THE VIEW FORWARD for the ICT INDUSTRY

2022
2021
2020

Commemorative Issue: Walker and Associates Celebrates 50th Year of Industry Leadership

since 1970

50 YEARS ANNIVERSARY

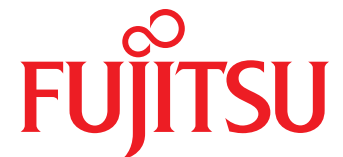# Broadband with low risk and even lower stress?

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Editor's Letter

As Walker celebrates its 50th anniversary in 2020, becoming reflective of the company's changes, milestones and accomplishments over the years is an easy route to follow. While we do pay a tribute to those topics in this issue, we decided it most important to cast our vision forward toward the next stages of industry innovations, challenges and opportunities. For at least the last decade, the industry has been focused on 2020 as the benchmark year for significant achievements, including broad deployment of 5G, further entrenchment of software derived network solutions, and more. So, here we are at 2020, looking ahead and asking, "What's next?"

Industry leaders responded to our call for their insight. Overwhelmingly, the industry appears focused on rural broadband expansion. Specifically, the energy around this topic is heightened by launch of the FCC's Rural Development Opportunity Fund (RDOF). The aggregated USF funds used to create the program exceed $20B, and is intended to deliver broadband services to areas lacking fixed broadband. While the FCC standard definition of broadband remains at 25/3, there is an expectation that a weighted system will award funding to providers poised to offer Gigabit/low latency broadband services into their communities. Expectations are running high that this funding mechanism will create spans in an ever-increasing digital divide in the US.

In concert with RDOF, is the industry's new fascination with rural electric cooperatives, who are appearing on everyone's dance card. From practically every contributor for this issue of Skinny Wire, electric cooperatives rise to the top as the bridge for rural community connectivity. Much of that work, it is expected, will occur in partnership with other entities, whether in the form of public/private or public/public. Headed forward, they deserve increased attention and focus. Even the banking industry is taking note of this segment's pending play in broadband deployment, as noted in the article by Live Oak Bank on page 23.

Certainly, public policy will continue shaping and molding industry opportunities headed beyond 2020. Making broadband services available through funding and sound public policy is only part of the challenge, however. Increasing adoption rates in rural communities through digital inclusion efforts is another facet of the bigger picture. Grassroots efforts to minimize the digital divide include digital literacy programs, creating new resources for affordable devices, establishing publicly available Wi-Fi hotspots, addressing the homework gap among students, and more. Rural community stability is at stake.

And, technology advancements in coming decades is simply a given. While portions of the ICT industry are still making the conversion to IP networks, the future is clearly about big data. Whether you're talking about moving it, storing it, securing it or creating it, this industry faces enormous opportunity to solve business challenges in every sector of the economy. Fiber deployment is a critical component of these future-ready networks that deliver on the promises of 5G, AI, network virtualization, automation and more. Any of these opportunities will only be realized through technological breakthroughs.

Just as it was in 1970, 2020 is a great year to be in this industry. Looking backward can feel indulgent; Looking ahead is a bigger responsibility. Beyond 2020 are opportunities not yet imagined, questions not yet asked, solutions too bold to even dream. The industry joins in congratulating a company that has weathered the last 50 years in an industry riddled with complex change. Here's to the next generation of innovators, dreamers and industry disruptors!

Randy Turner

Editor, Skinny Wire
Director, Marketing Communications
Walker and Associates
336-731-5246
randy.turner@walkerfirst.com
SWEditor@walkerfirst.com

Opinions expressed by contributors and commentators do not necessarily reflect the views of Walker and Associates, Inc.

Walker Celebrates 50th Anniversary in 2020!

By Randy Turner
Director, Marketing Communications
Walker and Associates

To understand the boldness required of Chris and Virginia Walker, who opened their family business in 1970, it is important to place that decision in its proper context. The 1970s was not a kind economy. The combination of wage and price inflation, coupled with slow business growth, created a new term to describe a troubled economy: stagflation. As the pace of change quickened, the ability of large corporations and the US government to adjust diminished. This combination created a ripe environment for entrepreneurs: Enter Chris and Virginia Walker.

SMALL BUSINESS, LARGE SACRIFICES
For the Walkers, making a decision like this required making certain sacrifices. One of their first was selling their Connecticut home and moving into the basement of Virginia's parents in Chester, VA. With their four young children in tow, Chris and Virginia mapped out a plan for him to engage customers through travel in the mid-Atlantic region while she worked from the home office as his inside salesperson, customer service spcialist, inventory manager and bookkeeper. As the children grew older, they pitched in to help, earning their stripes doing administrative and logistics tasks.

