entirely digitally here in the US, however, there is significant value being left on the table. It was terrific to hear an industry leader challenge the industry to find ways to digitize and ultimately reduce the cycle time of fiber deployments.

ISE: With labor issues adding to broadband deployment challenges, what are you proactively doing to address this?

White, Congruex: We have been making big investments into our training and development programs to bring 1,000 unskilled workers into the broadband construction industry over the next 12–18 months. We have identified parallel industries that have resulted in lower turnover of new hires and similar skill sets that reduce the time it takes to create a productive employee. Given the current increase in national network deployments, it is important that large GC's develop new talent rather than pulling from an existing pool of resources—this is the only way builds will be successful.

Jensen, Corning: Corning and AT&T announced a collaborated effort to build a training program to equip thousands of technicians and network specialists across the industry with the skills crucial to design, engineer, install, and manage a growing fiber broadband network across the US. In fact, the initial training class was completed August 26th at Corning's Optical Communications headquarters in North Carolina. We also proactively support training programs through the Fiber Broadband Association. Lastly, we are constantly innovating

Joe Jensen
DIRECTOR MARKET
DEVELOPMENT, FTTH
**CORNING OPTICAL
COMMUNICATIONS**

CORNING

solutions that reduce the amount of skilled labor required to build networks. For example, one of our premier cabling solutions can almost eliminate the splicing that is required in the field and accelerate deployment speed by up to 5x.

René, Esri: We've heard a lot about digital transformation over the past decade. However, I think what we really need to focus on to solve broadband deployment challenges is organizational transformation. Service providers must do more, faster than ever before, and often with less people. This has motivated many individual teams throughout organizations to digitally transform aspects of their workflows without understanding the impact on the entire organization. This has led to siloed data, cumbersome workflows, and frustration.

As service providers throughout the world leverage GIS to transform their companies and to provide a stable foundation for all teams throughout the organization, the need for

> **"One of the biggest challenges on the immediate horizon for our industry, is Environment, Social, and Governance (ESG) reporting."**
> **– RANDALL RENÉ, ESRI**

employees who think spatially and understand GIS grows. To help ensure industries are best prepared to utilize GIS to take on challenges throughout the world, we donate software to schools and have a robust intern program to help educate and inspire our future industry colleagues.

Bogue, Fujitsu: We offer our customers a skilled engineering staff to augment their network builds. We also offer a turnkey network deployment service where we provide everything needed to design, deploy, and operate a broadband network. Both offers help our customers deploy their networks faster, with a reduction in cost.

For turnkey broadband builds, we use our own engineering staff to perform much of the work, but we rely on partners for OSP construction. We're acutely aware of the shortage of labor,

and we're working with our construction partners to provide the best forecasts possible so they can plan their resources. We've also diversified our pool of construction partners to help keep our broadband projects on track. Our design and engineering services have benefitted from a very successful recruiting and hiring program we've implemented. Recruiting and retaining people in skilled roles has been crucial to our success.

Dan Levac
NATIONAL SALES MANAGER
COMMUNICATIONS MARKETS
PLP

PLP

Levac, PLP: We believe that supporting trade work for every level and from every avenue is instrumental in alleviating labor issues. Whether it's the PCCA Workforce Development program, the FBA OpTIC Path, or the Telecommunications Industry Registered Apprenticeship Program (TIRAP), PLP is proud to support these programs any way we can. We are also actively promoting the broadband industry by making connections at high schools, trade schools, and colleges to get the word out. We want people to know that broadband industry work is in demand, the jobs pay well, and projections show that opportunities will continue to grow in this field in the coming years.

Pratt, Render Networks: The highest budget item on a project is labor and, as we know, these constraints are already impacting delivery. Render's technology focuses on keeping field and project teams highly productive. Field teams remain fully utilized as they only receive ready-to-go tasks with dependencies built in, and with detailed work and data capture instructions that reduce cycle time.

By utilizing real-time data in the field, fewer project resources are ultimately required. Ensuring operators have access to class-leading deployment automation technology is what we're focused on solving at Render. ■

Janice Oliva is VP, Group Publisher Lighting & Digital Infrastructure for Endeavor Business Media. She oversees sales, editorial, circulation and production of ISE Magazine, ISE EXPO, and both websites. Contact Janice at joliva@endeavorb2b.com.

ISE 2023 Buyer's Guide

CATEGORY LISTINGS

C&E/Planning

3-GIS
A-Aerial, a division of Altec
AFL
Black & Veatch
Blue Diamond Industries LLC
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Celerity Integrated Services Inc
Channell Commercial Corporation
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WL Plastics

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Harger Lightning & Grounding
Ross FiberOptic LLC

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I&M/Network Reliability/ Cybersecurity

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ICT SOLUTIONS & EDUCATION

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DIRECTORY

3-GIS

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350 Market St NE, Suite C
Decatur, AL 35601
256-560-0744
sales@3-gis.com
www.3-gis.com

Since 2006, 3-GIS has empowered companies to achieve better operating efficiencies and to meet the challenges of building increasingly complex fiber networks. 3-GIS uses a data driven approach based on geospatial reference, rules-based calculations, mobility, and web-based services to realize market opportunities of fiber assets.

CATEGORIES: C&E/Planning | Cloud/IoT/M2M | FTTX | I&M/Network Reliability/Cybersecurity | Mapping/GIS | Network Transformation/ Simplification

A-Aerial, a division of Altec

3462 Webster Ave
Riverside, CA 92571
800-256-5186
aaerial.team@altec.com
www.linemen-tools.com

A-Aerial is your best choice and leading provider of tools, materials, and supplies for your upcoming projects, aerials or underground. We have developed unprecedented methods using e-commerce and advanced shipping methods to get your items delivered quickly. Our stocking and warehousing capabilities insure the items you need are immediately available.

CATEGORIES: C&E/Planning

ADB

18777 US Hwy 66
Pacific, MO 63069
314-426-5200
info@adb-us.com
www.adbcompanies.com

ADB is a nationwide provider of utility & fiber optic infrastructure, wireless communications, and technology solutions serving multiple industries. Services offered include: Project Management, Engineering, Utility Construction, and Technology Solutions. ADB provides turn-key, end-to-end solutions for the communication and utility industries with full capability of self-performing all offered services.

CATEGORIES: FTTX | Rural BEAD/ Digital Divide Solutions | Wireless

AFL

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170 Ridgeview Center Dr
Duncan, SC 29334
bailey.verreault@aflglobal.com
www.aflglobal.com

Founded in 1984, AFL is an international manufacturer providing end-to-end solutions to the energy, service provider, enterprise, hyperscale and industrial markets. The company's products include fiber optic cable and hardware, transmission and substation accessories, outside plant equipment, connectivity, test and inspection equipment, fusion splicers and training.

CATEGORIES: C&E/Planning | Cloud/IoT/M2M | FTTX | Rural BEAD/Digital Divide Solutions | Testing | Wireless

American Power Systems LLC

1851 Central Pl S
Kent, WA 98030
520-668-8959
ericslay@ampowersys.com
www.ampowersys.com

American Power Systems is a DC Power Full-Service EF&I company that provides quality products, superior service and installations for the reserve power industry. We have multiple locations across the United States to ensure prompt reliable service. Services include products, installs, removals, engineering, project management, audits, maintenance, logistics, battery recycling.

CATEGORIES: Core/Legacy | Power/Sustainability | Wireless

American Products

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597 Evergreen Rd
Strafford, MO 65757
417-736-2135
info@amprod.us
www.amprod.us
■ SEE AD ON PAGE 51

American Products is a Strafford, MO, based manufacturer that specializes in producing turnkey telecommunications enclosures. We partner directly with service providers to design, create and deliver integrated enclosure solutions they can count on to protect their valuable networks for years to come.

CATEGORIES: FTTX | Miscellaneous | Wireless

BICSI

8610 Hidden River Pkwy
Tampa, FL 33637
813-979-1991
sales@bicsi.org
www.bicsi.org

BICSI is a professional association supporting the advancement of the information and communications technology (ICT) profession and currently serves more than 26,000 members and credential holders. Provides Education and Training, Conferences and Events, Credentials and Certification Programs, Standards and Best Practices, Reference Manuals, Community and Membership, What is ICT?, and more.

CATEGORIES: Education

Black & Veatch

11401 Lamar Ave
Overland Park, KS 66211
913-458-2000
www.bv.com

Black & Veatch is an engineering, procurement, and construction company with a more than 100-year track record of innovation in sustainable infrastructure. Since 1915, we have helped our clients improve the lives of people around the world. Our revenues in 2021 exceeded US$3.3 billion. Follow us on www.bv.com.

CATEGORIES: C&E/Planning | FTTX | Wireless

Blue Diamond Industries LLC

4040 Finn Way, Suite 240
Lexington, KY 40517
859-224-0415
info@bdiky.com
www.bdiky.com

Provides HDPE (High Density Polyethylene) conduit solutions for the protection of fiber optic, data and power cables. The conduit solutions of duct, innerduct and microduct provide optimal service and value through delivery, technology, and economic benefit. Has the production agility necessary to support the demands of the rapidly growing infrastructure expansion throughout the US market.

CATEGORIES: C&E/Planning | FTTX

Border States

2400 38th St S
Fargo, ND 58104
www.borderstates.com

SCADA. AMI/AMR. Distribution Automation. Smart Grid. NERC-CIP. Utilities use communications. Whether you are starting from scratch, securing what you are already using or adding to your network, Border States can help. From fiber optics to surveillance, we have the latest products and solutions from the best vendors in the industry.

CATEGORIES: Network Transformation/Simplification | Testing | Wireless

Budco Inc

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2004 N Yellowood Ave
Broken Arrow, OK 74012
800-331-2246
mail@budcocable.com
www.budcocable.com

Budco is a distribution company for cable and fiber construction, installation and identification tools and products. Build It, Install It, Identify It... Budco represents the manufacturers whose products have built the telecommunications industry as we know it. For over 50 years, Budco has been serving the cable professional every step of the way.

CATEGORIES: C&E/Planning | Core/Legacy | FTTX | I&M/Network Reliability/Cybersecurity | Public/Private Partnerships (P3) | Safety

C&D Technologies

200 Precision Rd
Horsham, PA 19044
800-543-8630
www.cdtechno.com

C&D Technologies supplies the reserve power needed to keep up with emerging technologies from emergency 911 call centers to wireless sites, cable TV distribution and even remote communications sites. C&D supports the telecom world with a wide range of products to fit each unique application and carrier.

CATEGORIES: Power/Sustainability | Wireless

Celerity Integrated Services Inc

3500 AM Dr
Quakertown, PA 18951
215-538-1600
salesinfo@nextmiletech.com
www.nextmiletech.com

Celerity designs, builds, services, and maintains fiber optic and wireless infrastructure.We proudly serve telecommunications companies, electric utility companies, education, and healthcare organizations using the most efficient network technology available, through all phases of pre-planning, construction, splicing, testing, and close-out documentation.Well Planned. Well Crafted. Well Done.

CATEGORIES: C&E/Planning | FTTX | Testing

Channell Commercial Corporation

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1700 Justin Rd
Rockwall, TX 75087
214-304-7800
sales@channell.com
www.channell.com

Celebrating its 100th anniversary, Channell Commercial Corporation has been the leader of thermoplastic enclosures in the Telecommunications, Broadband and Utility markets. Channell is a fourth-generation family run global corporation and proud USA manufacturer. Established in 1922 and headquartered in Rockwall, Texas with additional manufacturing facilities in Nevada and California.

CATEGORIES: C&E/Planning | Core/Legacy | FTTX | I&M/Network Reliability/Cybersecurity

An **Amphenol** Company

Charles Industries LLC

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1450 American Ln, 20th Fl
Schaumburg, IL 60173
847-806-6300
mktserv@charlesindustries.com
www.charlesindustries.com

■ **SEE AD ON PAGE 59**

Charles Industries, LLC supplies a comprehensive line of Innovative Enclosed Solutions™ for fiber distribution at the customer premises, business, cell tower or other network edge location. Environmental enclosures include buried distribution pedestals and hubs, equipment and power cabinets, handholes, aerial splice closures, demarcation terminals, NID, concealment shrouds, and multi-purpose housings.

