

MAR/APR 2023 VOL. 41 | NO. 2

ISE

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& EDUCATION

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EXECUTIVE INSIGHTS WITH **Joe Pellegrini**

**CHIEF CONSTRUCTION OFFICER,
GREAT PLAINS COMMUNICATIONS (GPC)**

Splicing Start Leads to Sound Network Leadership

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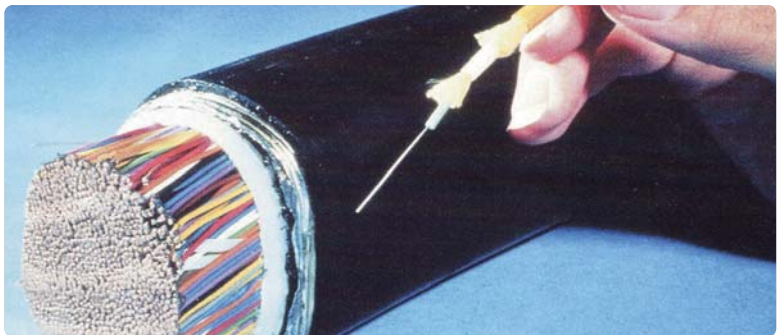
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INTRODUCING

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Did you know there are 5 million podcasts today? Below are some of the most popular topics in 2023, according to Statista:

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- True Crime – 18%
- Sports – 17%
- Health and Fitness – 17%
- Religion or Faith – 16%
- Politics – 16%
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VOL. 41 | ISSUE 2

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ISE Magazine USPS Permit 1511, ISSN 2470-0517 print, ISSN 2470-0525 online is published 6 times annually, Jan/Feb, Mar/Apr, May/Jun, Jul/Aug, Sep/Oct, Nov/Dec, by Endeavor Business Media, LLC, 1233 Janesville Ave., Fort Atkinson, WI 53538. Periodical postage paid at Fort Atkinson, WI, and additional mailing offices. **POSTMASTER:** Send address changes to ISE Magazine, PO Box 3257, Northbrook, IL 60065-3257. **SUBSCRIPTIONS:** Publisher reserves the right to reject non-qualified subscriptions. Subscription prices: U.S. \$32.00 per year; Canada/Mexico \$50.00 per year; All other countries \$115.00 per year. All subscriptions are payable in U.S. funds. Customer service can be reached toll-free at 877-382-9187 or at ISE@omeda.com for magazine subscription assistance or questions.

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Mutually Exclusive or Not?

IT APPEARS OUR INDUSTRY is finally embracing the fact that sustainability and profitability can work in sync to drive industry innovation and work toward net zero targets.

The GSMA recently released its annual report, *Mobile Net Zero: State of the Industry on Climate Action 2023*¹. It shares how mobile operators are beginning to walk their talk about changing the environmental impact of their network operations. Below are a few data points from the report:

- Sixty-two operators, representing 61% of the industry by revenue and 46% by connections, have committed to science-based targets intended to rapidly reduce their direct and indirect carbon emissions by 2030.
- Global operators that have committed to net zero targets by 2050 account for 39% of mobile connections and 43% of global revenue.
- Nearly 25% of all electricity used by the sector is now coming from renewable sources. About 70% of European operators are purchasing the most renewable energy. North American operators are achieving around half that.
- With a majority of mobile operator's emissions coming from their supply chain, vendor partners like Apple and Samsung are working to make their products more sustainable. (Editor's Note: Find your sustainable network infrastructure partners in our proprietary Buyer's Guide: www.isemag.com/directory.)
- The industry is improving its climate reporting. CDP² is a not-for-profit charity that runs a global disclosure system for investors, companies, cities, states, and regions to manage their environmental impacts. Sixty-seven operators, accounting for 79% of mobile revenue and 66% of



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global connections, stepped up their reporting efforts in 2022. Of those, 36 operators got an "A" score for the disclosures they made.

While these are small steps, at least we're seeing green-washing as the reality it is—a cover up. Kudos to those leaders and doers who are taking baby steps to become climate advocates. We all need to better live by the Turkish proverb: There is no right way to do a wrong thing.

Sharon

REFERENCES

1. www.gsma.com/betterfuture/resources/mobile-net-zero-state-of-the-industry-on-climate-action-2023
2. www.cdp.net/en



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Do You Believe in Magic?

How Magicians (I.E., Sharp Engineers) Create Magic Solutions

“Any sufficiently advanced technology is indistinguishable from magic.”

Arthur C. Clarke, *Profiles of the Future: An Inquiry into the Limits of the Possible*, 1961

ARTHUR C. CLARKE, the science fiction author who wrote “2001: A Space Odyssey” was not just a writer of fiction, he was a futurist. In his stories, he predicted many things about the future including communications satellites, home computers and the Internet. I am a big fan of Clarke’s, especially the quote above which I often use when

speaking to non-technical groups about fiber optic communications. It also tells the reason why I am passionate about fiber optic education!

I’ve been using this photo for 40 years to illustrate the advantages of fiber optics. (See Figure 1.) Its origin has been lost, but I think it might have been an early AT&T press release photo touting the information carrying capacity of fiber optics. At that time, the notion a hair-thin glass fiber could carry high-speed digital communications for long distances sounded like magic. When I was first introduced to fiber optics at Bell Labs in 1978, I thought it was magic myself even though I was trained as a physicist and astronomer and knew a lot about optics, just mostly big ones.

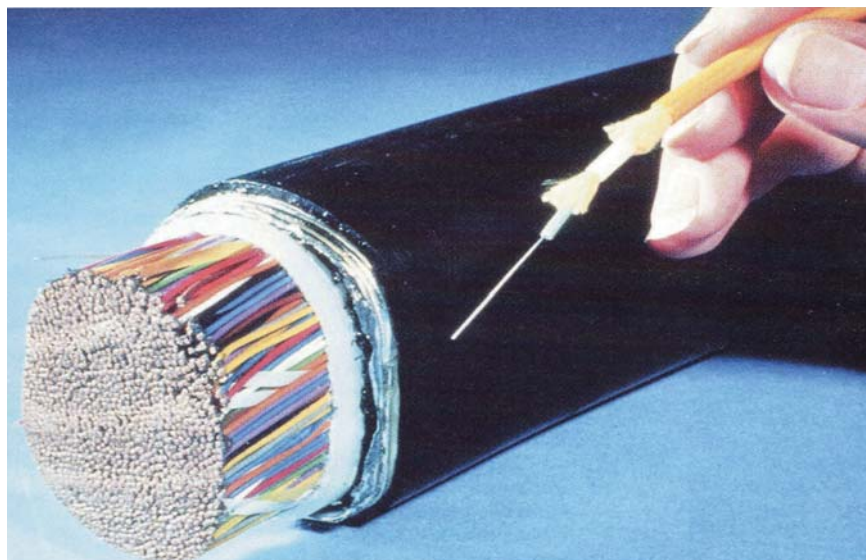


FIGURE 1. PR photo from the 1970s showing the advantage in size of optical fiber cables.



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Over the years, we’ve watched fiber optic technology’s “magic” develop to include wavelength division multiplexing, passive optical networks and now terabit speeds.

But nothing seems as magical as coherent technology. Most fiber optic transmission has been based on direct modulation of a light source as a transmitter and simple conversion to electrical signals in a receiver. The limitation of this approach has been bandwidth—how fast you can modulate a laser or how fast you can build a receiver. That method has typically been hitting a speed limit at 25-50 gigabits per second and distance limits of tens or maybe hundreds of kilometers. To reach faster data speeds, we use multiple transmitters and wavelength division multiplexing. Fiber amplifiers are used as repeaters to get longer distances. (See Figure 2.)

Coherent transmission systems use some powerful magic to gain at least another factor of 10 in performance. Coherent transmitters are the least complex to understand; they don’t modulate lasers at all, they turn the laser on all the time and modulate it in several modes with an external device

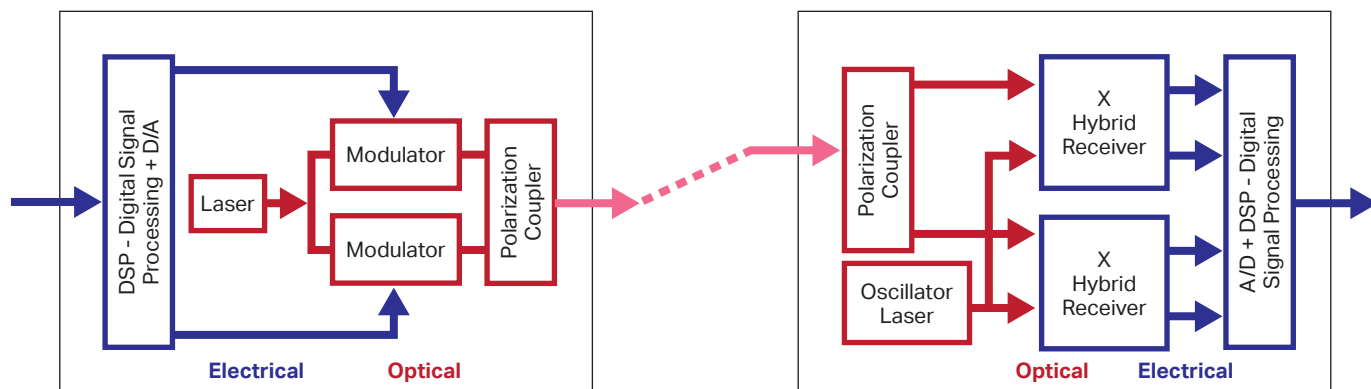


FIGURE 2. Coherent links are complex systems.

that is much faster. Coherent receivers are truly complex gadgets that use a local laser mixed into the received signal and a powerful digital signal processing system to extract the communications signal. Real magic.