Through the first decade, Chris Walker easily won a reputation for his ability

Chris and Virginia Walker celebrate the holidays in the early 1980s with colleagues.

to earn the trust and confidence of his customers. Going far beyond simply providing products, Chris kept an eye on solving customer problems, deepening relationships, and expanding industry partnerships. As a team, Chris, Virginia and their children developed a brand that was poised to take advantage of the biggest landmark change in the industry since the dawn of telecommunications.

INDUSTRY CHANGE
As the AT&T divestiture was finalized in the early 1980s, the industry was

1970
Walker and Associates launches in Chester, VA, home of co-founders, Chris and Virginia Walker

1978
Corporate offices relocate to Welcome, NC

Evergood Fabrication founded as manufacturing division of Walker Group

1983
AT&T Divestiture

1996
Telecom Act of 96 becomes law

Evergood Fabrication sold to Reltec

1998
Mark Walker announced as new President of Walker and Associates

1999
Walker recognized as one of NC's fastest growing companies

2000
Passing of co-founder, Chris Walker

Virginia Walker becomes new CEO

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already responding to new opportunities brought about by new technologies. The advent of a new age of competition, birthed by advances in computer switching equipment, satellite communications and fiber optic technologies, fell into full swing as the company known as the largest employer in the world during most of the 20th century was divided into seven smaller regional companies.

Walker became a trusted volume supplier to each of these regional carriers, which helped brand the Walker name nationally. The sales and logistics facilities shifted to Welcome, NC, a great logistics location and home to a progressive sales staff. Chris and Virginia's philosophy of customer focus took shape in a staff that increased based upon one simple question: "What's in it for the customer?" The strongest skillset required was figuring out how to help customers solve their challenges. Wearing multiple hats was a prerequisite for anyone joining the young company.

North Carolina also brought the opportunity to launch a second business to support telecom customers. From 1978 - 1996, Evergood Telecom Enclosures was a manufacturing division of Walker. Their focus on aluminum telecom cabinets for outdoor network hubs and power transfer points earned Evergood as much as 70% of the national telecom power switch market in the mid 1990s.By the time this division was sold to Reltec in the late 1990s, the product line had expanded into indoor central officce and data center equipment cabinets. Walker served as the sole distributor of Evergood products.

Along with growing internally and expanding its customer base, the company forged relationships with leading equipment manufacturers. As noted on page 9, Walker's early partnerships with ADC (now CommScope), and Telect (now Amphenol Network Solutions), solidified the company's ability to provide passive and connectivity solutions to its growing base of rural and emerging regional competitors. By the time the Telecom Act of 1996 became law, the company added Corning Optical Communications as a partner, adding more value to customer engagement. Today, more than 400 suppliers distribute products through Walker and Associates, making it a one-stop shop for the communications network among ICT professionals.

COMPANY LEADERSHIP
As the turn of the century drew close, Chris and Virginia set the stage for their retirement years together. Their younger son, Mark, took the lead as company president in 1998. His leadership as the president of Evergood, along with his experience in the field in outside sales for Walker and manufacturers, brought new direction to the company as it responded to burgeoning industry growth brought about by the Telecom Act of 1996. Their older son, Rick Walker, led the company's services department, and their older daughter Laura served in a variety of roles including HR, purchasing and as a board member along with her siblings. Chrystie, the youngest of the four, having supported the business since its earliest days in her grandparents' basement, served on the board and took advantage of opportunities to learn about the business and the industry.