CATEGORIES: FTTX | Wireless

CHR Solutions

9700 Bissonnet, Suite 2900
Houston, TX 77036
713-351-5111
info@chrsolutions.com
www.chrsolutions.com

Building the future of Broadband. CHR offers products and services that enable better broadband. We specialize in B/OSS Software business solutions, Broadband Engineering services (including outside plant and network design), and Managed IT and NOC services. Our approach ensures our clients improve operations and grow revenue.

CATEGORIES: C&E/Planning | FTTX | Rural BEAD/Digital Divide Solutions

Clearfield Inc

7050 Winnetka Ave N, Suite 100
Minneapolis, MN 55406
763-476-6866
sales@seeclearfield.com
www.seeclearfield.com
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Whether delivering fiber to the home, MDU, cell tower or business, Clearfield's "fiber to anywhere" platform serves the unique requirements of leading wireline and wireless carriers and MSO/cable TV companies, while also catering to the broadband needs of the utility/municipality, enterprise, data center and military markets.

CATEGORIES: FTTX | Rural BEAD/ Digital Divide Solutions | Wireless

CommScope

1100 CommScope Pl SE
Hickory, NC 28602
828-324-2200
kimberly.koenig@commscope.com
www.commscope.com
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CommScope pushes the boundaries of communications technology with game changing ideas and groundbreaking discoveries that spark profound human achievement. We collaborate with our customers and partners to design, create, and build the world's most advanced networks. It is our passion and commitment to identify the next opportunity and realize a better tomorrow.

CATEGORIES: FTTX | Network Transformation/ Simplification | Rural BEAD/Digital Divide Solutions

Comtest Networks

171 MacFarlane Rd, Unit E
Ottawa, ON K2E 6V4
877-369-5499
cni-salesteam@comtestnetworks.com
www.comtestnetworks.com

Enhances the experience of broadband for millions of customers around the world. Improves the quality and reliability of next-generation networks while enhancing the customer experience overall. Comtest designs, engineers, and manufactures all of our products here in North America and we are changing the landscape of Broadband through continuous innovation.

CATEGORIES: C&E/Planning | Core/Legacy | FTTX

Craftmark Cable Markers

3212 S Cravens Rd
Fort Worth, TX 76119
800-627-5255
csr@craftmarkid.com
www.craftmarkid.com
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Craftmark is a world leader in the design and manufacturing of cable marking markers including snap on, snap flags, cable tags, decals, tapes, & signs.

CATEGORIES: Miscellaneous | Safety

CyberPower

4241 12th Ave E, Suite 400
Shakopee, MN 55379-1946
877-297-6937
sales@cpsww.com
www.cyberpowersystems.com

CyberPower provides reliable, cost-effective solutions for fiber-to-the-premise (FTTP) and fiber-to-the-home (FTTH) needs. Our CyberShield FTTx Systems provide power protection to network interface devices (NID) and optical network terminals (ONT). CyberPower's solutions provide best-in-class surge protection and backup power during outages. Let us help you find the power products you need.

CATEGORIES: Education | FTTX | Power/Sustainability

Dura-Line

11400 Parkside Dr, #300
Knoxville, TN 37934
800-847-7661
tanya.kanczuzewski@duraline.com
www.duraline.com

Dura-Line produces more than 500 million meters of essential and innovative infrastructure per year to bring a world's worth of information everywhere. Dura-Line produces telecommunications conduit, cable-in-conduit, and other HDPE products and solutions that create physical pathways for fiber and other network technologies connecting cities, homes, and people.

CATEGORIES: C&E/Planning | FTTX | Network Transformation/Simplification

Dycom Industries Inc

11780 US Hwy 1, Suite 600
Palm Beach Gardens, FL 33408
561-627-7171
info@dycomind.com
www.dycomind.com

Provides engineering, construction, program and project management, material provisioning, subscriber installations, maintenance, and underground facility locating services to the telecommunications and utility industries. We have engineered and constructed hundreds of thousands of miles of fiber meeting the needs of our customers while upholding the customer service and quality standards our customers expect.

CATEGORIES: C&E/Planning | FTTX | I&M/Network Reliability/Cybersecurity | Wireless

East Penn Manufacturing Co Inc

PO Box 147
Lyon Station, PA 19536
610-682-6361
reservepowersales@dekabatteries.com
www.dekabatteries.com

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East Penn is a leading manufacturer of Deka valve-regulated lead acid (VRLA) batteries and battery systems including the revolutionary Deka Fahrenheit in both 12- and new 2-volt configurations. Our diverse product line covers a wide variety of Reserve Power applications including Telecommunications, UPS systems, Utilities, Switchgear, Solar, and Emergency Lighting.

CATEGORIES: Power/Sustainability | Wireless

EnerSys

2366 Bernville Rd
Reading, PA 19605
610-208-1991
marketing@alpha.ca
www.enersys.com

Focuses on the entire power ecosystem, using power and energy storage systems to create solutions to power the modern network, lowering energy and labor costs while maintaining world-class network reliability. AC/DC power systems, outdoor cabinets, batteries and remote line power (RLP) systems are all part of our toolbox.

CATEGORIES: Cloud/IoT/M2M | I&M/Network Reliability/Cybersecurity | Power/Sustainability

Enginuity Communications

3545 Stern Ave
St Charles, IL 60174
630-444-0778
sales@enginuitycom.com
www.enginuitycom.com

Enginuity provides innovative service delivery solutions at the network edge. We continue to expand our product portfolio of fiber access panels, wall racks, fiber cleaning products, and fiber drop splice repair solutions to provide cost-effective, space-saving and quality service handoff.

CATEGORIES: Core/Legacy | FTTX | Miscellaneous

Ensure Optic Electronic Technology

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1699, Jian'de Rd, Zhangpu Town, Kunshan City
Suzhou, Jiangsu 215321, China
86-136-4141-5226
hello@ensure-ks.com
ensure-ks.com

ENSURE is an Advanced high-technology Manufacturer of Premium Optical Passive Components, delivering Connectivity Solutions worldwide to the FTTx field. We manufacture in-house premium PLC chips, wafers, fiber arrays & ferrules, applying the strictest quality control procedures, designing & customizing AD-HOC & special requirements at our labs or R&D department.

CATEGORIES: FTTX

ESPi

630 Lincoln Ave
Clay Center, KS 67432
877-799-3774
sales@espicorp.com
www.espicorp.com

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ESPi understands the problems Telcos face in today's world; remote 48V needs where no AC power exists, powering 12V ONTs in single units or multiple units, switching power supplies or backup power. ESPi provides comprehensive on-grid and off-grid power solutions that are easy to install, dependable and reduce truck rolls; saving the customer time and money.

CATEGORIES: C&E/Planning | FTTX | Power/Sustainability

Esri

380 New York St
Redlands, CA 92373
909-793-2853
ylin@esri.com
www.esri.com

Esri applies The Science of Where to unlock data's full potential in every organization. We continue to pioneer real-world problem solving using geographic information systems (GIS). Using this powerful platform to reveal deeper insights in their data, Esri users are creating the maps that run the world.

CATEGORIES: C&E/Planning | FTTX | Mapping/GIS | Network Transformation/Simplification | Rural BEAD/Digital Divide Solutions | Wireless

Fiber Plus International

Fiber Optic Connectivity Solutions | www.gofiberplus.com

10 Buist Rd, Suite 403
Milford, PA 18337
570-234-2051
customerservice@fiberplus.com
www.gofiberplus.com

Fiber Plus International designs and manufactures fiber optic connectivity solutions. Bullet® Bare Fiber Adapters, DZE® OTDR launch/receive cables, Divot® Bare Fiber Adapter, Delay Lines, QuickLINK® Adapters, SwitchBox® Manual Desktop, and Rackmount A/B Switch.

CATEGORIES: FTTX | Testing

Fiberdyne Labs Inc

127 Business Pk Dr
Frankfort, NY 13350
800-894-9694
sales@fiberdyne.com
www.fiberdyne.com

Fiberdyne Labs, Inc. is a manufacturer of fiber optic cable assemblies, termination boxes, attenuators, splitters and couplers, WDMs including CWDM, DWDM, NG-PON2 5G solutions and more! Our new 1RU FiberPassHD Chassis accommodates up to 144 ports in 1RU and can be populated with MPO cassettes or WDM cassettes; all kinds and splitters/ couplers cassettes. Call today!

CATEGORIES: FTTX

FIBERONE

5 Technology Place
East Syracuse, NY 13057
866-434-8877
sales@fiberonellc.com
www.fiberonellc.com

FIBERONE designs, manufactures, and supplies a complete line of fiber optic connectivity products for communication networks. Typical applications include FTTx, Telecommunications, CATV and Data communication systems. Fiber Network Products include, Optical Splitters, Fiber Jumpers, Fiber Terminals, Fiber Cassettes, Fiber Distribution Hubs, Fiber Cabinets, WDM, CWDM, DWDM and Fiber Patch Panels.

CATEGORIES: FTTX | Trends/Research

Finley Engineering Co Inc

INTEGRITY INTO EVERYTHING

104 E 11th St
Lamar, MO 64759
417-682-5531
info@finleyusa.com
www.finleyusa.com

Since 1953, Finley has provided energy and broadband engineering consulting services. We understand both industries in great detail, and can offer solutions our competitors simply can't match! Need funding expertise? We have helped secure hundreds of millions of dollars on behalf of our clients and we can help you!

CATEGORIES: C&E/Planning | Mapping/GIS | Rural BEAD/Digital Divide Solutions

FS3 Inc

9030 64th St NW
Annandale, MN 55302
320-274-7223
marty@fs3inc.biz
www.fs3inc.biz

Is a material supplier to the Utility Industry focusing on underground materials like conduit, cable installation equipment, handholes, work-zone safety, PPE and related items. Also offers HDD tooling and accessories, various styles of reel trailers, custom truck-mount reel handling equipment, innovative restoration equipment and more!

CATEGORIES: C&E/Planning | Core/Legacy | FTTX | I&M/Network Reliability/Cybersecurity | Miscellaneous | Safety

Fujitsu Network Communications

2801 Telecom Pkwy
Richardson, TX 75082
972-690-6900
fncinsidesales@fnc.com
www.fujitsu.com/us/products/network

Fujitsu Network Communications, Inc. customizes digital transformation solutions for network operators, service providers and content providers. We combine best-in-class hardware, software and services to enable cost savings, faster services delivery and improved network performance. Working closely with our ecosystem partners, we design, build, operate and maintain better networks for the connected world.

CATEGORIES: C&E/Planning | Core/Legacy | Network Transformation/Simplification

GCG Communications

8770 W Bryn Mawr, Suite 1200
Chicago, IL 60631
jtorok@gogcg.com
www.gogcg.com

■ SEE AD ON PAGE 58

GCG Communications is far more than a wire and cable distributor. We Make Connections Possible through our specialized segments serving over 30 diverse markets including Telecommunications and Broadband. We offer value-added services and have the knowledgeable teams to ensure our customers are paired with the right services and products.

CATEGORIES: FTTX | Miscellaneous | Wireless

GEOGRAPH Technologies LLC

103 W Main St
Easley, SC 29640
800-674-4803
info@geograph.tech
www.geograph.tech

GEOGRAPH is a GIS software provider working with clients to better manage their fiber optic, copper, and coax networks. We help organizations make smarter and faster network management decisions. We also offer a range of services including GIS Consulting, Data Migration, Network Planning & Design, Training, and Remote GIS Management.

CATEGORIES: Mapping/GIS

GMP Tools

3111 Old Lincoln Hwy
Feasterville-Trevose, PA 19053
215-357-5500
info@gmptools.com
www.gmptools.com

Manufactures products for the telecommunications, power utility and cable television industries, and the contractors who serve them. The company's total capabilities include the development, prototyping and manufacturing of Aerial Cable Construction Equipment & Tools, Copper & Fiber Cable Placing and Blowing Equipment, Manhole & Duct Tools, Installer's Hand Tools, and more!

CATEGORIES: C&E/Planning | Core/Legacy | Power/Sustainability

Go!Foton Corp

28 Worlds Fair Dr
Somerset, NJ 08873
732-469-9650
sales@gofoton.com
www.gofoton.com

An innovator with proven expertise in optics and photonics, Go!Foton serves the telecom and data center markets with connectivity, long haul, metro, and broadband access applications, solving real world problems with a scalable and customized approach. Go!Foton also supplies optical materials and components to the imaging, medical, and instrumentation industries.