Coherent systems are capable of terabit speeds and thousands of kilometers in link distance. Since they were first introduced as very expensive printed circuit boards full of components about 15 years ago, they have become smaller, even reduced to plug-gable transceiver modules. Most importantly, they cost much less. In fact, the cost is such that they are being touted for short high-speed links in data centers and to create passive optical networks (PONs) running at 100G serving a thousand users. Real magic.

Recently, a reader asked me if I knew what a C-OTDR was. I discovered that a C-OTDR is a coherent OTDR. It did not take long to find out

that the advantage of coherent transceivers has not been overlooked by at least one test equipment company. OTDRs are always trying to reach longer ranges and greater distance resolution, so coherent transceivers seem to be a natural solution.

The problem this coherent OTDR is targeted to solve is testing transoceanic cables. Its distance capability is just what is needed. They also solve a roadblock on these systems. These very long-distance networks use fiber amplifiers to regenerate signals and fiber amps, block signals going in the opposite direction to transmission.

The challenge is that OTDRs require bidirectional transmission; thus, the fiber amp becomes a roadblock. Thankfully, some magician, er sharp engineer, came up with a solution. Couple the return signal into another fiber in the cable that transmits in the opposite direction. And just like magic, a pair of

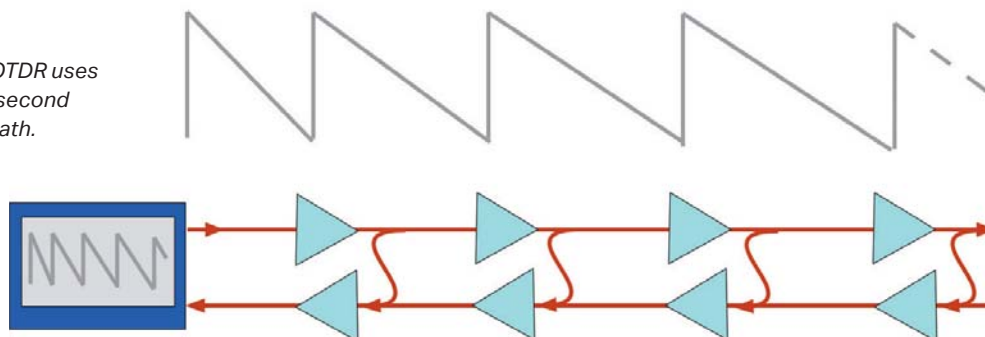
simple passive splitters at the location of the fiber amps allows the two amps to work in concert. They amplify the OTDR test pulse in one direction and amplify the backscatter signal in the other direction. (See Figure 3.)

The coherent OTDR for these submarine networks no longer has a single test port; it has separate transmitter and receiver ports and of course gains an additional 3 dB from the elimination of the splitter normally used in the OTDR. And the trace becomes a "sawtooth" trace, showing individual OTDR traces for each link between amplifiers. Now it's possible to test and troubleshoot transoceanic cables with an OTDR.

Once again, the magical minds of engineers solve another fiber optic problem. ■

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

FIGURE 3. The C-OTDR uses splitters to use a second fiber as a return path.



EXECUTIVE INSIGHTS WITH Joe Pelleg

Chief Construction Officer,
Great Plains Communications (GPC)

Splicing Start Leads to Sound Network Leadership

BY SHARON VOLLMAN

TOPIC: Your Challenges

When you were hired, your charge was to develop and implement Great Plains Communications' Fiber-to-the-Home (FTTH) strategic growth initiative to residential customers in new markets as well as aggressive expansion in current Midwestern markets. Now, it's evolved a bit to say the least.

ISE: As Chief Construction Officer, what's the most challenging thing about your job responsibilities?

Pellegrini: It's been terrific having the opportunity to take on responsibility for a larger portion of the business. For me, it always comes down to three main things. Do we have the proper processes in place? Do we have the right systems to support those processes? And does everyone, me included, understand what they're responsible for and how to achieve success?

I'm a huge fan of digitized documentation and mapping. The most challenging part of my job responsibilities now is

helping define the processes needed as we grow and morph into a digital and IT-IS centric business while ensuring people are getting trained in the new or refined systems. This allows us to grow the business, purify and digitize more and more records and deliver on somewhat of a changing customer expectation landscape.

TOPIC: Field Experience

ISE: You were a fiber splicer early on in your career. Why is it important to understand fiber field realities in your role at GPC? What is your recommendation to field techs who want to move into leadership as you did?

Pellegrini: As a splicer, having the proper records, understanding the deliverables and being able to be an advocate for the business while standing in front of the customer made an impression on me. Logistically, it's understanding that weather and where things are located have a huge impact on the crew, delivery, and customer completion schedule.

rini

In his role as Chief Construction Officer, Joe oversees Outside Plant (OSP) Engineering, OSP Construction and CAD/GIS.

Then safety. We can all look at spreadsheets and move numbers around, but there are larger implications such as people. Now, as an executive, that experience allows me to liaise well between the spreadsheets and growth trajectory, and then the true operational cost, time frame, logistics and safety of implementing those asks in terms of growing a business.

Having spent so much time in the field at a young age has given me a greater perspective on optimizing a business successfully and managing all those different pieces that go into it. Appreciate and learn from where you are at that moment in time. So many people want to grow and run to the next level and hurry up to the next piece of their career or the next job title before truly understanding and becoming an expert where they are. As you move through the ranks by learning and developing those skills, you continue to round yourself out.

TOPIC: Supply Chain

You've said the following about GPC's supply chain strategy: "We've had to plan appropriately and order earlier, tying up more CAPEX and placing larger orders earlier, so we have a more definable inventory delivery schedule to continue building at pace. The new reality is that what formerly was a three-to-six-month order/delivery window could now be up to a year or more, and we must plan accordingly."

ISE: Define that more specifically using a network-related example.

Pellegrini: The last couple of years have been a challenge with the supply chain. Things that used to require a three-to-six-month delivery window are now pushed much further out. Yet, we sometimes don't know what we need a year or more out in terms of the enterprise. What we do know is our projected growth. We knew we were going to grow fairly aggressively. So, we go to vendors and inquire about the terms of allocations over time, upsizing some allocations and purchasing and buying down earlier to arrive before we need the product.

A specific example is on the FTTH side. We knew we were going to upsize the delivery from late 2022 through 2024, so we went through all the different pieces of a true FTTH construction plan and delivery schedule—whether it's internal office equipment, external customer, prime equipment, or everything in between—and ordered a year or two's worth of inventory. We are now taking delivery of all that.

TOPIC: Fiber Construction Nuts and Bolts

ISE: What portion of your deployment is handled in-house versus by contractors? Share two best field deployment practices that GPC can teach other network providers to improve time-to-market and reduce cost-per-mile and unit passed.

Pellegrini: We do the majority of our splicing in-house. It's a huge cost savings that allows us to define a very specific

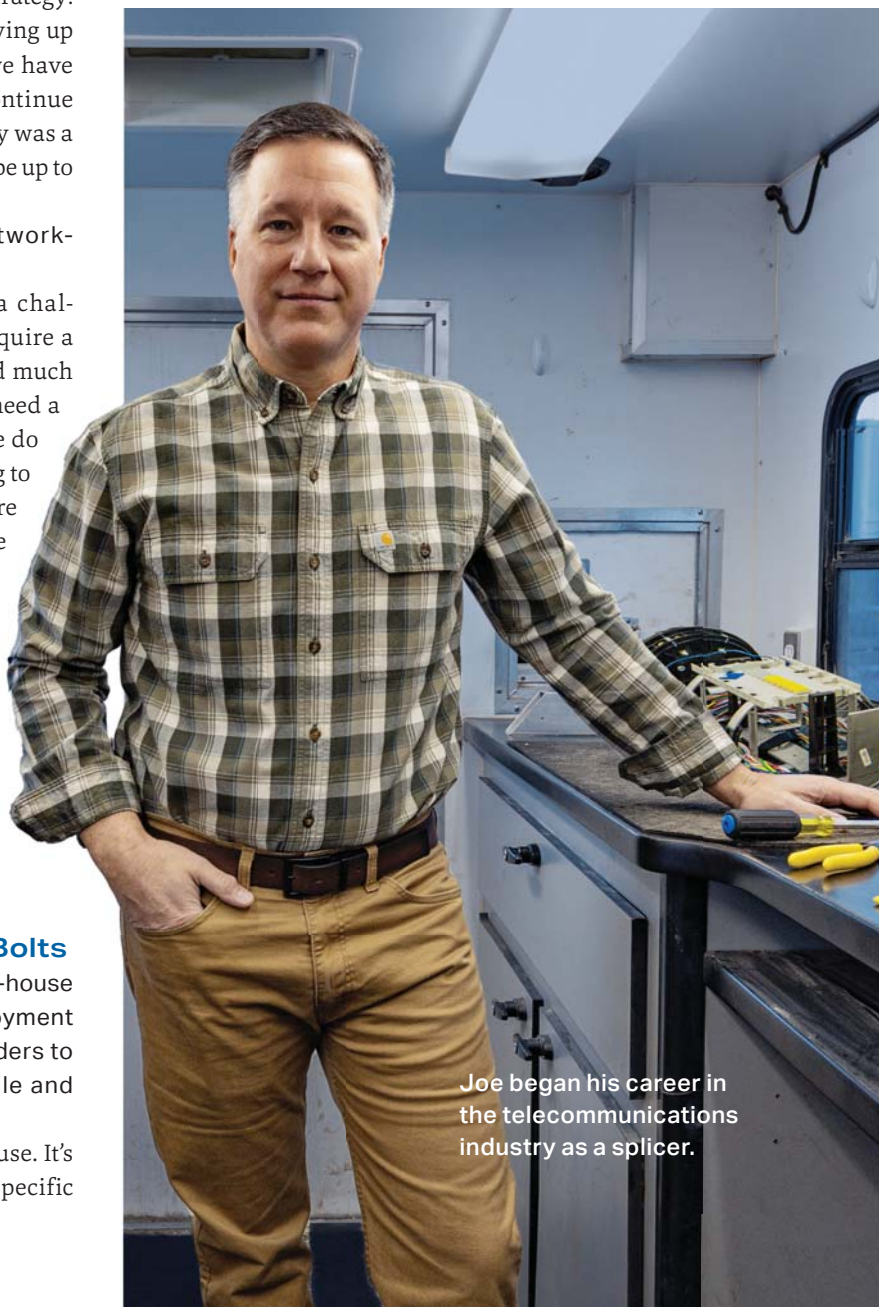
practice and policy in splicing and testing. Our operations group does all installations and trouble calls to ensure timely customer delivery and a terrific customer experience.