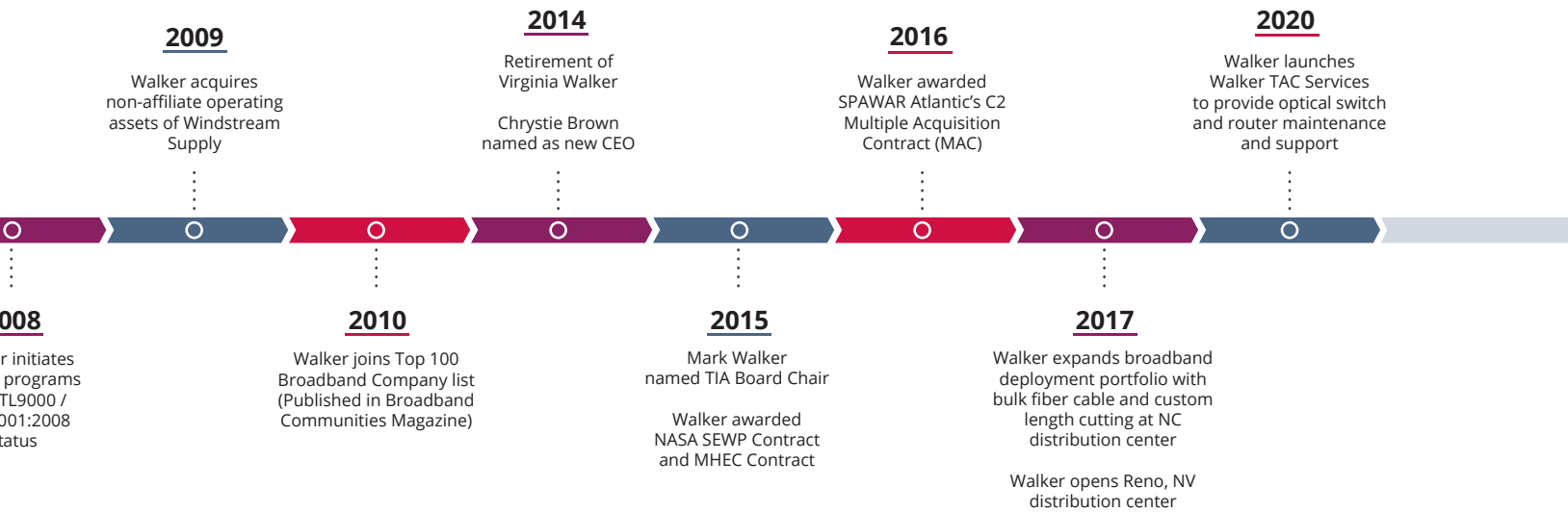Chris Walker's reputation as an industry giant was firmly fixed. Known by customers, association leaders, manufacturers and others, he was honored and respected. In June 2000 I had the opportunity to drive Chris from his hotel to the Georgia World Conference Center in Atlanta for what industry veterans will recall as the last great SUPERCOMM. This industry flagship event spilled from every hall at the GWCC into the Georgia Dome and surrounding parking lots with its expo. I accompanied Chris into the hall headed to Walker's booth. Dressed in his signature cherry red sports coat, he was immediately recognized, drawing a steady stream of greetings from business acquaintances who stepped out of their booths and into the aisle to shake his hand. What should have been a brief walk to a tradeshow booth turned into a marathon of networking, business card sharing and affirmations. I felt like I was with a superstar. In hindsight, I know that was the case.

The following month, as the dot com bubble pinnacled, Chris Walker was diagnosed with pancreatic cancer. He passed the following October at the age of 77. The company he and Virginia founded had just marked its 30th year.

NEW CENTURY, NEW CHALLENGES
As the company and the family grieved this loss, the market's tide shifted nearly in unison as the telecom winter unfolded. Dramatic bankruptcies, business closings, corporate scandals and finally the events of 9/11 rocked the industry along with US and global economies. Walker was challenged in new ways to navigate tough times through a series of downsizing events, reorganization, inventory reductions, belt tightening and adjusting to a new normal of uncertainty. As the industry itself dealt with supplier

2009
Walker acquires non-affiliate operating assets of Windstream Supply

2014
Retirement of Virginia Walker

Chrystie Brown named as new CEO

2016
Walker awarded SPAWAR Atlantic's C2 Multiple Acquisition Contract (MAC)

2020
Walker launches Walker TAC Services to provide optical switch and router maintenance and support

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r initiates programs TL9000 / 001:2008 tatus

2010
Walker joins Top 100 Broadband Company list (Published in Broadband Communities Magazine)

2015
Mark Walker named TIA Board Chair

Walker awarded NASA SEWP Contract and MHEC Contract

2017
Walker expands broadband deployment portfolio with bulk fiber cable and custom length cutting at NC distribution center

Walker opens Reno, NV distribution center

consolidations and customer attrition, the Walker family's resolve to not merely survive but thrive was relentless. Virginia, accompanied by each of her children, once again made sacrifices, put in the hard work and renewed their commitment to creating and retaining customers. Personal calls from the family, innovation and a basic sense of entrepreneurship once again fueled the company as it emerged leaner, yet healthier and more resilient.