CATEGORIES: C&E/Planning | Cloud/IoT/M2M | Core/Legacy | FTTX | Network Transformation/ Simplification | Wireless

Graybar

34 N Meramec Ave
St Louis, MO 63105
800-GRAYBAR
www.graybar.com

Graybar specializes in supply chain management services, and is a leading North American distributor of high-quality components, equipment, and materials. Graybar products and services support new construction, infrastructure updates, building renovation, facility maintenance, repair and operations, and original equipment manufacturing.

CATEGORIES: FTTX | Public/Private Partnerships (P3) | Rural BEAD/Digital Divide Solutions | Safety | Testing | Wireless

GS Yuasa Energy Solutions Inc

1150 Northmeadow Pkwy, Suite 110
Roswell, GA 30076
800-472-2879
sales@gsyuasa-es.com
www.gsyuasa-es.com

GS Yuasa Energy Solutions, Inc. is a subsidiary of GS Yuasa Group, the world's second largest battery manufacturer which specializes in lead acid, lithium, and other battery chemistries. In the US, GS Yuasa's focus is on VRLA products for telecommunication, FTTX, UPS, electrical utility, security, renewable energy, and related markets.

CATEGORIES: Power/Sustainability

Harger Lightning & Grounding

301 Ziegler Dr
Grayslake, IL 60030
847-548-8700
sales@harger.com
www.harger.com

Harger Lightning & Grounding is a leading manufacturer of lightning protection and grounding equipment, including Ultraweld and UltraShot exothermic welding materials for the communication and electrical industries. Harger also offers certification training, design and engineering services, specializing in providing total systems solutions.

CATEGORIES: C&E/Planning | Education | I&M/Network Reliability/Cybersecurity | Miscellaneous | Power/Sustainability | Safety

HellermannTyton Connectivity

Waterside House, Edgar Mobbs Way
Northampton, Northants NN5 5JE, UK
44-1604-706633
sales@htdata.co.uk
www.htconnectivity.com

HellermannTyton provides a complete range of FTTX solutions, delivering fibre from the central office, to the building and through to the customer connection. HellermannTyton has designed a range of outlets, connection points and wall boxes that, combined with their selection of fibre splice closures, help deliver a full fibre network.

CATEGORIES: FTTX

Hexatronic US

4040 Finn Way, Suite 240
Lexington, KY 40517
859-554-8877
nasales@hexatronic.com
www.hexatronic.com

Hexatronic offers a wide selection of passive fiber system solutions and products for FTTH, metro, access and transportation networks. Our systems utilize blown fiber technology and all components to build the entire cabling infrastructure delivering the lowest total cost of ownership, highest levels of reliability, scalability, and speed of installation.

CATEGORIES: C&E/Planning | FTTX | Rural BEAD/Digital Divide Solutions

INNO Instrument America Inc

2010 Valley View Ln, Suite 140
Dallas, TX 75234
214-484-3627
josh@innoinstrument.com
www.innoinstrument.com
■ **SEE AD ON PAGE 63**

Develops intelligent fusion splicers, cleavers, and related accessories to connect the world. INNO Arc-fusion, fiber-splicers, are designed to satisfy the stringent requirements of the fiber industry. The complete line of View fiber-splicers, high-precision cleavers, and accessories are world-class products utilized in the installation, maintenance, monitoring, and trouble-shooting of optical networks.

CATEGORIES: FTTX | Testing | Wireless

Jameson LLC

1451 Old N Main St
Clover, SC 29710
800-346-1956
sales@jamesontools.com
www.jamesontools.com
■ **SEE AD ON PAGE 39**

Jameson is a leading supplier of tools and equipment for overhead and underground broadband cable installation and maintenance, professional tree trimming/line clearance products, and high-performance equipment lighting, work lighting, and wide-area lighting solutions. Wherever the job takes you, count on Jameson.

CATEGORIES: C&E/Planning | Core/Legacy | FTTX

Jonard Tools

200 Clearbrook Rd, Suite 128
Elmsford, NY 10523
914-793-0700
www.jonard.com

Founded in 1958, Jonard Tools manufactures tools for the Telecom, CATV, Fiber Optic, Home Automation, Security & Alarm, and Electrical markets. Jonard tools designs and engineers patented products to create innovative solutions for industry needs. Through quality and innovation Jonard aims to move the industry forward and connect the world.

CATEGORIES: Core/Legacy | FTTX | Wireless

KGPCo

3305 Hwy 60 W
Faribault, MN 55021
800-328-5142
contactkgp@kgpco.com
www.kgpco.com
■ **SEE AD ON INSIDE FRONT COVER**

KGPCo is a product distribution and supply chain logistics supplier to telecom service providers, MSOs, and utilities. Our stock on hand includes thousands of in-demand products. Our Solution Innovation Center and ecosystem of the top telecommunications and technology partners, helps companies navigate today's challenges and implement tomorrow's innovations.

CATEGORIES: FTTX | Wireless

Laser Tech

6912 S Quentin St, Suite A
Centennial, CO 80112
303-649-1000
info@lasertech.com
www.lasertech.com/telecommunication

Laser Tech's TruPulse® series make laser mapping an efficient solution. Use this laser rangefinder built for professionals and ensure precise, reliable, and repeatable measurements along with onboard calculations for span, sag, and tension values. Remain in safe terrain while maintaining high accuracy by using an offset workflow to gather data.

CATEGORIES: C&E/Planning | I&M/Network Reliability/Cybersecurity | Mapping/GIS

LEOCH Battery Corp

20322 Valencia Cir
Lake Forest, CA 92630
949-588-5853
sales@leoch.us
www.leoch.us

LEOCH is a global leader in battery manufacturing offering NEBS‚Ñ¢ 3 certified battery solutions for both outside plant and central office battery systems. Our patented designs include: Pure Lead, High Temperature VRLA AGM, Hybrid Gel, Tubular Flooded, Lithium and much more!

CATEGORIES: FTTX | I&M/Network Reliability/Cybersecurity | Power/Sustainability

Lindsay Broadband - a division of Technetix group

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2-2035 Fisher Dr
Peterborough, ON K9J 6X6, Canada
705-742-1350
info@lindsaybb.com
www2.lindsaybb.com/ISE23_LBB

Lindsay Broadband - a division of Technetix group, brings you tough technology with proven performance. Our end-to-end solutions will keep your customers connected. Serving the global marketplace, we've got the RF, optical, powering and business connectivity solutions to help you increase efficiency and reliability while reducing costs. Discover more at https://www2.lindsaybb.com/ISE23_LBB.

CATEGORIES: C&E/Planning | Cloud/IoT/M2M | Core/Legacy | FTTX | Miscellaneous | Power/Sustainability | Rural BEAD/Digital Divide Solutions | Safety | Wireless

MacLean Network Solutions

610 Pond Dr
Wood Dale, IL 60191
800-350-1650
sales@macleansenior.com
www.macleannetworksolutions.com

MacLean Network Solutions offers a comprehensive line of Outside Plant Hardware for all your pole to pole, pole to house, guying and anchoring, and grounding and bonding needs. We serve all areas of the Communications market, which includes Telephone, Broadband, Satellite, Electrical Coop, and Wireless / Small Cell applications.

CATEGORIES: C&E/Planning | FTTX | Wireless

Maverick Engineering and Construction

1 Westinghouse Plaza, D6
Boston, MA 02136
617-361-6700
sales@maverickcorporation.com
www.maverickcorporation.com

Maverick is a full-service Engineering, Procurement, Construction company servicing large-scale communications and power networks. Maverick's global team of over 175 employees delivers detailed design, innovative engineering, professional installation, and comprehensive infrastructure management to municipal and state governments, power companies, and communication service providers throughout the US and beyond.

CATEGORIES: C&E/Planning | FTTX | Mapping/GIS

MaxCell

600 Plum Creek Dr
Wadsworth, OH 44281
888-387-3828
info@maxcell.us
www.maxcell.us

MaxCell®, the flexible fabric innerduct, allows increased cable density in a conduit while preserving space for future bandwidth expansion. MaxCell's unique fabric construction conforms to the cables placed within, significantly reducing wasted space compared with rigid innerduct.

CATEGORIES: C&E/Planning | FTTX | Miscellaneous | Network Transformation/Simplification | Wireless

Millennium

2121 Hobbs Dr
Delavan, WI 53115
866-287-7830
marketing@mymillennium.us
www.mymillennium.us
■ SEE AD ON PAGES 10, 11

Millennium has redefined the broadband industry helping local and regional clients be first-to-market by providing enhanced geospatial design, financial guidance and loans, rental equipment, and materials management. Millennium employs 200 people in 19 locations across America, serving clients across 90% of the continental US. For more, visit: www.mymillennium.us.

CATEGORIES: FTTX | Mapping/GIS | Rural BEAD/Digital Divide Solutions

Milwaukee Tool

13135 W Lisbon Rd
Brookfield, WI 53005
262-957-4698
daniel.shirey@milwaukeetool.com
www.milwaukeetool.com

Develops innovative solutions that deliver increased productivity and unmatched durability for professional construction users. Whether it is through our world-leading M12™ and M18™ cordless systems, our ground-breaking M12 and M18 FUEL™ products, jobsite lighting, time-saving accessories, or innovative hand tool and storage products, we deliver a continuous flow of advanced, trade-specific solutions.

CATEGORIES: Safety

MOUNTAIN Ltd

52 Farm View Dr, Suite 201
New Gloucester, ME 04260
800-322-8627
gkltasky@mountainltd.com
www.mountainltd.com

Since 1979, MOUNTAIN, LTD. has successfully created and supported engineering solutions for traditional and wireless telecom providers across the United States. As a national leader in the industry, we provide high-quality engineering, on-time service, and skilled personnel paired with innovative technology and creative strategies. Specialties include OSP/ISP engineering, design, permitting, Right-Of-Way and CAD.

CATEGORIES: C&E/Planning | FTTX | Mapping/GIS

MP Nexlevel

500 County Rd 37 E
Maple Lake, MN 55358
320-963-2400
derek.groth@mpnexlevel.us
www.mpnexlevel.com

Offers expertise in planning, installation and maintenance of aerial and underground infrastructure work. Our comprehensive construction services, FTTH, directional drilling, splicing, plowing, trenching and more cover the spectrum of overhead and underground infrastructure installation. Our experienced team of project managers, foremen, journeymen, linemen, and cable installers have the qualifications, certifications and technical training to get the job done.

CATEGORIES: FTTX | Network Transformation/Simplification | Rural BEAD/Digital Divide Solutions

MPINarada

44 Oak St
Newton, MA 02464
800-982-4339
telecom@mpinarada.com
www.mpinarada.com

MPINarada is a leader of one of the broadest and most reliable VRLA and lithium battery solutions for telecom, data center, colocation, edge, grid, microgrid, and C&I energy storage. MPINarada provides outstanding sales support, engineering and design, and has multiple warehouse facilities.

CATEGORIES: C&E/Planning | Power/Sustainability | Safety

Multilink Inc

580 Ternes Lane
Elyria, OH 44035
440-366-6966
www.gomultilink.com

Multilink is an industry-leading designer, developer, and manufacturer of products for the telecommunications industry. Multilink manufactures fiber optic products including patch & splice enclosures, cables, assemblies, and optical splitters. We also offer a large variety of fiber distribution cabinets and architectural raceway molding for your networks and future network infrastructures.

CATEGORIES: FTTX | Power/Sustainability

Netcon Americas

601 Brickell Key Dr, Suite 901
Miami, FL 33131
786-408-6710
elangrafe@netconamericas.com
www.netconamericas.com/en

We are a reference company in consulting and integrated solutions for information technology and communication networks. We are the sole representative in the Americas of ConnectMaster,Ñ¢, a software solution that simplifies the design, construction, and operation of telecommunications networks by providing detailed documentation of all physical and logical resources.

CATEGORIES: C&E/Planning | FTTX | Mapping/GIS

OFS

2000 Northeast Expwy
Norcross, GA 30071
770-798-5555
mboxer@ofsoptics.com
www.ofsoptics.com
■ SEE AD ON PAGE 45

OFS is a world-leading designer, manufacturer and provider of optical fiber, fiber optic cable, connectivity, fiber-to-the-subscriber (FTTx) and specialty fiber optic products. We put our development and manufacturing resources to work creating solutions for applications in such areas as telecommunications, medicine, industrial automation, sensing, aerospace, defense, and energy.