That's a little more difficult to do if you're farming out all your work to contractors and vendors. When the customer knows everybody walking in the door on the delivery side has a GPC logo on their ID, it makes a difference in terms of how we define what a customer delivery looks and feels like and what that customer experience *should* look and feel like.

TOPIC: Muni Partnerships

ISE: Why should municipalities work with a network provider instead of building their own fiber networks?

Pellegrini: Municipal networks are usually led by a single champion. At a municipality, someone gets hired in town or gets the idea to build their own network and champion their cause. That one person might leave or go to a different job.



Joe began his career in the telecommunications industry as a splicer.

They may get a different opportunity or retire. Then that municipality loses that single champion.

Long-term budgets are not a given in municipalities. Municipalities must redo and pass their budgets each year. Therefore, if it's led by a single champion, it's got a one-year or bonded budget to build out the network. Then there's debt service associated with that. It's rarely put together in a way that accounts for long-term costs.

Our responsibility is to develop a full solution with a city in a technology partnership that provides the upfront costs,

demands and challenges. Our initiatives are our advantages when attracting quality employees.

TOPIC: Fiber Deployment

ISE: Aggressively deploying fiber across rural communities is no easy or cost-efficient task. What are two of GPC's best practices other providers can borrow as they work to connect the underserved in their communities?

Pellegrini: First, because we're a 113-year-old company and we've been building fiber for the last 30 years, we own and



"Having spent so much time in the field at a young age has given me a greater perspective on optimizing a business successfully and managing all those different pieces that go into it. Appreciate and learn from where you are at that moment in time. So many people want to grow and run to the next level and hurry up to the next piece of their career or the next job title before truly understanding and becoming an expert where they are."

maintenance costs, and upgrade cycles. We work alongside municipalities to help build, own, maintain, operate, market, and deliver services to their community.

TOPIC: Advocating for Rural Communities

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

Pellegrini: On the network deployment side, a growing industry challenge over the past 10 years has been difficulty getting on power and telephone company poles. The amount of make-ready and the time frames associated has changed the makeup of what we used to consider a successful build, which was 80% aerial and 20% underground in many places across the country.

There used to be cost savings associated with going aerial. The higher expenses today and greater difficulties for third parties like us to get access to those poles have forced more of an underground build. The time frames are also forcing a lot of companies to go underground more because we can build underground in many cases much quicker than aerial. For aerial fiber deployments, getting to some of these communities and servicing them effectively has been difficult in terms of network deployment labor challenges.

We're trying to entice employees to the industry who want to be here and grow with the business by creating an environment they want to stay in. That's an ongoing culture initiative in continuing to change and adjust to meet external industry

maintain a lot of our middle-mile network. This is a differentiator and best practice. By owning that middle-mile network, we pass many underserved communities.

Secondly, we can leverage that existing network asset, put in points of presence along that network and bring those underserved communities online.

When they do come online, we're tapping into a high bandwidth dual feed connection in our already robust middle-mile network. So, it's not that we're building low bandwidth spurs out to communities, but rather utilizing that existing dual path, which helps decrease downtime. These areas are mostly areas where we have successfully built and continue to leverage existing community relationships.

TOPIC: What Keeps You Up at Night?

ISE: What is the ONE item that keeps you up at night?

Pellegrini: People. An extremely important part of the business is developing the parameters where employees can come and put in the quality effort at work, but also disengage appropriately and put the quality effort into other things in their life that fills their cup, whether it's family, exercising, reading, etc.

TOPIC: Your Forecast for 2023

ISE: What's your crystal ball saying will be most important to the success of Communications Service Providers (CSPs) in 2023?

Pellegrini: Smart deployment of capital. The cost of capital has risen so much with the rise in interest rates. Debt service will be a huge drag on the company's bottom line if capital is being deployed without a real understanding of the time frame for the return on investment.



(left to right) Joe with Colin Lodl, OSP Project Engineering Manager, reviewing fiber supplies.

TOPIC: Operational Realities and Proactive Network Management

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

ISE: How will GPC ensure the networks it deploys are maintained in an operationally efficient manner? What are some proactive approaches you recommend to control OPEX?

Pellegrini: We have an extensive existing fiber footprint that continues to grow. It has been built over the years in a very managed way with an eye for high quality and redundancy. We can deploy and maintain the network efficiently because we engage local vendors, contractors, and employees in our markets. We take pride in the assets and the customer experience associated with them.

For GPC, controlling the operational expenditure side and improving network lifecycle management for complex fiber and legacy networks is difficult. To truly maintain and spend the money on maintenance, as well as upgrading, must be done in a thoughtful and managed way over a longer term. We can't just look at a network and in 12 months, fix, change, and upgrade everything. It must be done as a priority based on constraints with the network, the needs of the customer, or general equipment life cycles.

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.

Pellegrini: As an executive, I've been spending a lot of time on the upskilling subject. We have found in multiple employee surveys that employees in the five to seven service year range seem to be the most at risk. The reason tends to be that they've been in the business or doing a job long enough to become extremely proficient. Yet, if the time and energy aren't spent with them to help them continue to learn and grow, they stagnate. These people have extremely marketable skill sets and can go find other opportunities. It is important for businesses to not only understand that but also take action to retain and grow employees.

Any of us who have been doing this for a long enough time realize some of the biggest enjoyment we get out of work is helping, training, and mentoring others who are coming up in their careers and want to learn.

For GPC, it's recognizing top talent and what they bring to the business, ensuring benefits and flexibility are there, but also providing the opportunity to continually work and improve skill sets, and then share their abilities and skills with others who are up and coming. This creates a true mentoring and team environment that results in successful, happy employees.

TOPIC: Advice

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

Pellegrini: Try not to be everything to everyone. Understand every person, whether it's on the same side of the table or across the table, everyone has different experiences and perspectives and maybe a better way to get things done.

One of the smartest things you can do as a leader is close your mouth and let others express their interests, opinions,

or their versions of things. When I do that, I learn something, and it makes me look a little bit differently at a solution. We find better ways with more input.

My biggest advice would be for leaders to learn how to listen and not think that because you have a title you have a right to talk more. Learning to ask questions and listen yields better results in almost every single format.

TOPIC: Balance

ISE: Is there such a thing as work/life balance? How do you create that? And what is some advice you can give others?

Pellegrini: When I first started back in the day as a splicer, I had a beeper and a company cell phone, which was my first experience with 24/7, 365 access to work. I have struggled, as many others have, with what true work/life balance looks and feels like over the years, especially earlier in my career when I was on call and had to be actionably ready to leave and go help with something.

Now, as a leader, really defining for my team what that feels like in terms of requiring a level of effort at work, and then allowing folks to disengage in a meaningful way once they're off the clock, helps to create an employee that doesn't feel always on because always on equals burnout over time. My advice to others is try and have fun at work. Remember that we spend so much

time with each other at work that creating an enjoyable environment starts with you as a leader in any function. ■

ABOUT JOE PELLEGRINI

Joe Pellegrini is the Chief Construction Officer at Great Plains Communications (GPC), one of the largest privately-owned digital infrastructure providers in the Midwest, headquartered in Blair, Nebraska. The company has over a century of experience providing business and residential customers in Colorado, Iowa, Nebraska, and Southeastern Indiana communities with forward-thinking, fiber-driven technology services including high-speed Internet, Ethernet, video, hosted and traditional voice solutions. Joe is an industry veteran with more than 20 years of leadership experience within operations, telecommunications, wireless deployment and construction management. He is responsible for GPC's FTTH strategic growth initiative to residential customers in new markets, as well as aggressive expansion in current Midwestern markets. For more information, email contactus@gpcom.com or visit gpcom.com. Visit GPC on Twitter @GPC_updates, LinkedIn: <https://www.linkedin.com/company/great-plains-communications/> and Facebook: <https://www.facebook.com/GreatPlainsCommunications>.

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BUT WAIT, THERE'S MORE! Go online at isemag.com/14289681 for more topics discussed with Joe.

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SECURE NETWORK CLOUD ECOSYSTEM — 2023 Dynamics

Navigating Your Journey
When There Is No Destination

BY MARK FISHBURN



People frequently talk about goals and objectives but for this author, it's the journey experienced day-to-day that is of more interest.

Especially as most thoughts about the future are based on a predictable past. This has never been more appropriate than when dealing with the network ecosystem.

This article is a review of today's complex, seemingly chaotic network landscape. If nothing else, it's important to be at ease with living with business and technologies in a state of constant migration—because that's exactly where we are. The intention is to provide some guidance on your journey. To begin, it's important to start by looking at today's reality about our Network Cloud Ecosystem.

In my recent *ISE Magazine* article on holistic cybersecurity,¹ we looked at Zero Trust being the only viable solution for the perimeter-less network. We called out the many potential enforcement points as we laid out the principal elements of the ecosystem as the backdrop in Figure 1. It also called out the dynamics behind its evolution (migration to the network cloud).