In the years following, Walker has been marked by a steady growth in its supplier base, attracting many of the best names in the industry as partners. Recognition from them repeatedly tells the story of a relationship that works. Walker's decision to acquire the non-affiliate assets of Windstream Supply in 2009 resulted in deeper customer relationships, a richer supplier base, and an increase in internal talent. Attracting experienced talent to fill ever increasing technical roles remains a strong focus. Likewise, retaining experienced talent continues to remain a key competency. It isn't unusual to hear of associates who have been with the company 20 years, 25 years, even 30, 35 and higher. That kind of tenure speaks volumes about this family-owned small business.

Aquisition and grwoth demanded a higher commitment to quality, so in 2012, daughter Chrystie Brown became VP of Quality and Contracts. in 2014, Virginia passed the torch of CEO to Chrystie. This newest chapter for the company highlighted a commitment to quality and to basic values and principles that have served us well. As the company now celebrates its 50th anniversary, the thrid generation of the Walker family, Christpher Walker, is earning his stripes as a leader in the Federal Sales organization.

In recent years, Walker has earned industry awards for its performance in key markets, receiving numerous recognition from its supplier base, and earning

Virginia Walker with grandson, Christopher Walker, at the company's 2005 holiday dinner

Chrystie Brown, left, and Virginia Walker, right, collaborate together shortly after Chrystie assumed her new role as CEO.

a solid reputation for its leadership in important industry associations. Mark Walker's leadership at TIA as a board member and board chair provided new perspectives and experience. In 2018, Juniper Networks recognized Walker as the recipient of three significant award categories: AMER Partner of the Year, AMER Telco Partner of the Year, and AMER Partner of the Year EAST Awards. In January 2020, Walker was recognized by ADTRAN for the 17th year running as their #1 distribution partner.

MORE THAN DISTRIBUTION

Adding to the company's services through the years has always followed prompts from its customers. Early on customers expressed their need for customized solutions that represented a variety of products from a range of manufacturers. Walker pulled together a team of engineers who could scope the project, understand the business objective, and then "shop" from the growing set of supplier products to create solutions that saved customers time, money and manpower. Sometimes these solutions represented kits of materials that made onsite installation projects smoother and less subject to misstep. Through the years services like kitting, integration, installation and more have further entrenched the company reputation as "more than distribution."

Industry and technology advances created the need for device configuration services, which Walker established in the early 2000s. Now, Walker configures more than 55,000 units per year for a growing set of customers requiring these services. The service provides both basic and advanced configurations, dramatically reducing the cost of new service turn-up for carriers.

Other advances of services include creating an outdoor fiber cable yard, adding bulk fiber and cutom-length cutting as a service, turnkey EFI&T services, project management, professional services, managed services, a fully functioning NFV lab, and more. Reflecting Chris Walker's original mantra, responding to customer requirements is the foundation for each service added through the years.

WHAT'S NEXT?

Rounding the bend of 50 years in this industry requires not only a celebration of the past, but also crafting a vision for the future. That future includes additional services (reference article on Walker's new TAC services on page 17) that expand the company's ability to protect and secure customer networks. It includes reorganizations that create specific roles, generating better results for customers and suppliers. Talent acquisition and retention must remain a core competency.

Planning for the next decade and beyond requires new resources, new technology and new partnerships. A new ERP, now a significant active project, will bring stronger tool sets into the hands of those servicing customer accounts, as well as directly to customers who utilize the company's e-business suite of services. Walker's newly created CTO position puts an eye on technology changes that generate requirements for new services and new supplier relationships. Succession planning for an aging workforce is also an important conversation, reflecting a trend across the industry.

Chris Walker, when celebrating the company's 20th anniversary in 1990, wrote "If we have learned anything over the past twenty years, it is that survival means change. We have learned that change is not something to fear - change is opportunity!"

In his memory and honor, the Walker family is committed as much as ever to the values that served them well for the past five decades: integrity, passion, customer focus, quality, collaboration and innovation. Standing with them are their extended family of associates, many who have work at Walker nearly four decades. They are joined by the industry's finest leaders, who are extending their congratulations and best wishes during this year of celebration.

Most importantly, joining the company in celebration are the customers across the country who rely on the Walker brand to build and maintain their networks, grow their own family businesses, create communities that thrive, and secure and protect our nation's critical infrastructure.