CATEGORIES: FTTX | Rural BEAD/ Digital Divide Solutions

Oldcastle Infrastructure

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7000 Central Pkwy NE, Suite 800
Atlanta, GA 30328
888-965-3227
kevin.matsui@oldcastle.com
www.oldcastleinfrastructure.com
■ SEE AD ON PAGE 5

Oldcastle Infrastructure is one of the largest utility infrastructure product manufacturers in the world. Our products protect vital resources that affect millions of people's lives every day. With more than 80 locations in North America, we are committed to upholding our core values of reliability, quality, and service. For more information, please visit http://www.oldcastleinfrastructure.com.

CATEGORIES: C&E/Planning | Core/Legacy | FTTX | Mapping/GIS | Miscellaneous | Public/Private Partnerships (P3)

Pearce Services

1222 Vine St
Paso Robles, CA 93446
805-467-2528
shaselden@pearce-services.com
www.pearce-services.com

Is a leading self-performing telecom infrastructure service provider, specializing in repairs, maintenance, installations, and engineering for mission-critical infrastructure. Field technicians support our customers around the clock to optimize response times, ensure quality, accountability, and safety.¬†Our logistical density and niche technical expertise deliver superior quality and response times at competitive prices.

CATEGORIES: C&E/Planning | FTTX | Wireless

Petroflex NA

1305 N Interstate 35
Gainesville, TX 76240
940-668-7283
mikechu@petroflexna.com
www.petroflexna.com

Established in 1983 Petroflex has a long history of providing high quality HDPE Conduits and Cable-In-Conduit in a large variety of sizes and wall thickness. We offer the industry-best customer service to ensure you always know what's going on with your order.

CATEGORIES: FTTX | I&M/Network Reliability/ Cybersecurity | Power/Sustainability

Phoenix Contact

586 Fulling Mill Rd
Middletown, PA 17057
717-944-1300
info@phoenixcon.com
www.phoenixcontact.com/us

Produces future-oriented components, systems, and solutions for electrical controls, networking, and automation. Offers surge protection, connection technology, and automation control solutions to the ICT and telecommunications industry. Products optimize power and fiber distribution, so you can improve management of virtually every critical function of network reliability, including protection, connection, monitoring, and communications.

CATEGORIES: Cloud/IoT/M2M | I&M/ Network Reliability/Cybersecurity | Power/ Sustainability | Safety | Wireless

Positron Access Solutions Corp.

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5101 Buchan St, Suite 220
Montreal, QC H4P 2R9, Canada
514-345-2220
sales@positronaccess.com
www.positronaccess.com

Positron's GAM, an XGS-PON ONT, enables Gigabit services to subscribers in brownfield MDUs/MTUs over the existing telephone pairs or coax. Eliminates disruption. Less than 25% of the cost of rewiring with fiber. The GAM is fully featured, interoperates with OLTs, installs in hours. Provides a competitive advantage. Free trials.

CATEGORIES: C&E/Planning | Cloud/IoT/M2M | Core/Legacy | FTTX | Miscellaneous | Wireless

Power & Tel

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200 Keough Dr
Piperton, TN 38017
901-866-3300
info@ptsupply.com
www.ptsupply.com
■ **SEE AD ON PAGES 27, 29, 31**

Longevity, Diversity, and Value: Power & Tel is a national stocking distributor of communication equipment enabling connectivity – providing even the most ancillary products. We ensure your entire list of materials is well-advised and on the job site, allowing you to finish projects on time and within budget.

CATEGORIES: C&E/Planning | FTTX | Power/Sustainability | Rural BEAD/Digital Divide Solutions | Safety | Testing

Powerline Hardware

6841 Philips Pkwy Dr S
Jacksonville, FL 32256
904-288-9880
mike@powerlinehardware.com
www.powerlinehardware.com

Provides high-quality Distribution Hardware, Insulators, Cutout Switches, Anchoring and Grounding Products, Aerial, Telecom and Cable TV hardware. Our size, ability, and commitment to meet needs of customers, has provided us with client relationships that span decades. Carries a large inventory of ready-to-ship products for aerial plants and drop installation needs.

CATEGORIES: Core/Legacy | Power/Sustainability | Public/Private Partnerships (P3)

PPC Broadband

6176 E Molloy Rd
East Syracuse, NY 13057
800-800-6652
ppc@ppc-online.com
www.ppc-online.com

PPC is an award-winning, global leader in connective technologies with a diverse solutions portfolio, supporting broadband architectures and applications from the headend to the home. Our solutions components include and end-to-end suite of fiber and RF products for a broad range of network topologies.

CATEGORIES: FTTX | Rural BEAD/Digital Divide Solutions | Wireless

Primex

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20160-92A Avenue
Langley, BC V1M 3A4, Canada
404-991-1131
bblystone@primex.com
www.primex.com
■ **SEE AD ON PAGE 61**

Primex, a CRH company, creates solutions for service providers, installers and builders to bring dependable broadband experience to the home. Our SOHO Pro™ media panels and connectivity products lay the foundation for the smart home. Our Wave™ Fiber ties in OSP service with flexible, reliable FTTH solutions for SFU/MxU architectures.

CATEGORIES: FTTX

Pro-Mark Utility Supply Inc

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

Pro-Mark Utility Supply, Inc. is a leading manufacturer of Marker Posts, Utility Signs and Terminal Enclosures with over 25 years of experience in identifying and marking buried cable and fiber optic lines. Pro-Mark's marking systems and products are made to perform, identify and prevent damage to avoid dangerous accidents.

CATEGORIES: C&E/Planning | Safety

Prysmian Group

4 Tesseneer Dr
Highland Heights, KY 41076
859-572-0000
https://na.prysmiangroup.com/contact-us
■ **SEE AD ON PAGE 19**

We are the world leader in the design, manufacture and sales of wire and cable products. Based in Highland Heights, Ky., From wire & cable products and solutions for the transmission and distribution of different voltage systems, to a cutting-edge offering of optical fiber and copper cables and connectivity systems.

CATEGORIES: FTTX | Power/Sustainability | Rural BEAD/Digital Divide Solutions

Quest Controls

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

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

CATEGORIES: C&E/Planning | I&M/Network Reliability/Cybersecurity | Power/Sustainability

Rainbow Technology

261 Cahaba Valley Pkwy
Pelham, AL 35124
205-733-0333
sales@rainbowtech.net
www.rainbowtech.net

Our mission is to market specialty products and services to utility and industrial markets, nationally and internationally. Rainbow is an important vendor to the telecommunications, electric power, other key utilities, OEM's, contractors, and distributors to these markets. Rainbow seeks niche products and services while continuing to focus on traditional products.

CATEGORIES: Power/Sustainability | Safety | Wireless

Reef Industries

9209 Almeda Genoa Rd
Houston, TX 77075
800-231-6074
ri@reefindustries.com
www.reefindustries.com
■ SEE AD ON PAGE 57

Specializes in custom plastic laminates that help customers tackle the challenges they face when needing solutions to safeguard and prolong the service life of their investments. Our products range from covers that protect equipment during outdoor storage to underground marking tape that ensures buried utilities are protected from accidental dig-ins.

CATEGORIES: Safety

Ross FiberOptic LLC

5 Red Hill Rd
Aston, PA 19014
610-331-0639
sales@rossfibersolutions.com
www.rossfibersolutions.com

Ross FiberOptic is a provider of quality fiber optic supplies and education such as: Test equipment Anritsu OTDRs, Jonard fiber optic tools, US Conec fiber optic cleaners, Sumitomo fusion splicers and a Light Brigade fiber optic education partner. Whatever your fiber optic needs are, we provide consulting and strive to offer the best competitive solution.

CATEGORIES: Education | Testing

Safeguard Equipment

4204 W Riverbend Ave
Post Falls, ID 83854
208-773-9263
sales@safeguardequipment.com
www.safeguardequipment.com
■ SEE AD ON PAGE 41

Safeguard Equipment, established in 2016, is on a mission to save lives by innovating world-class safety equipment for those facing electrical threats in the workforce. Safeguard has since saved over 50 lives across the utility, telecom, and first-response industry with their compass line personal voltage and current detectors.

CATEGORIES: Safety

Senko Advanced Components Inc

2 Cabot Rd, Suite 103
Hudson, MA 01749
508-481-9999
sales-americas@senko.com
www.senko.com

Develops, manufactures, markets, and distributes more than 1,000 fiber-optic products for the telecom and datacom industries worldwide. ISO 9001 approved, the company is able to provide multinational corporations with the technical expertise to liaise with engineers, and the manufacturing flexibility to develop custom products for the ever-growing high-tech industry.

CATEGORIES: FTTX | Testing | Wireless

Sterling Fleet Outfitters

5510 192 St
Surrey, BC V3S 8E5, Canada
604-576-2300
inquiries@sterlingfleetoutfitters.com
www.sterlingfleetoutfitters.com

Sterling Fleet Outfitters is a commercial vehicle outfitter in BC Canada. We service all industries like Telecommunications, Contractors, and more. We focus on reliable products, quick turnarounds & innovative designs, resulting in less downtime, lower cost of investment, and increased efficiency. We're here to help you to Get More Done.

CATEGORIES: Miscellaneous | Public/Private Partnerships (P3) | Safety

Superior Essex

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5770 Powers Ferry Rd, NW, Suite 400
Atlanta, GA 30327
770-657-6000
marketing@spsx.com
www.superioressexcommunications.com

Superior Essex has 90 years of experience as the respected, industry-leading innovator of optical fiber, copper and hybrid communications cable design and manufacturing. We have the honed expertise and future-forward products to meet any Premises, Outside Plant (OSP) and Wireless cabling need to serve and connect the communications industry worldwide.

CATEGORIES: FTTX | Wireless

Taihan Fiberoptics

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221 River St, Suite 9
Hoboken, NJ 07030
201-784-1117
kmyoung@taihanfiber.com
www.taihanfiber.com

Taihan Fiberoptics is a South Korean company, one of the few companies worldwide with its own vertical integrated product lines in fiber optics with more than 45 years experience, having a total fiber solution for broadband infrastructure. Visit us at www.taihanfiber.com.

CATEGORIES: FTTX

Team Fenex

610 Illinois Ave
Sandoval, IL 62882
800-883-3639
sales@teamfenex.com
www.teamfenex.com

Designers and manufacturers of mobile power, fiber-optic, and HVAC, equipment. Altec-fenex offers a full line of specialty trailers and truck bodies to support both, underground and aerial Telcom service applications.

CATEGORIES: C&E/Planning | Core/Legacy | FTTX

Tech Products, Inc

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

Tech Products, Inc. is an innovator of FO and copper cable marking systems since 1948. Our brands include Everlast®, Fasttags, TechBrite and Tech-3D. We manufacture everything from signs, pole tags, cable markers, surface markers and do-not-dig products. Our customer service people can help you find what works best for you.

CATEGORIES: Mapping/GIS | Miscellaneous | Safety

Tii Technologies Inc

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

■ **SEE AD ON PAGE 65**

Over 55 year leader in providing the communications industry with fiber and copper products supporting the ever-changing demands of today's broadband networks.

CATEGORIES: Core/Legacy | FTTX | Public/Private Partnerships (P3) | Wireless

U-TECK

159 Rock Hill Rd
Fayetteville, NC 28312
800-542-7011
info@uteck.com
www.uteck.com

U-TECK manufactures and supplies specialized products and services for the telecommunication, utility, municipal and transportation industries. The central objective of U-TECK is the pursuit of excellence. U-TECK is dedicated to developing high-quality, innovative solutions that simplify everyday jobs in the field.

CATEGORIES: C&E/Planning | FTTX | Safety

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LOOKING FOR
Funding?

Dedicate 2023 to Building Community Support in a Competitive Grant World

BY MEGAN BERESFORD

Grant funding for infrastructure continues to be front of mind for many in the broadband industry, and with this, the need to be competitive. The Infrastructure Investment and Jobs Act dedicated $65 billion towards broadband, supporting a variety of programs that have only just begun. The largest portion of that funding—$48.2 billion—has been given to the National Telecommunications and Information Administration (NTIA). Of that amount, $42.45 billion is in the Broadband Equity, Access, and Deployment (BEAD) program—a formula funding grant program which will provide dollars directly to states for planning, adoption, and infrastructure deployment programs.

At Learn Design Apply, Inc. (LDA), we are consistently asked two questions about BEAD. The first: When will I see BEAD money? The answer is always an educated guess, as there are many processes in play that will affect the distribution of these funds (including the notorious FCC maps). The NTIA has recently declared they will announce BEAD funding allocations in June 2023. This means, realistically, states will not have BEAD funded grant programs until mid-2024 at the earliest. While this is disappointing for some, it should be treated as welcome news. This means you can dedicate 2023 to the second question: How can I be competitive for BEAD money?