Despite the complex and evolving nature of our network environment, there are several other factors in play that are important to understand. These

may not be obvious and are either overhyped or not spoken of at all. These are:

- Secure Access Service Edge and Secure Service Edge
- Standards and Open-Source Challenges
- Newly Available Standards
- A Layered Business Architecture
- Service and Cloud Provider, Integrator and End-user perspectives

Secure Access Service Edge and Secure Service Edge

Since December 2019, when Gartner's SASE blog² envisaged a set of technologies, the network community was given a direction—the possibility of the secure integrated network ecosystem. A great

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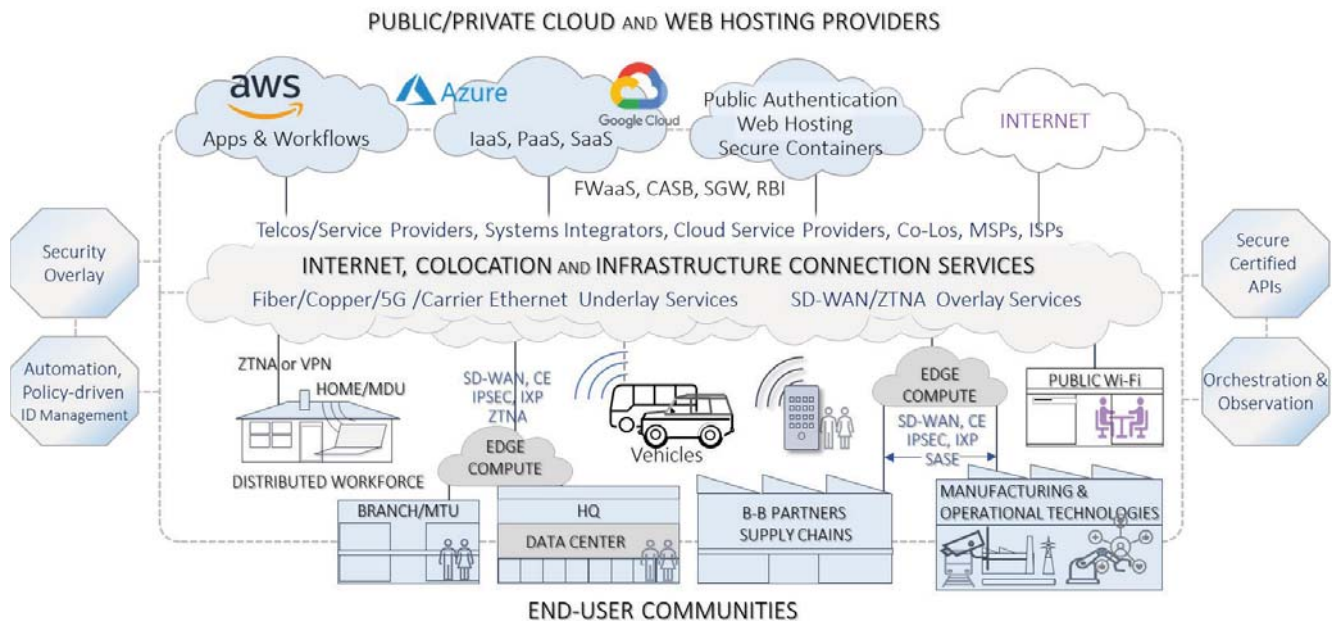


FIGURE 1. The Secure Network Cloud Ecosystem

idea that has created masses of hype and multibillion dollar analyst predictions. Soon after COVID-19 hit and Zero Trust became a necessity, SASE became even more important. Both were equally misinterpreted (I think I'm being polite). As we said at the beginning, it's a journey that needs a 2023 reality check to get past the hype.

For those living under a rock for the last three years with Secure Access Service Edge (SASE), Gartner called out (but did not define) **SD-WAN** "Overlay" services and network services "such as" **Secure Web Gateway (SWG)**, **Zero Trust Network Access (ZTNA)**, **Firewall as a Service (FWaaS)** and **Cloud Access Security Broker (CASB)**, and has termed it all as SASE. Essentially, SASE is a package of technologies including the core abilities above with the ability to identify sensitive data or malware and the ability to decrypt content at line speed, with continuous monitoring of sessions for risk and trust levels.

Today and tomorrow, that possibility is becoming a reality with around 20 suppliers, integrators, and service providers taking the journey to SASE. However, any claims of compliance to the SASE model should be viewed with caution because frankly it's a

combination of services, not a definition of a standardized, cohesive, implementable framework. As you read the product reviews of solutions marketed as SASE, you should view them as earnest attempts at implementations that will, or may, eventually encompass all the elements but for now represent some of the required components. Implementations themselves often blur the distinctions between the categories, none of which actually have an agreed standard definition, being proprietary in nature! Even the recent NIST "Guide to a Secure Network Landscape"⁴ should be read with this in mind.

But wait, there's more. Not only are there no standardized definitions but newer ideas have legitimately been rolled into one offering, for example, CASB and RBI (Remote Browser Isolation). RBI is a cool function, separating users' devices from the act of Internet browsing by hosting and running all browsing sessions on a remote cloud-based, and hopefully secure, container. It helps prevent malware from being inadvertently loaded onto end user systems. It also means that data can be screened to avoid exfiltration of sensitive data or access to middle box functions and as a phishing defense. It's

also an efficient way and place to implement a Zero Trust End Point.

Perhaps daunted by the monster they had created, Gartner later created a milestone in the SASE roadmap termed *Secure Service Edge (SSE)* consisting of just SWG, CASB and ZTNA. Capabilities included access control, threat protection, data security, monitoring, and use control enforced by network and API-based integration. SSE is primarily delivered as a cloud-based service and may include on-prem or agent-based components. In March 2022, Gartner created a new magic quadrant summarizing 11 players in this space.

Industry reviews of product progress. This article provides a context for your reading. I cannot vouch for the analysis:

- Software Testing's top 11 SASE Vendors³
- TechRadar's Top SASE vendors⁵
- Netify's top 10 SASE vendors⁶
- Expert Insight's top 10 SASE vendors⁷
- Gartner's Magic quadrant features 11 SSE companies (Feb 22)⁸

It's such a temptation for suppliers or service providers to wrap their products into "unique all-encompassing solutions" with the actual value, the products can be

lost. I.e., the guidance of this article is to ignore any “complete SASE/SSE solution” hype and focus on matching what a product actually does against your current and anticipated business requirements. We will discuss later a layered business architecture model that will handle migration and technology changes to help with such decisions.

As I said upfront, this is a journey and it’s one worth taking. SASE and SSE are finding their way in the world.

Standards and Open-Source Challenges

Having been on both sides of this discussion, it’s clear that both industry standards and open source have benefits and challenges. (See Figure 2.)

It’s also clear that if time to market is key then open source is the fastest but not often the cheapest approach. If multinational or multi-cloud approaches are critical, then standards-based approaches are advisable. Solutions that appear later based on standards can then be built in as a migration path.

In the next section, we look at some very recent standards that can be used to bring services and products that enable both SASE deployment and Zero Trust Enforcement to many points in the ecosystem including operational networks.

New Standards for the Secure Network Cloud Ecosystem

There are several standards related to implementing secure network ecosystem services. The SD-WAN service is well-established and two are new.

The MEF (MEF.net) has produced standards for more than two decades and some recent ones are available to network equipment suppliers, security providers and service providers.

The latest iterations include MEF 70.¹⁹ *SD-WAN Service Attributes and Service Framework*. This developing standard defines the externally visible behavior of an SD-WAN Service based as an agreement between an SD-WAN

	Open Source	Standards
Benefits	<ol style="list-style-type: none"> 1. Solutions built around customer or industry specific use cases. 2. Much faster time to market. 3. Differentiation. 	<ol style="list-style-type: none"> 1. Consensus of best minds producing industry applicable solutions. 2. Great for creating interoperable solutions that allow multinational companies to deploy systems that span (1) multiple providers or (2) allow mixing of best-of-breed enterprise solutions & can (3) include solutions for multi-cloud workflows. 3. Increase competition.
Challenges	<ol style="list-style-type: none"> 1. Lack of depth of understanding of potential uses. 2. Lack of Interoperability with other solutions locks in enterprises to a supplier, integrator or increasingly to a Cloud service provider. The publishing of secure APIs may be a way forward. 3. They also make generation of multinational solutions very difficult. 4. Increased security risk of using open-source software components. 	<ol style="list-style-type: none"> 1. Ponderous standards development times with lack of implementation guidance means they can miss the market window. 2. Generalized solutions are often technology rather than business focused. 3. Can be overly complex and difficult to implement for specific uses cases. 4. As discussed earlier there may be no industry group set up to standardize a software approach.

FIGURE 2. Open Source and Standards Comparison

subscriber (buyer) and a service provider (seller) agreement on the values of a set of SD-WAN service attributes. This was published in 2021.

In November 2022, the MEF also published its standard MEF 118¹⁰: *A Zero Trust Framework and Service Attributes*. Its initial intention covers many use cases of potential Zero Trust-based services. These attributes enable services to implement Zero Trust principles and strategies into a network service

deployed anywhere in the network. This is game changing. For instance, it could also be applied in Zero Trust-based services such as ZTNA, as part of the aforementioned SASE and also in areas of enterprise operational networks. This standard handles user identity, authentication, access control based on user roles and attributes, policy enforcement at policy endpoints and continuous monitoring as shown in Figure 3. It handles interactions between subject

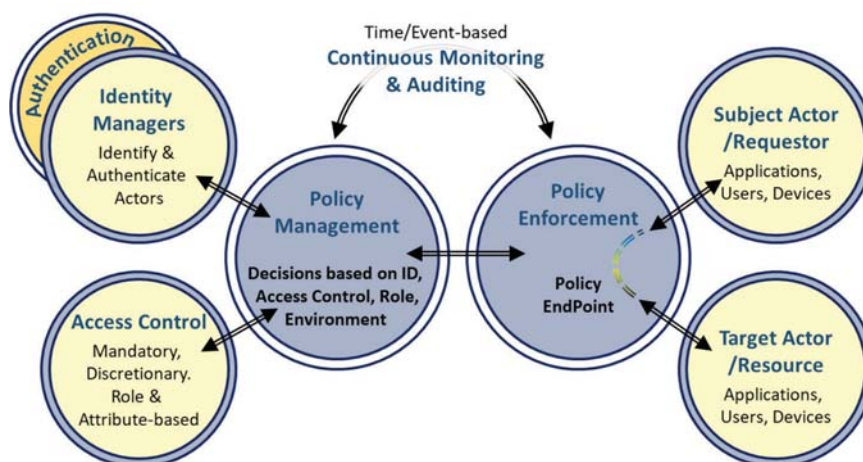


FIGURE 3. Zero Trust Elements

and target actors that can be users, applications, or devices such as IoT devices in operational networks. It enables standardization between applications and multi-cloud and computer edge workflows. The author of this article was privileged to be a contributor to this important standard over the last two years.