Interested in learning more about Walker's co-founder, Chris Walker? Click here to view a 1995 interview with him, retelling the story behind the famous red jacket, or visit https://youtu.be/kge-K_bTD80

Pictured below: Standing l - r: Chrystie Brown, CEO, Mark Walker, President, Rick Walker, Board Member, Laura Walker (deceased); seated: Virginia Walker, Board Chair, Co-Founder of Walker and Associates, Inc.

Rick Walker, Chrystie Brown and Mark Walker are pictured at the 2020 Annual Commercial Sales & Marketing Kick-off Meeting.

Above: Chris and Virginia Walker
Below: Mark Walker, Virginia Walker, Rick Walker and Chrystie Brown together during the company's 2004 annual meeting

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A Half Century of Industry Partnerships

By Randy Turner
Director, Marketing Communications
Walker and Associates

since 1970 — 50 YEARS ANNIVERSARY

Summarizing 50 years of industry partnerships and achievements is no small task, particularly when the list of current supplier partners exceeds 400 names of prominent industry players. Represented here, however, are some of the highlights of Walker and Associates' longest standing relationships, most significant achievements, and partners with whom Walker still enjoys the greatest levels of shared vision for the future.

1984
Walker begins distribution partnership with **ADC Telecommunications** (currently **CommScope**)

1987
Walker begins distribution partnership with **Telect** (now known as Amphenol Network Solutions)

1988
Walker signs a distribution agreement with **Tellabs** (now **Infinera**)

1993
Distribution partner agreement begins with **Corning Cable**

1997
Walker signs a distribution contract with **Telecom Solutions** (Later **Symmetricom**, later **Microsemi,** now **Microchip Technology**)
Walker signs a distribution agreement with **Telco Systems**

1998
Walker announces distribution contract with **Emerson Network Power** (now **Vertiv**)
Walker enters into a distribution agreement with **ADTRAN**

1999
Walker recognized as one of NC's fastest growing companies

2003
Walker named as **ADTRAN**'s #1 Service Provider Distributor

2004
Distribution contract signed with **Fujitsu Network Communications**

2008
Walker initiates quality programs with TL9000/ISO 9001:2008 status
Launch of **Fujitsu** STAR Partner status with Walker

2009
Walker enters into distribution agreement with **ADVA Optical Networking (currently ADVA)**

2010
ADVA recognizes Walker as their Top Tier Value Added Partner

2011
Walker earns Elite Partner status with **Brocade** (now **Extreme Networks**)

2012
Walker earns Elite Partner status with **Juniper Networks**

2014
Walker recognized as **Juniper Networks** Telco Partner of the Year
Walker signs distribution agreement with **Ciena**

2015
Walker awarded NASA SEWP Contract
Walker awarded MHEC Contract status
Walker recognized as **Juniper Networks** Telco Partner of the Year
Ciena recognizes Walker as a Diamond Business Partner

2016
Walker awarded SPAWAR Atlantic's C2 Multiple Acquisition Contract (MAC)
Walker Software Networking Lab launch

2017
Walker expands its fiber cable offerings to include a fiber cable yard with custom cutting and spooling facilities
Walker opens its Reno, NV Distribution Center
Walker earns Star Team status from **VIAVI**

2018
Gold Partnership status with **Fortinet** awarded to Walker
Walker earns Federal Master Distribution Partner status with **VIAVI**
Walker recognized as **Juniper** AMER Partner of the Year, AMER Telco Partner of the Year, and AMER Partner of the Year EAST Awards
Ciena recognizes Walker as an Elite Business Partner

2019
ADVA recognizes Walker as their Top Tier Value Added Partner for the 9th consecutive year

2020
Walker recognized with Gold Status by **Corning Optical Communications**
Walker recognized by **ADTRAN** as their Top Service Provider Distributor for the 17th consecutive year

Fiber Broadband and 5G: A Foundation of the 4th Industrial Revolution

By Adam Zuckerman
Corporate Strategy & Innovation, Entrepreneur, & 4th Industrial Revolution Keynote Speaker

Looking back over the past century, technology has played a major role in changing nearly all aspects of society. Today, with more internet-connected devices on the planet than people and more people on track to have cell phones than electricity in 2020, humanity is in the midst of a technological revolution that will alter life as we know it in unprecedented ways.

Just as generations before us have experienced systematic societal changes during the first three industrial revolutions, we are now experiencing another fundamental shift on a global scale.

Defined as a merging of physical and biologic systems, The Fourth Industrial Revolution, has arrived.