There are many factors that can make an organization competitive—from financial stability to tenure and experience to the construction timeline. These are certainly important, but to be the most competitive, an applicant must address all scoring criteria. Community support—the support of your broadband project by residents and businesses, gathered through in-person and virtual engagement with community members—has long been a part of grant applications, but the emphasis on community support has grown substantially in broadband grants. Check out these real-life examples:

Photo 126279229 © Andrey Popov | Dreamstime.com

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- This past fall, the Missouri Broadband Infrastructure Grant Program asked applicants to demonstrate public support and community approval by submitting letters from local leaders, feedback on the project gathered from public outreach, and community benefit agreements.
- The NTIA Middle Mile Broadband Infrastructure Grant Program asked applicants to discuss their approach to involving local communities in the project, identifying partners from public, non-profit, and private sectors, with a focus on community anchor institutions, and potential benefits community partners will receive.
- The Connect New Mexico Pilot Program, which may see a third round in January 2023, requires multiple narratives, one of which specifically requests a description of the breadth and depth of community support and an overview of letters of support detailing the number, sources, degree to which the letters are personalized, and the process of collecting the letters.

In the past, agencies have awarded grants to applicants who merely provided one letter of support from a city official, usually the mayor. In this time of BEAD, the mayor's support alone is no longer enough. This new insistence on community support and engagement is expected to grow across grants (broadband or otherwise) for the foreseeable future.

Three Community Engagement Tips

The specificity for which grants are asking for can seem unrealistic or unattainable. Great news: it's not. Whether you are looking for a grant to build in a new market, or a grant to expand your infrastructure in a current one, take the time in 2023 to follow these simple tips to build community support and make your application more competitive.

1 UTILIZE CITY CONTACTS

If looking at a new market, tap the city council members or city officials you've likely already connected with about your proposed build. These individuals will have contacts with the groups and institutions that can assist with community engagement and support.

One of the best first introductions you should request is leaders of the school district. There is no other group that had to pivot as drastically, problem solve as quickly, and struggle as greatly during the early pandemic days as schools. If you are bringing faster connectivity, chances are, the school district wants in. Schools are key anchor institutions and

influence all sectors of a community. You're more likely to receive a letter of support after a conversation, so set up talks with the superintendent of the school district to discuss your grant project. After discussing the benefits to the district, ask him or her to write a letter of support you can include to strengthen your funding application. From here, you can get letters of support from principals, school boards, and even the PTAs.

LDA worked with a client in New Mexico, who had a contact on a local economic development board in a new market. The contact, like many individuals who sit on boards, had an extensive network. The individual was able to provide introductions to not only the school district and school board, but the public library administrators, local business leaders, public works committee, and other community leaders. The relationships built by the client have resulted in comprehensive community support and allowed for a competitive application.

If you are looking to expand in a current market, seek out ways to partner with schools or community groups in that area. A great example comes from a provider in Southern California who partnered with the County Office of Education and Partners in Education to host a Teachers Appreciation award. Relationships such as these read very well on a grant application and help persuade your reviewer that the community needs and wants your organization's proposed project.

2 FIND THE LOCAL EXPERTS

Many towns and counties have organizations that promote broadband and digital equity in their communities. Digital equity/inclusion—the activities necessary to ensure equitable access to and use of communication technologies—goes hand in hand with broadband deployment. It is very likely your city contact and the superintendent are aware of these organizations and can make an introduction. If not, a quick Google search can provide insight into what groups in the area are actively involved in digital inclusion efforts. Have a discussion on the work they currently do and how your grant project could help.

Organizations that have an interest in expanding access in the community understand the need for quantifiable data. Opening channels of communication with these groups can lead to their sharing granular local data that you can integrate into your grant application. If it makes business sense, find a way to partner with them or supplement the work they perform in your project's scope.

The State of Washington is a good example. Local Broadband Action Teams may include individuals who are committed to digital inclusion. These teams monitor the pulse of the community and possess the ability to reach out to local businesses and minority neighborhoods. Some of LDA's clients have joined Broadband Action Teams in their service areas and successfully leveraged their connections to improve their grant applications and gain meaningful letters of support. Every letter, every person, every name matters. For community support, more is more.

3 COMMUNITY BENEFIT AGREEMENTS
Community Benefit Agreements (CBA), long the standard in real estate development, have now become commonplace in the infrastructure world. The CBA is an agreement between an outside entity—in this case an ISP or WISP—and a community organization, outlining the benefits which the entity will provide in exchange for community support. The connections you have with the city council and school district can help you identify the organizations which can enter into a CBA.

The benefits in a CBA can include many things already required by grant programs, such as local hire provisions.

CBA commitments can provide reduced pricing for a certain period, agreements to net neutrality, or provide support and assistance for those wishing to utilize the ACP. Consider as well what digital inclusion efforts you may be able to commit to—these efforts are viewed favorably by agencies.

Best Practice for the Long Term

Federal and private investment in broadband has boomed since the start of COVID-19. It is important we use these funds correctly and keep in mind the people served by projects. Regardless of whether you seek grant funds, community engagement is a best business practice. With increased competition, customer retention and customer take-rates are an important consideration for any market. A proven way to ensure both: be a difference-maker in the community you serve. ∎

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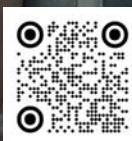
The Secret Sauce to REALLY Deploying 5G Nationwide

Could the Answer Be Right In Front of Us?

BY DAVID LEVI
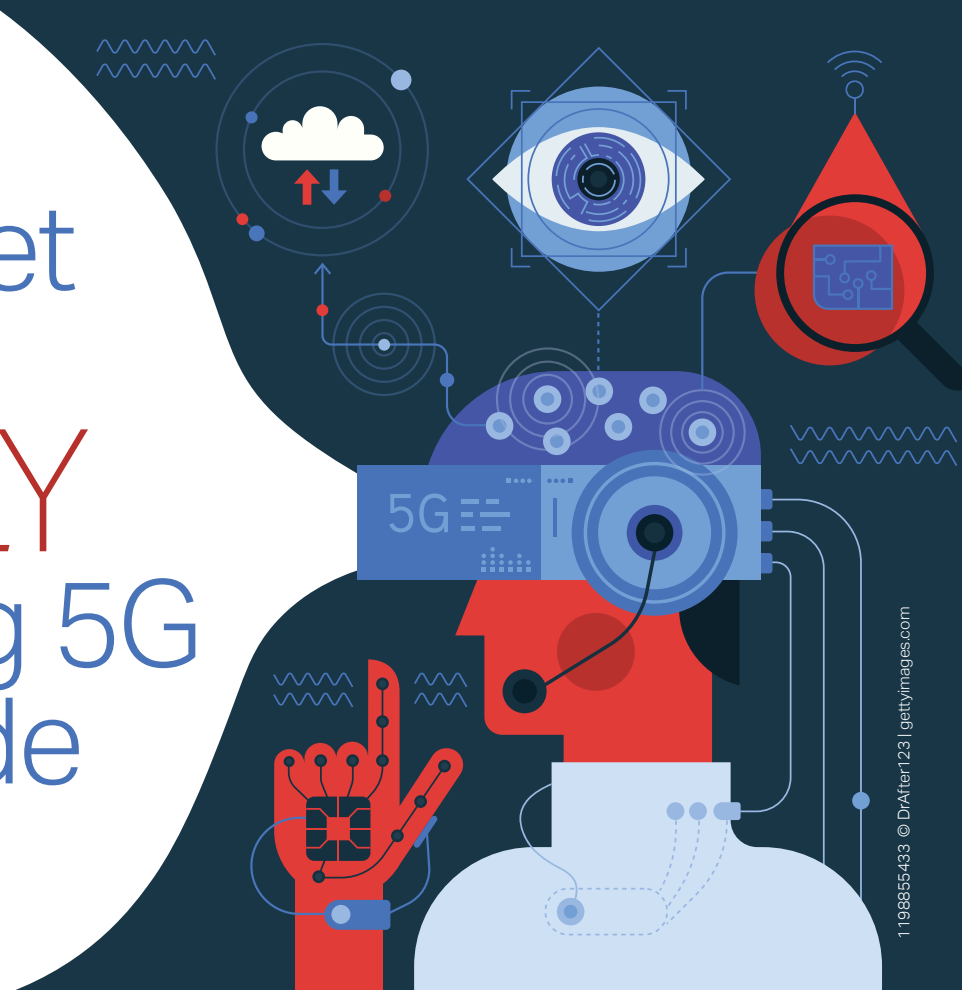
To drive and sustain the required high bandwidth of 5G, wireless radio channels must be adjusted toward using a millimeter-wave band. Although millimeter-wave can support higher capacities and large throughputs, its major drawback is distance. The signal radius is reduced from as much as a kilometer in 4G networks to 100 meters or less, depending on the terrain and weather conditions.

As a result, 5G requires more access points for the same coverage as 4G. The estimates are that 5 to 10 times more antennas will be required by 2026 to achieve complete 5G penetration, which translates to tens of millions of towers globally. (Source: https://www.ctia.org/the-wireless-industry/infographics-library?topic=17)

Despite frequent claims to the contrary by the largest telecom operators, there is no such thing as a nationwide network for 5G yet because there simply are not enough towers in place to provide the necessary coverage. Mass deployment of base stations in a dense enough network is a major infrastructural challenge that is rarely discussed openly regarding 5G networks.

And even once such a network is in place, how are all these towers going to be connected?

Why is 5G Different?

In legacy 4G network architecture, base stations were usually co-located with each tower, taking up a lot of physical space for the antenna, radio unit, and baseband unit, as well as power supply, backup battery, and temperature control. Given the significantly greater number of towers that it requires, a 5G network, on the other hand, separates the data processing within the distributed unit (DU) from the signal-bearing radio unit (RU), moving the DUs to telco central offices at the edge of the access network in order to reduce both the size and cost of the base stations.

The main backhaul element for connectivity in most 4G cell towers is microwave technology. 5G networks, though, will be deployed based on cloud RAN topology, in which data will run directly over fiber from antennas towards the DUs, requiring 10 Gbps to 25 Gbps connections, a difficult task for microwave to bear. Moreover, physically separating the DU from the RU necessitates much greater reliance on high-capacity fiber to bridge them and to meet 5G standards, which can reach as much as 20 times the required capacity of 4G LTE, not to mention the need for extremely low latency of up to 10 times less delay than LTE.

One option is to lay all new fiber to connect these millions of radio towers, but that would take an inordinate amount of time and major added cost that operators cannot afford. A different solution must be found to address the logistical constraints and the tremendous infrastructure expenses of implementing the 5G network—one that optimizes the cost of deploying towers and the last-mile transport to reach the base stations.

PON for 5G

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(RAN) by exploiting existing fiber infrastructure. The answer is passive optical networks (PON), which are already available for fiber-to-the-home connectivity, and which can enable the 5G data to be transported via fiber from the radio towers to the RAN. (See Figure 1.)

PON is agile and reliable, and it is efficient enough to provide fronthaul transport for both cellular and fixed broadband within a single network. That offers a tremendous advantage over other distribution networks that require alternative types of distribution for different technologies.

For 5G to also reach home and enterprise sites, there must also be connections from the millions of radio antennas to the RAN. Operators can reduce the number of trunk fibers that are used by implementing an architecture based on the point-to-multipoint tree topology of PON.

The large, extensive existing FTTx networks have sufficient line and port resources, plus the required optical devices and power supply. PON maintains connectivity even if a line is disconnected, offering a resilience that cannot be matched by many other transport options. Perhaps most importantly, PON reuses existing fiber and optical filters, lowering networking costs, and it handles various traffic streams with greater capacity than the alternatives.

Thus, because it offers both a cost-effective solution and optimal performance, the ideal conduit for transporting 5G traffic from the RUs to the DUs and perhaps even onward to the rest of the access network, is existing PON fiber.