In November 2022, The MEF also published its SASE service and service attributes definition (MEF 117)¹¹ by defining a standard combining security functions and network connectivity as an enabler of SASE services. It defines a service framework and specifies service attributes that need to be agreed between a service provider and a subscriber for SASE services, including security functions, policies, and connectivity services.

These specifications, in conjunction with proprietary SWG, CASB, FWaaS and RBI services, can be the basis of a

robust SASE offering and a far-reaching enterprise network solution.

A Layered Business Architecture

From an end-user's organizational perspective, particularly larger enterprise and government bodies, the focus is on business agility, cost and, of course, security. This is an important topic for the Open Networking Group (ONUG.net). ONUG represents the voice of the enterprise providing that community with guidance on the evolving network cloud. The Network Cloud Working group, of which this author is a member, recently published a layered business **Network Cloud Playbook**.¹² (See Figure 4.) This is driven by business policy and is intended to be capable of being able to replace network elements and infrastructure as dictated by changes in policies and on demand. It ties back to this article's theme that

network journey is never complete but in a constant state of migration. Its intention is to empower enterprises and businesses in general to choose an infrastructure that supports their unique business requirements.

Service & Cloud Providers, Integrators, Suppliers and End-User Perspectives

The final piece of this article covers the market dynamics. This is important because it gives you the context of the sales and purchasing discussions. Everyone wants to be in control. If you are an Enterprise, then you will relate to the business-oriented Network Cloud Playbook. You may also like to visit my website (cybyr.com) covering the importance of taking a holistic approach to cybersecurity across your entire organization. I.e., SASE and Zero Trust are important but they only address a small part of the cybersecurity landscape.

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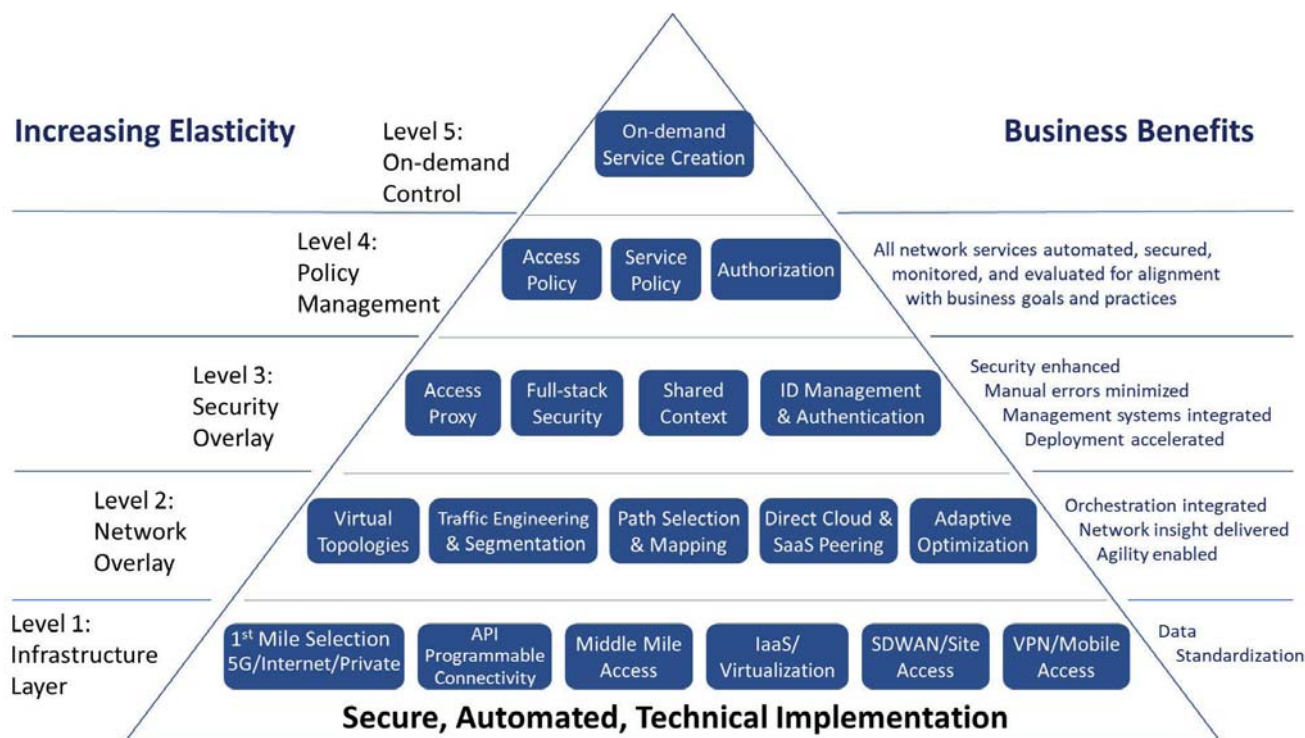


FIGURE 4. Network Cloud Business and Digitalized Architecture

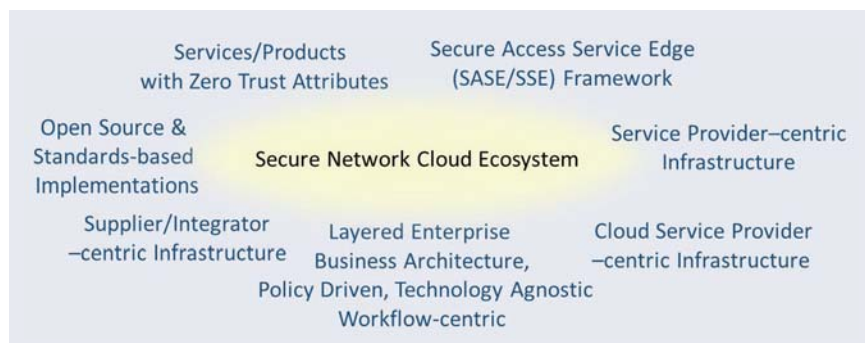


FIGURE 5. The Forces in Play

Cybyr.com also breaks news of the latest threats and explains 100+ cybersecurity terms.

From the perspective of service providers, cloud providers, integrators, equipment suppliers, software and security companies—everyone wants to be in control and will claim to have a complete solution and build a wall around you and your purchases.

There are many forces in play in the evolving, dynamic Secure Network Cloud Ecosystem, some business, some technical and many commercial as summarized in Figure 5.

For end-user organizations it comes down to budget, control, security, and your ability to contractually bind your

suppliers to their performance and ability to deliver high performance, high security solutions no matter what they are called or branded. As they say in Zero Trust, Don't Trust, Verify.

My hope is that my personal perspective gives a balanced view bringing some order to the incredibly fast-moving pace of network change. For the most part it's important to enjoy the journey and be flexible as the path to the perfect network will likely keep taking new turns! ■

REFERENCES AND NOTES

1. www.isemag.com/network-reliability-testing-and-assurance-cybersecurity-safety/article/14287070/the-search-for-cybersanity

2. blogs.gartner.com/andrew-lerner/2019/12/23/say-hello-sase-secure-access-service-edge/
3. www.softwaretestinghelp.com/top-sase-vendors/
4. <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-215.pdf>
5. www.techradar.com/features/here-are-the-10-biggest-sase-vendors
6. www.netify.com/learning/who-are-the-best-rated-sase-vendors
7. expertinsights.com/insights/top-sase-solutions/
8. www.gartner.com/doc/reprints?id=1-2966J3JL&ct=220218&st=sb
9. www.mef.net/wp-content/uploads/MEF_70.1.pdf
10. www.mef.net/wp-content/uploads/MEF-118.pdf
11. www.mef.net/wp-content/uploads/MEF-117.pdf
12. onug.net/wp-content/uploads/2022/04/ONUG-Network-Cloud-White-Paper.pdf



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Decarbonizing **BACKUP POWER?**

It Is Possible

BY DR. THOMAS HILLIG

Telecom networks are energy intensive. While energy efficiency is constantly improving, the total amount of data transmitted is increasing as digitalization advances and conquers more and more sectors of our private lives and business applications. Cloudification and the introduction of 5G are related to this development. This is why the total energy consumption is still rising despite significant energy efficiency efforts from Broadband Service Providers.

Telecommunication companies are also rushing to cut their carbon emissions. Remote towers are increasingly vulnerable today to power outages because they are under increasingly higher risks of storms, floods and other extreme weather events that are increasingly severe and frequent because of climate change. Climate resilience becomes an increasingly important topic for telecom companies.

Even more obvious is the need for on-site power generation at remote telecom tower sites that are not connected to the national grids. While historically, they run on diesel gensets only, small-scale renewable energy power plants have since been added—mainly solar arrays. Solar is an intermittent energy source that needs to be balanced. This article will introduce and compare different solutions such as a dynamic use of diesel gensets, batteries and fuel cells.