It's now more important than ever to examine and understand how technology will impact your life and business. We're talking about ever-present artificial intelligence, asteroid mining, flying-cars, humans supplemented by (and arguably integrated with) computers, human-robotic interfaces, custom gene therapy, smart cities, autonomous vehicles, and much, much more.

As the Fourth Industrial Revolution is largely driven by data, fiber broadband and the end points it connects will continue to play an instrumental role in this evolutionary step for decades to come.

What is the Fourth Industrial Revolution?
The Fourth Industrial Revolution (frequently abbreviated as "4IR" or referred to as "Industry 4.0") is characterized by the convergence of physical and biologic systems.
Many believe the Fourth Industrial Revolution will continue to break down global barriers by building sustainable interlinked economies around the world. However, others believe that the Fourth

Industrial Revolution will lead to a dystopian future where governments, businesses, and individuals more concerned with maintaining their social and economic positions in than overall societal good wield god like power over others.

While it's unclear how the above scenarios will play out, one constant will remain true. The Fourth Industrial Revolution is dependent on a foundation of unprecedented amounts of data, and thus, the need for reliable and fast internet will remain a necessity.
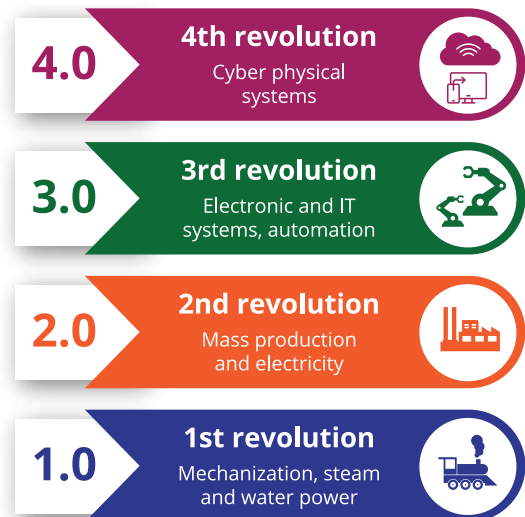
In particularly over the last 20 years, we have seen technology more tightly interwoven into every aspect of life. How much more integrated can we really become with technology, and what are the inherent risks of becoming a society even more dependent on technology?

There's little we can do to slow the integration of technology in to our daily lives, and there is no reason to expect that the pace of change going forward will slow down. Though, in a neat twist of appearance, technology often becomes less apparent (and at many times invisible) as it integrates in our lives.

Take your home stereo system as an example. Twenty years ago, a high-end stereo system was comprised of multiple components, often including a receiver, a CD player, a record player, and of course, speakers. Today, taking advantage of internet connectivity, many modern stereo systems are standalone. Unbox a Sonos speaker, load up an app on your phone, connect the devices to your wifi, and you're set up.

Today, less is more.

Our desks at work have also undergone a shift in footprint. Calendars, pens, pads of paper, business card rolodexes, fax

4.0	**4th revolution** — Cyber physical systems
3.0	**3rd revolution** — Electronic and IT systems, automation
2.0	**2nd revolution** — Mass production and electricity
1.0	**1st revolution** — Mechanization, steam and water power

machines, desktop computers, and desk phones are often now replaced by a single laptop computer and a smartphone. With more information at our disposal via the internet and nearly 2.5 million apps available in the Android app store (compared with 1.8 million in the Apple store), there appears to be a technology based offering for nearly anything you can imagine.

Not only do people maintain a "relationship" with their devices (think about it... how do you feel when you leave your house and realize you forgot your phone?), but an international team of researchers recently published that "the Internet can produce both acute and sustained alterations in specific areas of cognition, which may reflect changes in the brain, affecting our attentional capacities, memory processes, and social interactions." (source)

Put differently, technology is literally changing how our brains function.

Yet, what's strange about this phenomenon is that while many people may implicitly agree that technology is chang-

ing their lives, they often are unaware of the nuances of the impact.

Try asking a group of people if they regularly use artificial intelligence in their daily lives and most will respond, "no." However, if you ask if they unlock their phone via a fingerprint or face ID, automatically let Google or Apple catalog photos they've taken, whether searched for something on the internet, or even let Google Maps or Waze automatically route you to your destination, they will quickly realize they do.

The more technology weaves in to the daily routine of our lives, the less we may realize that it is there.