FTTR for Multi-Story Connectivity

COVID-19 proved how critical a high-performance Internet connection is in today's world. Students learned remotely, employees began to telecommute, online shopping became more prevalent, and telehealth gained popularity. The common denominator among these trends was the need for high-speed, low-latency Internet,
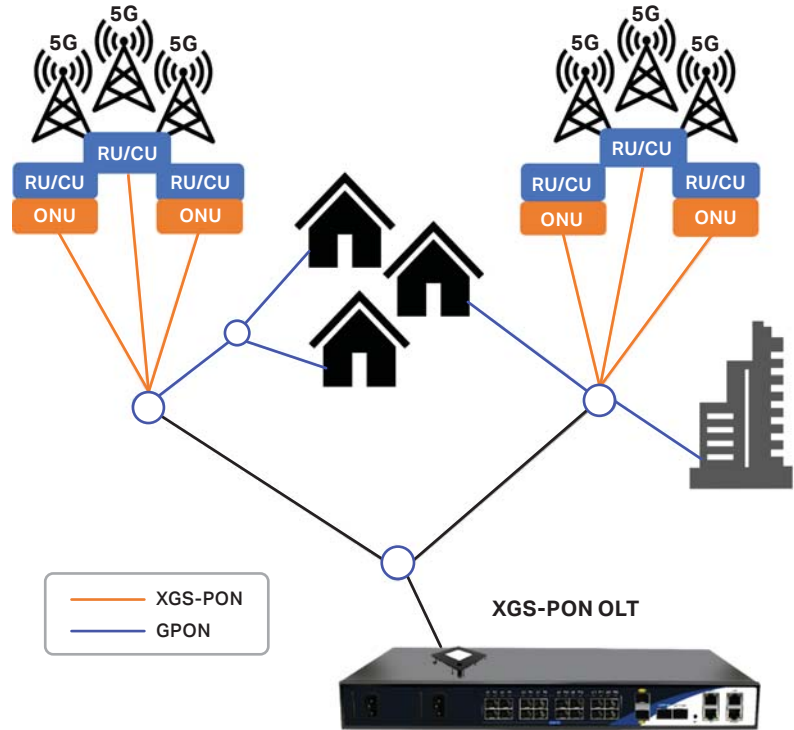
FIGURE 1. Gigabit PON is used for broadband fiber-to-the-premises, while 10G PON (XGS-PON), when connected to the Radio Unit (RU) and Centralized Unit (CU) through an Optical Networking Unit (ONU), is ideal for 5G fronthaul.
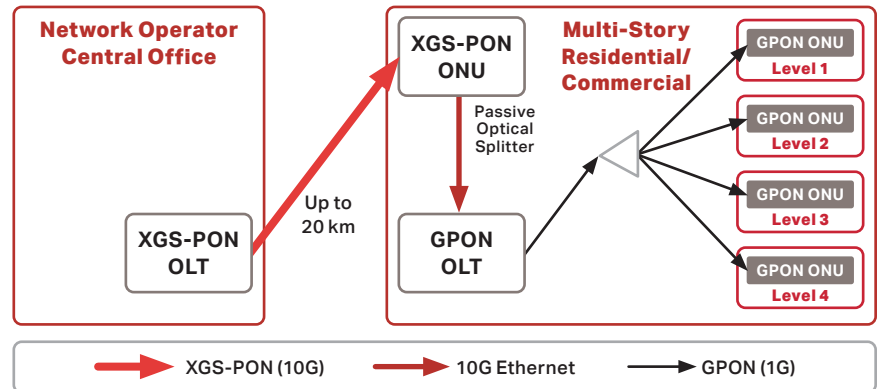
FIGURE 2. Suggested FTTR setup, enabling gigabit throughput to multiple floors within a multi-story building.

which is not a given for many homes and small businesses.

While the world has largely returned to its routine, many of our behavioral changes have stuck. We have come to expect a certain standard of service from our broadband—valuing reliability and performance over price.

FTTx has been viewed as a viable answer because fiber promises much faster overall Internet speeds. The issue, though, is that Wi-Fi presents a

bottleneck within a multi-floor facility such as an apartment building, hotel, or business. Its signal often struggles to reach distant rooms around corners, on different floors, or through walls, and it can also suffer from interference with neighboring Wi-Fi networks and microwaves. Moreover, a complex Wi-Fi network in a hotel or business can prove difficult to manage.

In many countries, fiber-to-the-room (FTTR) is becoming a solution to Wi-Fi

challenges. FTTR addresses Wi-Fi issues by bringing PON not just to the edge of the building, but also extends it within the structure to the various floors of the facility.

FTTR is an exceptionally smart option for new construction, when the fiber can potentially reach multiple levels from the outset, allowing for higher speed Internet (upwards of 1 Gbps) throughout the facility that is more reliable than Ethernet or coaxial cable. In Brownfield applications, laying fiber within the walls of the building is a bit more involved. PON can still be leveraged by running it within the building's existing electrical tunneling. (See Figure 2.)

Once PON is deployed via FTTR, it offers benefits for both end users and operators:

- For end users, FTTR ensures that they receive the level of Internet performance that they require, enabling multiple people within the same building to run live video conferencing streams simultaneously, without experiencing lags to the service.

- For operators, FTTR continues to take advantage of the existing PON infrastructure, while creating valuable opportunities for service upgrades for their customers, in turn allowing them to charge more per user. They can promote premium value-added services, such as augmented reality, virtual reality, metaverse, and other bandwidth-hungry applications, which would not be possible without PON's reliability and high performance.

The Secret Sauces?

PON differentiates itself to telecom providers as an optimal 5G fronthaul transport option and as a reliable, high bandwidth means of providing access within the multi-story residential or enterprise facility. It is already widely available and offers a single distribution network for both fixed broadband and cellular data transport. It can also scale, be configured simply based on demand, and it interoperates well with other networking architectures.

Ultimately, though, PON optimizes operator costs by using existing infrastructure, which is crucial when so much time and expense is being allocated toward implementing the dense network of towers that provide the backbone for 5G. ∎

David Levi is the CEO and Founder of Ethernity Networks. For more information, email media@ethernitynet.com or visit https://ethernitynet.com/. Follow them on Twitter @EthernityN and LinkedIn: https://www.linkedin.com/company/ethernity-networks/.

SDAN Implementation Best Practices

IT Methodologies and Strategies Work

BY EDDY VERGAUWEN

The fiberization of broadband networks continues apace. Network owners and operators, including many new investors capitalizing on the longevity and solid returns of a fiber network asset, are taking fiber broadband further than ever before.

As networks scale, existing operators find themselves facing increasing complexity, including multiple services, running across multiple technologies, often on assets from different providers. Add to the mix the explosion in subscribers, connected devices, and the ever-increasing service expectations of customers, and operators are facing unprecedented challenges in maintaining operational agility and efficiency.

The arrival of software-defined networking (SDN) in the access network (known as software-defined access networks, or SDAN) provides the solution to these challenges. SDAN creates a highly programmable, automated access network by decoupling the control and forwarding planes, allowing SDN-native and traditional access nodes to be connected to a SDAN
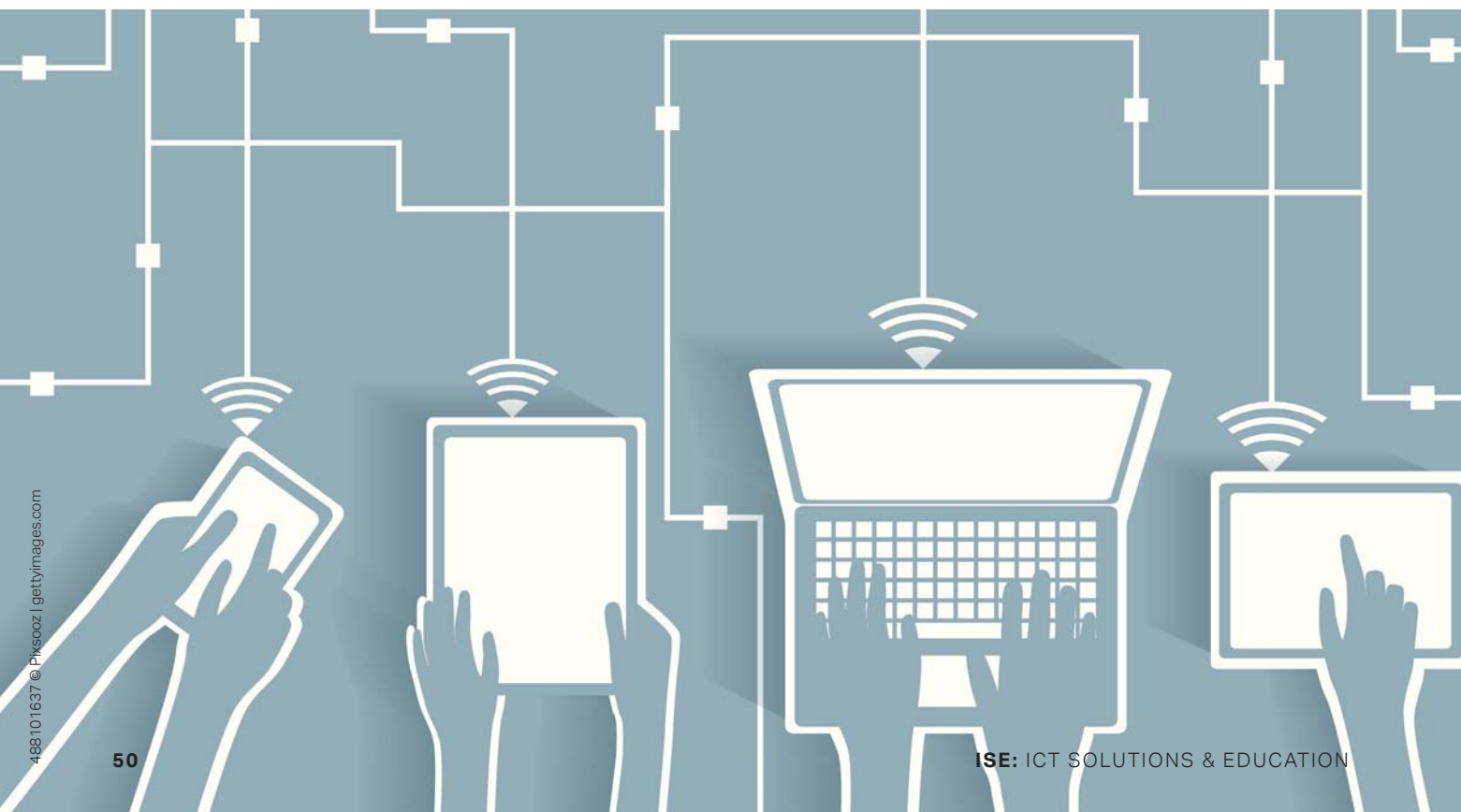
Cloud Acceleration Services for SDAN

Quantify SD-Access benefits, define best path	Build SD-Access your way	Deliver new features, faster
▪ Benefits modeling and quantification ▪ Optimal transition path definition ▪ Technology evaluation *Faster to business case*	▪ System integration services ▪ SDAN integration and migration centers ▪ Traditional access node migration *Faster to market*	▪ Continueous Integration & Continuous Delivery ▪ Nokia DevOps *New feature introduction in weeks instead of years*

FIGURE 1. SDAN works to accelerate the launch of new technologies, like XGS Passive Optical Networks (PON) as well as roll out fiber networks in new geographic areas.

controller in the cloud, and freeing devices from having to run complex controls and policies.

The network can then use all kinds of network data to program and automate many operational tasks, such as configurations, provisioning, adds/moves/changes, and even proactive fault finding and resolution.

The IT Learning Curve

The downside is that SDAN requires new knowledge and skill sets for operators founded on programming, system integration, cloud and other software skills. In their key themes for 2022, TM Forum found that 74% of telco CEOs are concerned about skills availability, with the situation compounded by a wave of retirements and employee turnover. (Source: https://inform.tmforum.org/research-and-analysis/reports/key-themes-for-2022/)

As a software-based deployment, SDAN is a clear departure from a traditional operator's comfort zone of hardware-centric projects. Among the knowledge gaps are a deep understanding of how SDAN increases network efficiencies and drives down costs, and how traditional and multi-vendor network architectures can be adapted to a common cloud-based, virtualized operating environment. As no two networks are the same, the transformation path to SDAN is unique to each operator.

At the same time, expert analysis is critical for identifying the best pathways for an operator and quantifying the benefits. Cloud and IT skill sets that encompass the use of microservices, DevOps, software development kits (SDKs), open-source and application programming interfaces (APIs) must be on par with other cloud deployments. These capabilities are needed when migrating to SDAN as then throughout the network life cycle as new functions are created, more complex configurations are deployed, and as new technologies and equipment vendors are introduced to the network.