Energy related questions are an important topic as energy costs are a substantial cost block for telecom operators. Already, before the current global energy crisis, they accounted for approximately 5% of operating expenditures.¹



FIGURE 1. Telecom tower with a solar power plant at a remote island in Nicaragua. (Source: THEnergy)

Off-Grid Tower Powering Options

Reliability is key in telecommunications. Unplanned power outages can mean a loss of service to critical customers which can translate into a loss of huge amounts of money or even the loss of lives. This is why the telecommunications infrastructure must be powered extremely reliably. Below are a few options providers can employ to deliver the ultra-reliability their customers' demand:

OPTION A: DIESEL GENSETS

In remote locations, telecom towers are typically powered by diesel gensets. Diesel generators are very flexible, meaning they can easily adapt to load changes of the telecom tower. However, diesel gensets also come with several severe problems. They require regular maintenance which can be particularly costly at remote sites, and they are much less efficient than large-scale grid-connected power plants.

The main issue with diesel is that it is not environmentally friendly. This is valid in different dimensions. Diesel is carbon-intensive and contributes significantly to climate change. Additionally, diesel also comes with on-site pollution, from noise to hazardous emissions, that can cause cancer.

OPTION B: SOLAR-DIESEL HYBRID

Solar and small-scale wind turbines might be used at remote telecom towers as an option to diesel. (See Figure 1.) As renewable energy sources, both solar and wind energy are carbon-neutral and do not require any fuel. However, they are also intermittent energy sources, and their output depends on solar irradiation or wind speeds.

These options cannot match the energy loads that remote telecom towers require. This is why



FIGURE 2. Fuel cell at a telecom tower in Iceland. (Source: GenCell)

diesel gensets are not really replaced but rather operated at lower loads whenever the sun is shining, or the wind is blowing.

Diesel gensets can quickly respond to power losses due to shading of the solar arrays being shaded or if the winds stop. That said, operating diesel gensets in such a dynamic way can increase their maintenance needs as they are typically optimized for operating at rather high loads.

OPTION C: SOLAR-DIESEL HYBRID WITH BATTERIES

Solar-diesel hybrid solutions reduce diesel consumption typically in the range of 15-25%. They can also contribute to decarbonization. While it's important to deploy as many solar-diesel hybrid solutions as possible at remote telecom sites, it's obvious that this approach is far from being carbon-neutral.

Diesel gensets can also be supported by batteries that allow diesel gensets to be switched off during sunny and/or windy days. In those situations, the diesel gensets are switched off and the batteries balance the gap between the intermittent renewable energy source and the requirements from the telecom tower.

Batteries can reduce the wear on diesel gensets by running them more steadily. They can also be a bridge-for-backup, meaning they can provide energy until the diesel genset is started, which might take up to a couple of minutes.

The share of renewables is seldomly beyond 50%. Even for such a modest looking renewable energy share, the

capital requirements for batteries can be rather high.

OPTION D: HYDROGEN AND AMMONIA

Seasonal fluctuations on the supply side (for instance weather-based) or the demand side, require long-duration energy storage systems or fuel-based solutions.

Hydrogen can be both an energy storage solution and a fuel. Hydrogen is produced on-site from solar or wind energy and converted in electrolysis plants to hydrogen. It can then be stored in tanks and reconverted into electricity when needed. That's how it can assume the role of an energy storage system. (See Figure 2.)

In some applications, it might be too complex to run a small-scale electrolyzer on-site to produce green hydrogen

locally. In those cases, hydrogen is transported in liquid form in specialized trucks to remote sites.

OPTION E: FUEL CELLS

Instead of burning fuel to create electricity, fuel cells rely on an electrochemical reaction that does not create any greenhouse gases and only clean vapor as local emissions. Three different types of fuel cells are:

1. PEM Fuel Cells (PEMFCs) PEMFCs consist of two electrodes (an anode and a cathode) with a thin platinum layer of catalyst, bonded to either side of a proton exchange membrane. Their acidic nature requires the use of platinum cathodes.

Membrane fuel cells typically require water for membrane hydration. If water and the heat of the fuel cells are not carefully managed, the performance of the membranes will start to dry out and conductivity will decline, or condensation could flood the electrodes. Therefore, they must be operated in conditions above freezing or be placed in a heated and insulated enclosure.

This option also requires expensive electrocatalysts, typically made of platinum, to support the reactions that occur at low temperatures—an important factor that drive costs of PEMFCs.

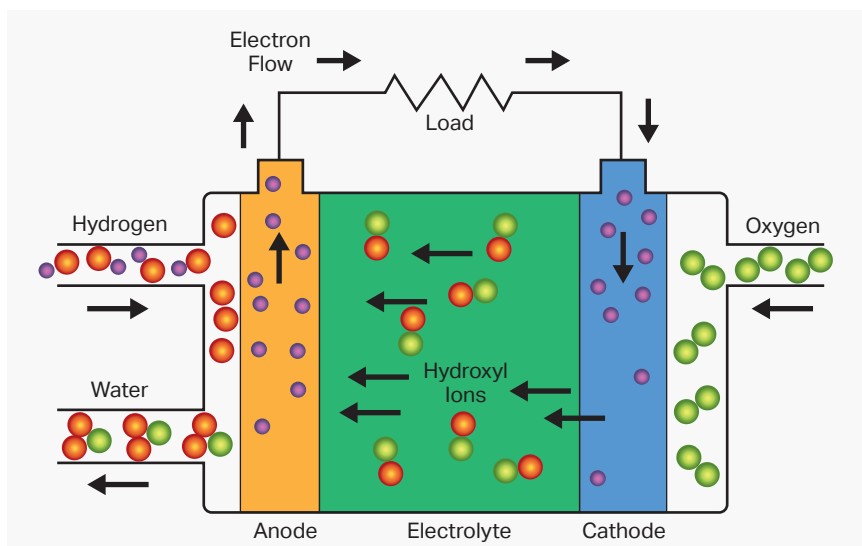


FIGURE 3. The electrochemical process of an alkaline fuel cell. (Source: GenCell, 2018)

2. Alkaline Fuel Cells (AFCs) The term alkaline fuel cells come from the use of an alkaline electrolyte such as potassium hydroxide (KOH) in water. AFCs are particularly efficient, reaching up to 60% efficiency and up to 87% for heat and power combined.

The circulating liquid electrolyte offers benefits compared to low temperature membrane-based fuel cells like PEM. (See Figure 3.)

The electrolyte (KOH) used in alkaline fuel cells has a freezing temperature of below -40 degrees Celsius. This allows their use in sub-freezing conditions. Liquid electrolyte also avoids many of the challenges with membrane humidification including limited operation in certain high and low humidity conditions. That means that AFCs can operate in a greater range of temperature and humidity conditions. This type of fuel cell also features a short start-up time.

The liquid catalyst makes AFCs relatively heavy. While they are not ideal for mobile applications, they can be used at telecom remote sites. Their significantly higher efficiency also translates into fuel savings and lower transportation needs and costs.

The main issue that remains with standard AFCs is the alkaline electrolyte which is quite sensitive to any CO₂ in the fuel or oxidant stream. The hydrogen-oxygen (anaerobic) AFC achieves an efficiency significantly higher than that of other types of fuel cells. It also uses ambient air as an oxidant, with a concentration of CO₂ of 300-450ppm. In the presence of CO₂, KOH electrolyte degrades and can form carbonates, which ultimately affect the durability and longevity of the AFCs operation. This problem is typically resolved by means of air scrubbers (regenerative and non-regenerative) that reduce the CO₂ concentration in the incoming air.

3. Advanced Alkaline Fuel Cells (AFCs) One company, GenCell, has made several patented improvements in AFC technology that optimize their

fuel cells for stationary applications. Capital costs have substantially been reduced by using non-precious metal catalysts instead of precious metal catalysts—typically made of platinum or platinum alloys.

If the fuel cells are powered by locally generated green hydrogen, the requirements for the electrolysis process and hydrogen storage are lower. This could turn into another important cost advantage.

However, transporting and storing hydrogen at remote sites remains a challenge. This is where ammonia comes into play. When hydrogen is extracted from ammonia and fed into the fuel cell, it is one of the most effective and energy-dense carbon-free hydrogen carriers, with only water, nitrogen, and heat as by-products. Green ammonia is carbon-free as it relies on green hydrogen.

Recommendation

Sustainability, costs, and resilience are the key factors for telecom operators when they address energy these days. There is a strong need to decarbonize AND maintain almost 100% reliability for the network infrastructure.

This article explored several options for powering remote telecom sites. Each remote site is location-centric and unfortunately, there is not a “one-size-fits-all” solution. The best course of action is to trial one or two in the field and rigorously test them. Only then, will it be clear which is the best fit for the short and long term. ■

REFERENCES AND NOTES

1. www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-case-for-committing-to-greener-telecom-networks

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12:00 PM – 5:00 PM Registration Open

1:00 PM – 4:00 PM Workshops

WEDNESDAY, AUGUST 30, 2023

7:00 AM – 5:00 PM Registration Open

7:00 AM – 10:00 AM Exhibitor Move-in

9:00 AM – 10:15 AM Seminar Sessions

9:30 AM – 10:30 AM Women in Telecom (WIT) Panel Discussion

10:30 AM – 11:30 AM Opening Keynote | Brightspeed Keynote Panel

11:30 AM – 5:00 PM Exhibit Hall Open

12:00 PM – 1:30 PM Lunch on Exhibit Floor

1:00 PM – 2:30 PM ICT Visionaries Roundtable (Closed Door)

1:00 PM – 3:30 PM Demo Zone Open

1:30 PM – 3:15 PM Seminar Sessions

3:30 PM – 5:00 PM Networking Event on Exhibit Floor

THURSDAY, AUGUST 31, 2023

7:00 AM – 2:30 PM Registration Open

8:00 AM – 10:15 AM Seminar Sessions

10:30 AM – 11:30 AM Closing Keynote | Tech Talk Presentations

11:30 AM – 3:00 PM Exhibit Hall Open

12:00 PM – 1:30 PM Lunch on Exhibit Floor

1:00 PM – 2:00 PM Demo Zone Open

2:45 PM – 3:00 PM Attendee Giveaway (in Demo Zone)

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KEYNOTE PANEL

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



CHRIS CREAGER

Chief Administration Officer

Chris brings a wealth of leadership experience in transforming wireline telecom businesses and driving customer growth. During his 29-year tenure with Verizon, he led large network and multi-billion-dollar business units that created powerful fiber optic access to millions of homes and businesses. Chris is focused on ensuring that Brightspeed delivers on its brand promises, for customers and employees, by building a seamless and efficient support structure for the company.