Eventually, the "singularity" may take place, when artificial intelligence becomes smarter than humans and human-machine interfaces are also likely a reality (Google Neuralink, BrainCo, Kernel, or Paradromics for examples). At such time, the divide between humans with resources will widen exponentially from those without, as the former will likely disproportionately take advantage of the benefits inherent to the new world order.
If this happens, what it means to be "human" will be radically challenged, but one thing is certain... we'll need a lot of bandwidth to sustain the shifts.

What role will the Internet of Things play in the Fourth Industrial Revolution?
 The Internet of Things (or "IoT") is best explained as a collection of interconnected objects or devices that are embedded with sensors, software, and network connectivity.

In 2019, 26.66 billion IoT devices were active globally, and by 2025, there will be 75 Billion IoT devices in the world. It is estimated that 127 new devices are connected every second to the internet. (Source)

nity is tremendous. Thermostats and lighting can be adjusted remotely, farms can more efficiently grow crops, toilets and showerheads are now "smart", and streetlights often help monitor traffic density and air quality. While these examples are just a few examples, it should come as little surprise that the global smart city market size (which is largely fueled by IoT) is expected to reach $252 billion dollars by the end of 2025. (Source)

Eventually, the "Internet of Things" moniker will become so ubiquitous that the it will transition to the "Internet of Everything" or the "Internet of Intelligence", at which point the acronym will begin to lose meaning.
However, for such a shift to happen, the successful deployment of robust widespread internet connectivity becomes increasingly important.

Is the Fourth Industrial Revolution a global phenomenon?

Yes.

On an international level, leaders of the most powerful nations on earth are actively prioritizing technology agendas that drive the Fourth Industrial Revolution.

Speaking to students in 2017, Vladimir Putin stated that "Artificial intelligence is the future, not only for Russia, but for all humankind," and that "whoever becomes the leader in this sphere will become the ruler of the world." A year later, Chinese President Xi Jinping urged that China must focus on the development, control, and use of artificial intelligence to secure the country's future, and in 2019, President Trump released a statement that "continued America leadership in Artificial Intelligence is of paramount importance to maintaining the economic and national security of the United States."

aggressive innovation agenda to remain competitive.

Will the Fourth Industrial Revolution Leave Developing and Rural Nations Behind?

It's important to note that the Fourth Industrial Revolution is on nearly every nation's radar. A recent internet search linking the Fourth Industrial Revolution with 195 specific countries around the world found that 87.18% of the nations were mentioned in content related to the Fourth Industrial Revolution. (Source) Viewed through an optimists' lens, developing and rural nations have an opportunity to catch up and even potentially leapfrog developed nations when it comes to the deployment of future facing infrastructure projects.

Foremost, a lack of legacy systems can position leadership to aggressively pursue development goals with a fresh perspective and the lessons learned from others. The approach to a build out is frequently different than when you have to account for and integrate with existing legacy systems and infrastructure.

Further, while the developing nations may move quickly, developed nations may not move at all. One reason is that the legacy infrastructure already in place in developed nations may be viewed as "good enough" by decision makers, which may lead to delayed action or prioritization of competing projects.

Lastly, due to end-of-use device upgrade cycles, legacy systems are often maintained for years after newer systems are deployed, often at significant cost. This means that developing nations will have a lower overall cost to maintain a system than developing nations, while also potentially freeing additional funds for further deployment.

While the optimistic view is promising, the stark reality is that competing within the context of the Fourth Industrial Revolution is far more complicated than whether infrastructure such as a fiber broadband and next generation cellular network can be deployed. Drawing an analogy to a highway system, simply because roads are built does not mean that they will be used effectively.

Q&A: 5G promises AI, an always-connected experience, lower latency and greater bandwidth. What are the implications for rural America if we delay taking steps to bridge the digital divide?

> *" . . . in a neat twist of appearance, technology often becomes less apparent (and at many times invisible) as it integrates in our lives."*

Within the context of the Fourth Industrial Revolution, IoT devices are necessary components of an integrated and intelligent future, and the market opportu-

An international digital arms race is in full swing, and while the United States is a leading entity in the high-stakes nation-state level competition, it must pursue an

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It's interesting that so many people turn to the example of a remote surgery powered by 5G technology to demonstrate the efficacy of how faster, more reliable internet is going to open up possibilities for remote communities. While this example is no longer theoretical as China recently demonstrated several surgeries powered by 5G from traversing a distance of several thousand kilometers, the reality is that many of the areas which would benefit most from a 5G powered remote surgery are also the least likely places to deploy such a network without significant government subsidy.