Transformation Means Acceleration

Getting operators into the cloud also requires a certain level of expertise to meet operators' unique needs. As such, it can be beneficial to break

> Typically, operator fault, configuration, accounting, performance, and security (FCAPS) routine tasks are expected to see operating expenses savings of 25-40%.

down the cloud acceleration services into two components: the business and technology consultation, then the system integration.

The consultation part evaluates where SDAN can be best applied to an operator's network and operating model, and hence ascertain the operational areas

that will benefit the most. This will translate into specific operator internal cost savings. For example, across proactive network care, zero-touch device turn-up, or software life cycle management. Typically, operator fault, configuration, accounting, performance, and security (FCAPS) routine tasks are expected to see operating expenses savings of 25-40%. (Source: https://www.nokia.com/blog/sdan-we-do-the-math-you-get-the-money/)

The analysis will be captured in a solution design and deployment plan which includes operational support system (OSS) consultancy and a customer blueprint enlisting service intents, controller configurations and slicing models customized to the operator's network. This helps speed up decision making for which nodes, technologies or geographies need to be migrated in the near term. It also brings to light the areas where SDAN can accelerate the launch of new technologies, like XGS Passive Optical Networks (PON), or roll out fiber networks in new geographic areas—fast. (See Figure 1.)

SDAN requires seamless integration at both ends—northbound to an operator's legacy/next-gen OSS and southbound to multivendor optical line terminals (OLTs) and optical network units (ONUs). System integration, therefore, is another evolved IT skill needed on the path to SDAN.

IT techniques and DevOps methodologies, such as automated delivery, deployment, and testing, enable regular software improvements. SDAN updates and new features or services are delivered and tested in a validation environment before being put into production, paving the way towards Continuous Integration and Continuous Delivery (CI/CD). This approach is faster and minimizes rollbacks and service disruption.

With cloud design and integration being relatively new for operators, there are many ways that service providers can provide support. Some areas include designing public cloud solutions

on Amazon, Google and Microsoft; configuring services; and installing and integrating the SDAN controller. Global SDAN integration and migration centers allow the reuse of perfected components including intent and test case libraries in commonly recurring SDAN applications, improving the time-to-market for operators.

Incidentally, SDAN can be implemented on a bare metal server, in a private cloud or now in a software-as-a-service (SaaS) model. With SaaS, one doesn't need the IT expertise, doesn't need to buy the equipment to run the software, doesn't need to make a significant up-front investment, and doesn't need to lose precious time

SDAN requires a disciplined system integration and automation approach
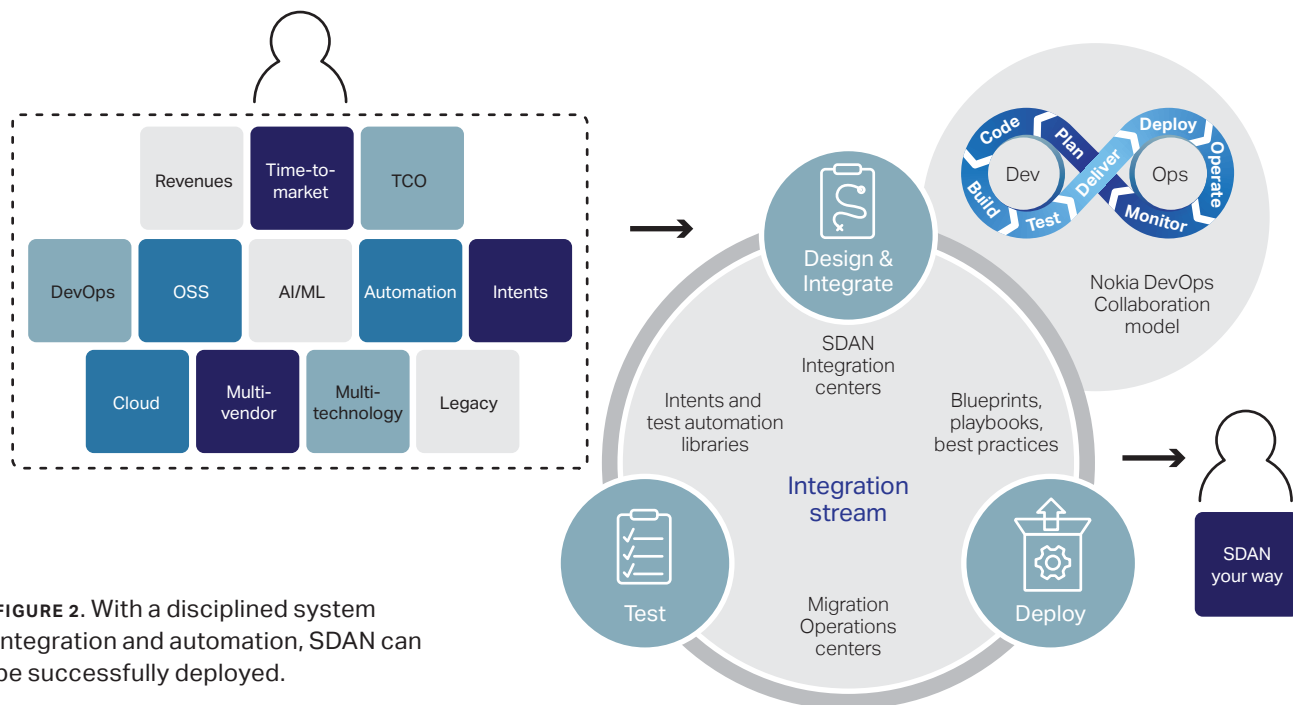
FIGURE 2. With a disciplined system integration and automation, SDAN can be successfully deployed.

integrating it in the IT environment. (See Figure 2.)

SDAN in Action

To illustrate the benefits of SDAN, let's look at a couple of real-world examples. A Tier 1 operator in North America recently wanted to accelerate the introduction of G.fast services. SDAN automation meant that many configuration and provisioning tasks became a plug and play affair, reducing or eliminating the need for manual intervention. The provider used lightweight protocol adapters which allowed the operator to maximize the use of its existing IT infrastructure and OSS and got their services online much more quickly. This also accelerated time-to-revenue.

Likewise, in a greenfield fiber-to-the-home (FTTH) deployment for a wholesale network operator, the provider used SDAN to introduce more control and autonomy for its customers and network tenants. With open access to its infrastructure, customers and tenants have been able to customize and tune their virtual network slices based on their needs.

Deep IT expertise and cloud capabilities, combined with deep networking

> "Deep IT expertise and cloud capabilities, combined with deep networking expertise, will play a critical role as cloud-based architectures define how fixed broadband access networks are controlled and managed, so it's inevitable that operators will need to increase their skills and resources in these areas in the mid- to long-term."

expertise, will play a critical role as cloud-based architectures continue to define how fixed broadband access networks are controlled and managed, so it's inevitable that operators will need to increase their skills and resources in these areas in the mid- to long-term.

But that shouldn't be a barrier to the successful adoption of SDAN in the short-term. The faster the move to the cloud, the faster operators can reap the benefits of reduced costs and quicker time-to-revenue with new customers or with new services.

An experienced professional services partner not only brings those skills to a successful migration, but also transfers them to the operator during the process. By pairing up their internal

capabilities with cloud acceleration services, operators can speed up their SDAN rollouts and in doing so, enhance network performance, increase service velocity, and significantly improve their bottom line. ∎

Eddy Vergauwen is Marketing Director for professional and support services within Fixed Networks Services at Nokia. For more information, email eddy.vergauwen@nokia.com or visit https://www.nokia.com/networks/solutions/software-defined-access-networks/. Follow Eddy on Twitter @evergauw. Follow Nokia on Twitter, LinkedIn and Facebook @Nokia.

Vet Secrets to Success
IN TELECOM

Q&A with Jeremy Przybilla, Veteran and CTC Member Services Technician

BY SHARON VOLLMAN

Rural Minnesota may be home to thousands of expansive lakes but it's also home to one of the most expansive and robust fiber networks in the Midwest.

Consolidated Telephone Company (CTC) owns or manages most of that network, continuing to set the standard in telecommunications for much of Minnesota.

As a full-service provider, they currently serve more than 16,000 residential and business members with Internet, phone, TV, and technology services. Within the 1,200 square miles of their service area lies over 4,400 route miles of buried fiber. Additionally, CTC has partnered with electric cooperatives for over 10 years to support their broadband services. For CTC, growing their network—while maintaining the excellent customer service they're known for—will be the name of the game in 2023.

CTC's support of the Talent Pipeline Challenge was a no-brainer. Having a stable workforce, while proactively building programs and support for future workforce needs, is a high priority for the expanding cooperative. So, when they were invited to join other telecoms and companies at the Talent Pipeline Challenge Expo a few months ago, they leapt at the chance.

CTC's CEO/GM, Kristi Westbrock, and Jeremy Przybilla, one of CTC's member services technicians, flew to Washington, D.C. to join NTCA's CEO, Shirley Bloomfield, at the White House on November 2, 2022. The objective was to highlight three new partnerships to support the White House's Talent Pipeline Challenge, designed to promote jobs in infrastructure-related fields. (Source: https://www.ntca.org/ruralis-cool/newsroom/press-releases/2022/2/ntca-announces-new-partnerships-provide-apprenticeship)

Upon arriving at the White House, the CTC team set up a table in the Red Room and showed everyone in attendance how to splice fiber. "The whole experience was kind of neat," Przybilla said. "Going through Secret Service TSA-style check points with all my tools and seeing their reaction to that stuff going through their scanner, I wish I could've recorded that. Their eyes just lit up."

Post-event, ISE wanted to know more about the first person to splice fiber with White House officials. Take a moment to learn about his military experience, his perspective on why he's successful in the field and what's next on his list to accomplish in telecom. Then, consider sharing his insights with a veteran you know who should get involved with fiber deployment.

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

Przybilla: I joined the military because I wanted more for myself. I wasn't content on where I was in life and needed a change. I joined the Army Reserves in 2004 and proudly wore the uniform until 2017. I was deployed to Iraq, completed many annual training exercises throughout the United States and
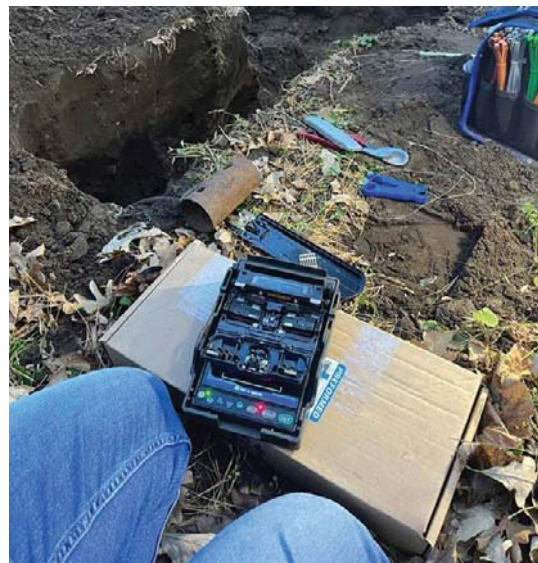
Work in the field includes performing fusion splices on a cut fiber at a residential home.

Central America, and participated in military leadership courses to further my career. In 2015, I was selected as

non-commissioned officer (NCO) of the year in my company.

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

Przybilla: My primary military occupational specialty (MOS) was 88M, Motor Transport Operator. My unit mainly transported bulk fuel but would haul anything via 915s (semis). Once I reached the rank of staff sergeant (SSG), I was transferred to another unit where I was a platoon sergeant, overseeing 20-30 soldiers while managing millions of dollars' worth in equipment and assets needed to complete the mission.

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

Przybilla: In 2002, I went to tech school to be a construction electrician but due to the market it was almost impossible to even get an internship. I started in telecom by working as a contractor for several companies. While contracting for CTC, I applied for and was offered a job, which was great because it was a local company. The demand for the services we install keeps me busy and the ever-changing technology keeps me on my toes.

"Lindsay was the biggest supporter of my decisions while in uniform. Without the support of family, friends, and employers, I couldn't have done what I did." – Jeremy with wife, Lindsay

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

Przybilla: In my current role as a member service technician, I install and troubleshoot phone, Internet, and TV services for residential and business customers in rural Minnesota. The telecom industry is rewarding. Being able to provide services that people want and need is very satisfying.

ISE: Share 1-2 accomplishments at CTC for which you are particularly proud. What is the "secret" to your success?