TOM MAGUIRE

Chief Operating Officer

Tom brings more than four decades of telecommunications experience to Brightspeed. Starting as a field technician, Tom built his career from the ground up. As Chief Operating Officer, Tom is responsible for ensuring Brightspeed's operations team leverages state-of-the-art technology to deliver on the company's promise to provide best-in-class customer service and a faster, more reliable network across the company's footprint.



BOB MUDGE

Chief Executive Officer

Bob's leadership roles at Verizon and other telecommunications providers range from network operations to marketing and strategic transformation. He has deep expertise in public and private enterprises and has served as an advisor to private equity firms and industry research organizations. While the breadth and depth of his industry experience is crucial in his role at Brightspeed, his ability to develop high-performing teams that deliver exceptional results, focused on the customer, sets him apart in the industry.

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JOHN AMUNDSON

Director of Planning & Implementation

John Amundson oversees network design and project construction to support the company's aggressive fiber expansion efforts. He has been with TDS Telecom for more than four decades and has held numerous positions with increasing responsibility during his tenure.



BRIAN BOND

Chief Operations Support & Innovation

Brian has spent his career in telecom, leading technology transformation. He leads the company's network architecture design, delivering next-gen technology to scale the network and keep pace with the growing demand for capacity. His top priority is delivering cost-effective solutions that enable Brightspeed to deliver on the promise to bring broadband to underserved communities.



CHARLIE CANO

CEO/General Manager

Charlie Cano is a 26-year veteran of the telecom industry with diverse work experience as an Outside Plant Design Engineer, a Project Manager, and Sales Director for a national consulting firm. He's been with Etex for the last 20 years.



ASHLEY TRAVERS

Director of Network Engineering

Ashley Travers is the Director of Core Network Engineering for Voice and Video network operations globally. She and her team plan, design, provision and decommission the wireline network infrastructure including IP, switch migrations, web conferencing, capacity planning and network transformation decoms.



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GETTING Your Teams On-Purpose

Make Sure Your Team OPTS IN

BY GREGG GREGORY, CSP

Wouldn't it be great if your teams performed optimally on a regular basis as opposed to getting it right just some of the time? This is what we call performing "On-Purpose", rather than accidentally, where they get it right from time-to-time.

The fundamental principle to getting teams to opt in is getting everyone to understand that a team is much more than a group of people working together towards a common goal. It has often been said that there is no "I" in team. In fact, a high performing team includes individuals (the "I") that are surrounded with other like-minded individuals. It all begins with four individual-focused characteristics and four team-focused traits:

1. TRUST

The most common type of trust is called predictive trust—where leaders and team members can rely on each other to do what they have been asked to do. This is a critical foundation with any team.

Beyond predictive trust is vulnerability trust. Vulnerability is often thought by many to be a weakness. Nothing is further from the truth. Being vulnerable is a powerful strength. When everyone on the team allows themselves to be vulnerable, the team becomes stronger.

To help your team with this, use the simple exercise below with your team leaders. Then have them use it with their teams. The exercise is simple—in their groups, they answered the following four questions:

- Where did you grow up?
 - How many siblings do you have and where do you fall in the birth order?
 - What was an important or unique event (positive or negative) in your childhood before the age of 18?
 - How has that event impacted your professional life today?
- This exercise takes time, yet it is a powerful tool that will make a huge impact on team development.

2. RESPONSIVENESS

Successful teams communicate with each other. This does not mean they always agree—in fact there are often disagreements. Those disagreements are based around ideas and there is nothing personal, or any personal attacks, on or against others in the group.

This level of communication allows teams to be genuinely responsive to colleagues, subordinates, managers, other teams, customers—in other words, all stakeholders. They are responsive and do not avoid difficult conversations.



"Successful teams communicate with each other. This does not mean they always agree—in fact there are often disagreements. Those disagreements are based around ideas and there is nothing personal, or any personal attacks, on or against others in the group."

3. OWNERSHIP

The top teams have individuals who all take ownership for everything they do. When they make a mistake, they do not place blame, they do not ignore the mistake, they own the mistake and learn from it, and help others learn as well. On the other side of the coin, when they do something successful, they share that success with their team members. This must be done in a non-braggadocio's manner.

4. MISSION

Every organization has their mission statement—this is not what our word "Mission" means. The individuals on successful teams all have a unique passion for the specific mission for their specific team.

The power behind the passion for the team's mission is to make the position of each team member more personally fulfilling. When the position is more fulfilling, it makes the

position more fun. When the position is more fun, we want to do more to help our team succeed.

Next are the traits that each team should focus on. How we approach and employ these traits will, naturally, be slightly different for each team.

5. ENGAGEMENT

Studies show that employee engagement today is at one of the lowest levels in years. It is critical for team members to keep each other engaged. There will always be someone who is struggling with something, either personally or professionally, on any given day. When team members recognize this, they can step in and help.

One employee may not have all the knowledge necessary, and when others help, then everyone becomes more engaged. Engaged employees are not just the responsibility of the manager, getting everyone engaged is the responsibility of every team member.

6. ACCOUNTABILITY

When team members totally trust each other, are engaged with the team and the mission, as well as communicating effectively, then holding each other accountable does not seem like someone is picking on them. It is critical that employees feel as though they are being heard.

Teams should understand that each member has the responsibility to hold each other member accountable. President John F. Kennedy said, "A rising tide raises all ships." Accountability is the tide that raises the team.

7. SYNCHRONIZATION

If you have ever been on a small boat or plane with two engines, you realize how important it is for those two engines to be synchronized. If they are not synchronized, the vibration can become intense and even dangerous.

Teams are no different. Teams are often involved in multiple projects. Team members are often involved in multiple projects, possibly on different teams. Often, these projects are just a part of the same larger goal. It is vital that multiple team members get in sync with each other, and multiple teams do the same throughout the organization.

8. KNOWLEDGE

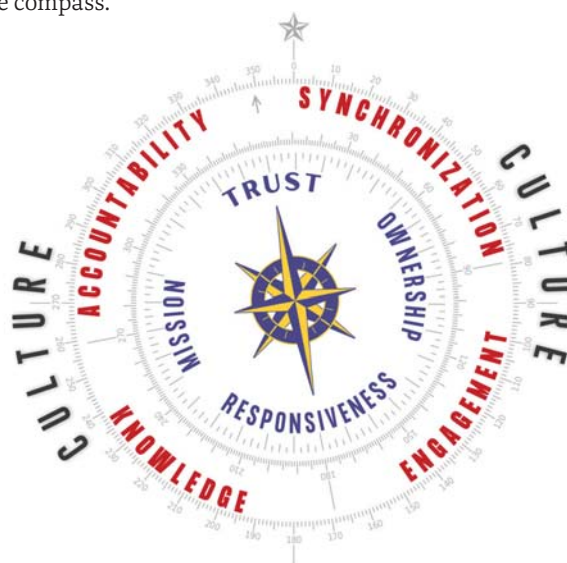
So many people believe the old statement that knowledge is power. What top teams recognize and believe is that it is the application of knowledge that is powerful. The old days of keeping knowledge to ourselves is long outdated. We need to share that knowledge because, once again, by sharing knowledge we are all raising our team.

One way many teams do this is by having either daily, or weekly huddle or heads-up meetings. These meetings are brief and succinct. The idea is to review where the team is, where the team is headed and tracking the goals. Then,

these teams share challenges, discuss how they overcame obstacles, and share with each other to create a knowledge library to help new employees and team members garner more knowledge.

When team leaders impart the philosophy of working On-Purpose, a team's consistency level increases. The morale of each team increases, turnover is reduced, and productivity and customer satisfaction increase greatly. This translates into a powerful culture for each team.

Here is a simple image to help you understand the process. The compass rose has been utilized by ship captains for centuries to make sure they navigate waterways successfully. I have added eight keywords around the eight key points on the compass.



The individual-focused words; Trust, Responsiveness, Ownership and Mission are on the inner circle. The team-focused traits Engagement, Accountability, Synchronization and Knowledge are on the outer circle. These traits then drive your team's culture.

It's important to recognize that teams grow in different stages and not necessarily in the same order. Teams are not created in a linear fashion.

This ON-Purpose Teams System is your secret key. So, make sure your team—OPTS IN.

This process can seem confusing, so to help you remember this, the first letters of the process above spells out the acronym: TEAMS ROCK.

Now, you can go and make your TEAMS ROCK! ■



Gregg Gregory, CSP, is the Founder/Owner of TeamsRock.com. For more information, please email him at Gregg@TeamsRock.com or visit www.TeamsRock.com. Follow him on Twitter @TeamsRock, LinkedIn: www.Linkedin.com/in/TeamsRock, and Facebook: www.facebook.com/TeamsRock.

Engineering Networks FOR A NET ZERO FUTURE

BY JOANNE TAAFFE

Concern about energy efficiency is not new for telecom network operators. The difference today from years ago, however, is that energy efficiency is increasingly a board level concern. A simple reason for this is cost. Networks typically account for upwards of 90% of a telco's energy consumption. If you consider that energy makes up between 5% and 6% of a telco's operating expenditure, a hike in energy costs can deliver a sizeable hit to telecom companies' profitability.

This short article is an adaptation of the report, "The Sustainable Telco: Engineering Networks for Net Zero"¹. In it the TM Forum explores the fresh impetus for telcos to make their network operations more sustainable. Figure 1 sets the stage for the discussion.

The reality is that investors are increasingly threatening to withhold

funds from telcos that lack a convincing long-term sustainability and energy efficiency plan. As a result, network operators are working with their suppliers and partners to find more efficient ways to process, store and transport data.

Their investments, which include the decommissioning of legacy networks, have been paying off. One source, MTN Consulting, reports an average 10% increase in network operator power use in 2021, even though the rise in data traffic has been much faster.

The indication, then, is that CSPs are starting to mitigate the effects of a relentless rise in network traffic. Telefonica, for example, says it has managed to keep energy consumption stable despite data traffic increases of 45% in 2020 and 31% in 2021.

Thankfully, network operators are being helped by their wider digital

transformation programs, some of which intertwine with sustainability projects. These initiatives could include AI's use in automation; innovative machine learning; cross-enterprise approaches to collaboration; Open RAN development and network disaggregation. All are opening up new ways of thinking about operational and service models. As we will see in this article, they are having a positive effect on energy consumption.

The Realities

Globally, data transmission networks consumed in the range of 260-340 terawatt-hours (TWh) in 2021 as shown in Figure 1. This translates to 1.1%-1.4% of total global electricity use, according to estimates from the International Energy Agency (IEA). Interestingly, global data center electricity use in 2021 was 220-320 TWh, or around 0.9-1.3% of global electricity demand.

Both of these facts are relevant to operators around the world working to monetize their 5G networks. The holy grail, of course, is greater efficiency in the radio access network (RAN), which

	2015	2021	Change
Internet users	3 billion	4.9 billion	+60%
Internet traffic	0.6 zettabytes	3.4 zettabytes	+440%
Data center workloads	180 million	650 million	+260%
Data center energy use (excluding crypto)	200 TWh	220-320 TWh	+10-60%
Crypto mining energy use	4 TWh	100-140 TWh	+2,300-3,300%
Data transmission network energy use	220 TWh	260-340 TWh	+20-60%

FIGURE 1. Digital and Energy Indicators Worldwide

TM Forum, 2022 (source: International Energy Agency)

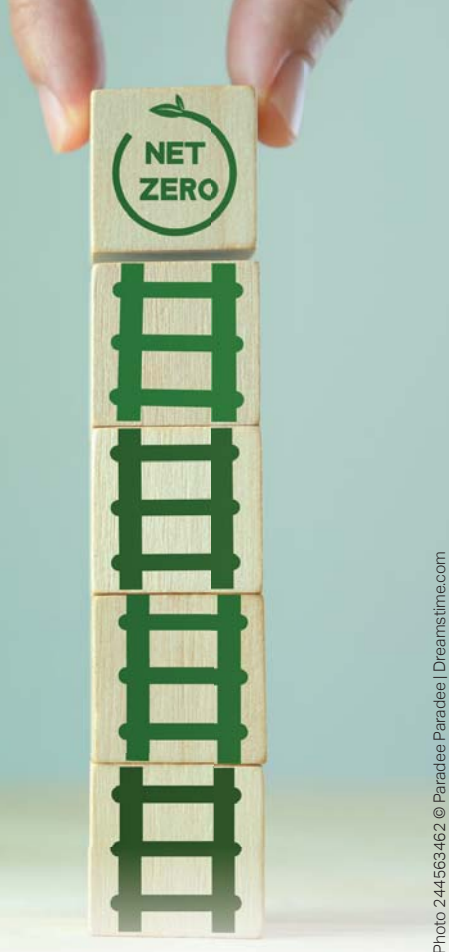


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typically represents more than 75% of a service provider's network power consumption, according to Ericsson. Additional data suggests the industry has made considerable progress and is starting to reap the benefits of more energy efficient design of 5G networks. A study by French telecoms regulator, ARCEP, shows that although deploying 5G networks alongside 4G infrastructure will incur an initial spike in energy consumption, it should result in a ten-fold decrease between 2020 and 2028, compared to using only 4G networks.

A recent Analysys Mason report, "Driving down energy usage across telecoms networks: 5G RAN and beyond", shows a best-case scenario for energy reduction in a country the size of the UK. (See Figure 2.) "Decommissioning copper is the biggest step that most operators can take to reduce their energy usage," say the report authors. "Indeed, FTTP (fiber-to-the-premises) is much more energy efficient than copper. Moving to a 4G/5G Single RAN deployment that eliminates the need for a separate 2G/3G RAN also provides a significant direct reduction in energy use."

Tactical Strategies

Although decommissioning is today's silver bullet for long-established telcos, its benefits are finite. CSPs are therefore turning to additional measures, such as network automation, which will improve areas like fault detection and self-optimization of systems. They can also aid with the dynamic shutdown of unused network elements and the use of Open RAN, network sharing. All could help reduce power consumption and maintenance costs across the 5G network.

CSPs are also applying greater pressure on their suppliers to find new ways to make equipment more energy efficient, as well as developing their own solutions. Network suppliers are responding to the call and have already "shifted the focus of equipment improvement towards the green agenda," says Gaurav Arora, Director, Sustainability & Operational Excellence, Telenor Group IHQ.

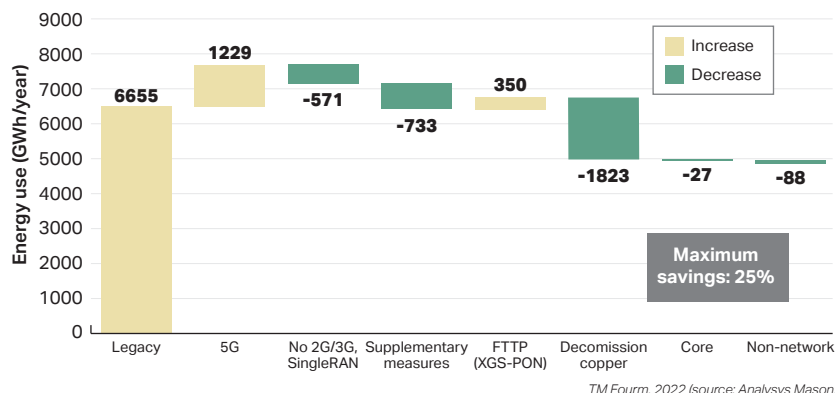


FIGURE 2. Potential Network Energy Reductions

While AI and machine learning can also be leveraged to lower telcos environmental footprints, CSPs network sites and operations are complex. Therefore, a lot of work must go into cleaning and structuring diverse data streams before AI and machine learning systems can harness them. Thankfully, many operators are already making those intelligent management systems a reality.

Verizon's Digital Twin Example

Verizon has developed a data analytics platform which provides a virtual representation, or digital twin, of its physical network to analyze and predict the performance, cost and efficiency of its network sites and equipment. Part of the company's wider investment in predictive analytics, the digital twin provides important insights into how Verizon can save energy costs and work with suppliers to improve network efficiency and performance.

"We were able to gather the power consumption data for all of the cell sites and see some crazy anomalies," says Michael Raj, Vice President of Network Enablement (AI & Data), at Verizon. As a result, "we could question why this costs \$1,000 versus the same configuration elsewhere, which only costs \$500... and identify specific problems related to that outlier, as well as make recommendations for how to remediate those situations when found in the future."

Verizon's digital twin also allows the company to visualize and compare how

different vendors' equipment consumes energy in the field as opposed to in a lab. The company uses the results to push for better performance. "Let's say for 100 gigabytes of capacity, vendor A proves to be 35% more efficient in practice than vendor B. That allows us to push vendor B to create a more energy efficient solution," says Raj.

Verizon also shares that providing a standardized environment in which to visualize issues and test potential solutions in the form of a digital twin has encouraged teams to take a more creative approach to improving operations. "It's allowed us to increase the ideation across our operations team now that they have a single source to look at how the standard differs across networks, lines of business, services and types of technology," explains Raj.

Once the systems are in place, they can be their own best advocates. Verizon, for example, is now able to forecast energy costs based on factors such as the addition of a new cell site or decommissioning, as well as price fluctuations in energy markets. This gives financial officers a much more detailed energy price forecast against which to budget, which in turn helps them better manage expectations of financial markets.

RAN/ORAN Evolution

Because network functions increasingly operate as cloud-based software—whether through RAN virtualization, the development of Open RAN, or 5G

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SUSTAINABILITY

standalone (5G SA) networks which have a cloud-native core—CSPs should be able to go further in using AI and machine learning to automatically collect, analyze and deploy data to improve energy efficiency.

The terms RAN virtualization and Open RAN can be used interchangeably, but their aims differ. Whereas RAN virtualization refers to implementing RAN functionality as software and running it on generic server hardware, Open RAN may well involve virtualization, but its principal aim is interoperability. CSPs are pushing Open RAN because they want to use standards-based, interoperable interfaces to interconnect disaggregated RAN elements, which makes it easier to build networks using a mix of suppliers. And the telcos behind Open RAN are also stressing its greener credentials.

The Open RAN Policy Coalition, with AT&T and Verizon among its members, also describes one of the benefits of Open RAN as being able to tap into the energy efficiencies of cloud computing: “Compared with the traditional RAN, Open RAN’s disaggregated, software-centric approach can accelerate the shift of compute resources to large data centers, leveraging advances in data center power optimization. By running as much software as possible in the cloud, Open RAN networks can take advantage of the economies of scale inherent to large data centers. Cloud data centers can leverage centralized cooling, lighting, and electricity purchasing agreements, bringing down power costs compared to local compute operations.” ■

REFERENCES AND NOTES

1. <https://inform.tmforum.org/research-and-analysis/reports/the-sustainable-telco-engineering-networks-for-net-zero>

Joanne Taaffe is Editor in Chief, Inform, TM Forum. For more information, visit <https://inform.tmforum.org>. Follow on Twitter @tmforumorg, Facebook: <https://www.facebook.com/tmforum> and LinkedIn: <https://www.linkedin.com/company/tm-forum>.

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DON'T STOP HERE! Go online at [isemag.com/14289933](https://www.isemag.com/14289933) for more from Joanne regarding the future of Open RAN.

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