Przybilla: I take great pride in the service area I cover. My goal is to provide the best service from the beginning—keeping the customers happy and avoiding unnecessary visits.

ISE: What are the translatable skills or character traits you bring to your current role that were formed from your military experience?

Przybilla: The Army Values are Loyalty, Duty, Respect, Selfless Service, Honor, Integrity, and Personal Courage. I live by these every day, even out of the uniform.

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

Przybilla: Honestly, pressure in the civilian world doesn't compare to the pressure I experienced in the military. I don't let it bother me though. I can only control so much and as long as one foot moves in front of the other I'm making progress.

ISE: What does the telecom industry need to do to attract more veterans?

Przybilla: In the military, teamwork and camaraderie is critical. If that can somehow be replicated in the telecom industry, it might go a long way to attracting more veterans. We need to be part of the TEAM because as everyone knows, there is no "I" in team!

(LEFT TO RIGHT) Jeremy Przybilla, Kristi Westbrock, CEO/GM, CTC, and Shirley Bloomfield, CEO, NTCA–The Rural Broadband Association, by the demonstration table set up by the Communication Workers of America.

ISE: What advice would you give to other military veterans as they follow professional aspirations?

Przybilla: Never think you know everything. There is always room for growth or multiple ways to complete the tasks no matter how knowledge-able you are.

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

Przybilla: Personal satisfaction and customer experience lead to success. If you or your customers are not happy, no one will be successful. My goals are to expand my knowledge in the telecom world. Everyone's broadband needs are different and changing, just keeping up with today's technology and being aware of what's coming around the bend is enough for me.

ISE: How do you keep abreast of the latest technologies in the telecommunications industry?

Przybilla: Constant conversations with co-workers and tech news/blogs

Jeremy demonstrates how to properly handle, splice, and test fiber strands to attendees of the Talent Pipeline Challenge Expo hosted at the White House on November 2, 2022.

are a good way to stay up to date. There is a value to technology, and it's needed to complete a lot of our day-to-day tasks. This is a fast-paced industry that requires being on top of the latest and greatest. ∎

CONTENT AND PHOTOS

Thank you to Jeremy Przybilla and Anita Hollenhorst, Business Development and Communication Manager, CTC, for the article content and photos. For more information, visit www.goctc.com. Follow them on Twitter and Facebook @ ConnectCTC and LinkedIn: https://www.linkedin.com/company/goctc/.

DIGITAL TWINS
## Take the Field in 2023

Six Benefits of True Network Visualization

BY JOEL PIRARD

All over the world, enormous sums are being invested in the telecom industry to support the roll out of full fiber networks. Whether planning, designing, building, or operating a network, the support of a "Digital Twin" is almost invaluable. A digital twin, which is a digital representation of a physical telecom network, presents a host of opportunities for everyone involved in the business—from investors and stakeholders to the entire workforce.
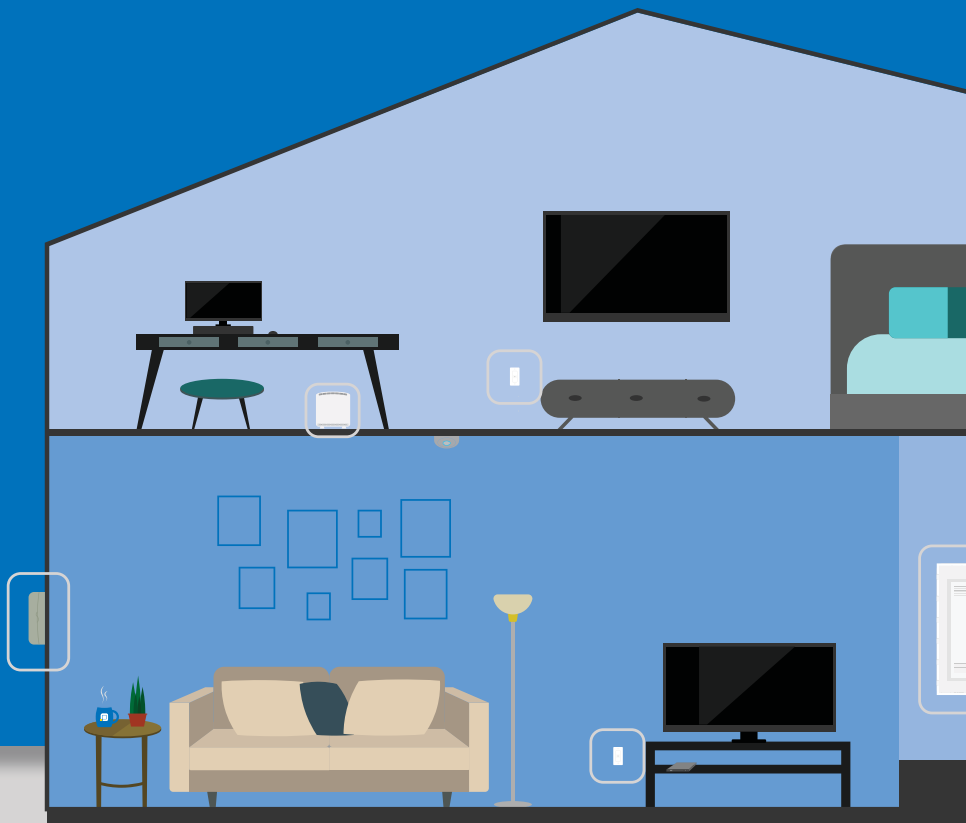
Alongside its multiple practical uses, a digital twin enables everyone involved in a project to combine around one version of the truth, it allows everyone to be proactive rather than reactive, and with the digital trace, everyone is also able to be held fully accountable.

Knowing the Network

With a digital twin, specific and detailed data about the network becomes available in a virtual form. It can answer the questions:

- What are the assets?
- Where are the assets?
- How are these assets connected?
- Who is using the assets?

This knowledge allows operators to analyze everything from the details of the age and life span of the cables to the condition they are in. Excellent support for failure analysis becomes available, as well as the knowing when maintenance is required. Telecom network providers can be on top of their game, fixing cables before they actually break, and keeping consumers up to date should planned outages be necessary.

Life cycle management is also critical to network providers. So, when they are planning, designing, operating, and maintaining the network they can keep the whole process, and the data related to it, collated in one digital system. It is with this data that reality is converted to the digital representation. During the respective processes, the digital twin is refined in every step. This allows the entire workforce access to one single source of truth which ensures greater efficiency when the network is working smoothly, and even when it is not.

Six Benefits of Digital Twins

Consider these reasons why telecom network providers need to embrace this technology to succeed:

1. Traditionally, a field engineer would bring an activity list on a hard copy, or have a digital copy saved on an electronic device. The moment that data becomes a copy, it is a deviation from the digital twin. Clearly, it would be better that the field engineer work with a mobile device synchronized with the digital system. There, correct information will be available with no risk of potential changes affecting the task at hand. By taking a digital twin out into the environment, accurate and updated information is transferred to the digital system in real time rather than needing to be written up when back at the office. In-house staff and field engineers can see any changes made instantly.

2. Customer care is (or should be) top of every telecom network provider's agenda, and the digital twin allows customers to know about their connectivity at all times. With a digital twin, potential reconfigurations and equipment replacements or upgrades can be tested in detail. When put next to the connected "real" network, the impact of planned outages can be analyzed in minute detail. With this analysis, an outage communication plan can be created and sent to consumers via email, text messages, or letters. Outage maps, giving a visual view of affected areas, are also a perk of the digital twin.

3. Investors and operators like to know the value of their assets, whether that is for raising new funding or part of a due diligence process. Being able to both show and prove key aspects via live network data helps validate valuable network assets.

4. Future network potential can be accurately compiled and demonstrated using a digital twin. One example is the overview of homes connected and homes passed. The digital twin provides a clear and structured view of the data, which allows for an understanding of investments, incomes, and outgoings.

5. Moving into 2023, this is a world where the risks of (or actual) war, terrorist attacks, and hostile infiltrations cast shadows on everyday life. The destruction of critical infrastructure would have devastating consequences. Security is therefore of utmost importance and demands protection from malicious attacks without affecting the accessibility of authorized users. Security is, to say the least, a complex matter, and frankly deserves a lot of attention. However, a very short summary of what to address regarding security when working with a digital twin would be:

- Outsider threats—where a digital system must be protected from infringement. The security issues are related to protecting the actual digital system.
- Insider threats—which relates to the standards, processes, and routines of the workforce. This includes training and an understanding of how sensitive data is to be handled.

6. Unintentional human error can also compromise security. Sensitive information going astray via hard copy or email happens more often than we care to admit. Setting up a portal for a field engineer who needs to change a cable in a certain area allows the field engineer to get exactly the amount of information needed to execute the changes, at the actual time the data is needed.

Today's network providers must deliver connectivity to their customers, and results to their investors and shareholders. Digital twins are an invaluable tool for telecom providers looking to succeed with both of those objectives. ∎

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How Encrypted is Your Data?

Data Bridge Market Research shared that the global data encryption market was valued at $25,389.30 million in 2021 and is expected to reach $84,391.70 million by 2029. This is a **CAGR of 16.20%** during the forecast period of 2022-2029.

SOURCE: https://www.databridgemarketresearch. com/report-category/information -and-communication-technology

I WANT MY CLOUD TV

Research and Markets forecasts that the global Cloud TV market is expected to reach **$4.9 billion by 2028**, with a 20.3% CAGR during the forecast period of 2022-2028.

SOURCE: https://www.researchandmarkets. com/reports/5694708/ global-cloud-tv-market-size-share-and-industry?

DCs Across the Pond

The European data center colocation market in 2021 was valued at $14.03 billion. The market is expected to reach **$29.37 billion** by 2027, at a CAGR of approximately 13.1% during the forecasted period of 2022-2027.

SOURCE: www.researchandmarkets.com
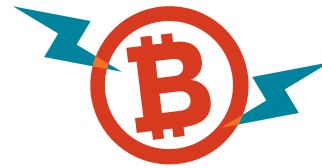
THE POWER HOG OF CRYPTO MINING

The University of Cambridge recently shared data about Bitcoin, the world's largest cryptocurrency. It currently consumes an estimated **150 terawatt-hours** of electricity annually—more than the entire country of Argentina, population 45 million.
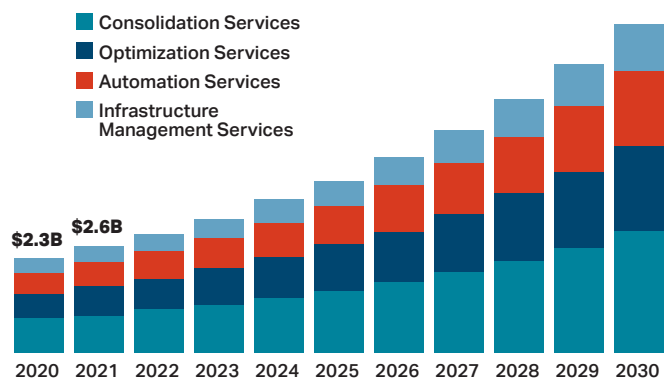
SOURCE: https://ccaf.io/cbeci/index

Instant 289% Cha-Ching!

A new study from Juniper Research has found that the number of instant payment transactions will exceed **376 billion** globally by 2027, increasing from 97 billion in 2022, a 289% growth. They predict that an increased roll out of instant cross-border payment schemes in multiple countries will drive this growth by enabling businesses and consumers to benefit from greater speed and efficiency.

P.S. An instant payment is any payment outside of a card network that is capable of receiving funds in 10 seconds or under.

SOURCE: www.juniperresearch.com/researchstore/fintech-payments/instant-payments?utm_source=juniper_pr&utm_campaign=pr1_instantpayments_financial_ fintech_dec22&utm_medium=email

- ■ Consolidation Services
- ■ Optimization Services
- ■ Automation Services
- ■ Infrastructure Management Services

$2.3B $2.6B

2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

13.5% INCREASE FOR DC MARKET TRANSFORMATION

Grand View Research expects the global data center transformation market to reach $24.13 billion by 2030. The market is expected to grow at a **CAGR of 13.5%** from 2022 to 2030.

SOURCE: www.grandviewresearch.com/industry-analysis/data-center-transformation-market-report?utm_source=prnewswire&utm_medium=referral&utm_campaign=ict_14-dec-22&utm_term=data-center-transformation-market-report&utm_

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