In the United States, the stark reality is that many rural Americans are frequently forced to travel from their homes to public or retail spaces to access the internet, and as a result, they are often excluded from educational and economic opportunities. However, change is possible. With the rise of smart manufacturing, intelligent farming, remote workforces, and autonomous vehicles, rural America can find a renewed renaissance if we can manage to link it more effectively with the rest of the nation.

While the economics for deployment and fiber broadband, 5G, and artificial intelligence are often more economically viable in urban areas due to customer density, these technologies have the ability to transform and reenergize struggling rural communities via a sustained "if you build it they will come approach." And, the timing could not be better. With the increase in cost of living over the past several decades, many individuals are struggling to afford the true cost of living in urban markets, especially millennials.

In parallel, a massive shift in how Americans are working has begun and recent statistics about the American workforce's shift from full-time employment to contract status is surprising to many and alarming to some. Today, one in ten workers in America is a contract worker (source) and many companies are on a steady march toward a majority of part-time workers. Google, for example, has more contract workers than full time employees (source). Within a decade up to half of the American workforce could be temporary workers (source), and as such, many will seek out areas with lower costs of living and flexibility to work remotely.

When the benefits of fast reliable broadband (aka: connectivity) combines with the benefits of future facing technologies such as autonomous vehicles (allowing for longer commutes), remote and flexible working arrangements, tele-medicine, remote collaboration, and more, non-urban communities become increasingly appealing to than their pricier urban alternatives. Optimistically, millenials will be able to save and afford houses again. However, while the impending shift to the future of work is something to prepare for, it is not yet time for societal panic. Just as car mechanics significantly reduced the need for farriers (those who specialized in equine hoof care), new jobs will find their place in the new economy. It's true that globalization and technology has made the world a smaller place, but in doing so, it's also opened up significant opportunity for those willing to embrace change.

How can the United States retain its competitive edge as it relates to the Fourth Industrial Revolution?
Put bluntly, we need to invest heavily in our infrastructure and accelerate widespread strategic deployment fiber broadband throughout the country to create the foundation upon which our nation's innovators can compete in the new economy.

With a landmass similar in size to all of Europe, the United States has a lot of ground to cover, and fortunately, progress is being made. Fifteen years ago, only 50,000 U.S. homes had access to all-fiber connectivity and while today it's nearly one thousand times that, there is still significant progress to be made.

Accordingly, we should focus on three items. First, we need to bring down the cost of deployment and identify funding sources for deployment throughout the nation. Second, we need to allocate significant resources to upskill and train the workforce required for such deployment and system maintenance. Third, we must endeavor to streamline the processes which currently delay the speed of deployment, including policy and regulatory hurdles at the local, state, and federal levels.

ADAM ZUCKERMAN
As an entrepreneur, attorney, and MBA, Adam is a subject matter expert focused on the impact and implementation of future-facing technologies and the fourth industrial revolution, often at the intersection of enterprise growth and startups.

With a diverse background that spans many industry verticals (including finance, non-profits, startups, and Fortune 500 companies) he serves as advisor to several organizations, keynotes events around the world, have been hired to present on the future of marketing and technology to leading global agencies (e.g.; Carat, Havas, MediaCom, Mindshare, Ogilvy, Publicis, Zenith, and others). He is also an Eisenhower Fellow, adjunct professor at the University of Maryland, and has been a guest analyst on the topic of business and technology on CNBC nearly two dozen times.

Fiber Broadband Has Moved Into Second Place For Home Internet
Broadband Type Market Share Based On RVA Consumer Research 2006-2019
1995-2005 Based On Other Published Studies (with estimates between points)
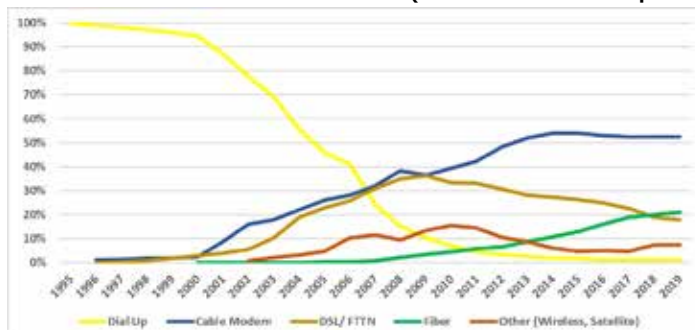
Note: Other comparisons based only major carrier subscribers. This RVA research is based on consumers (includes small providers).
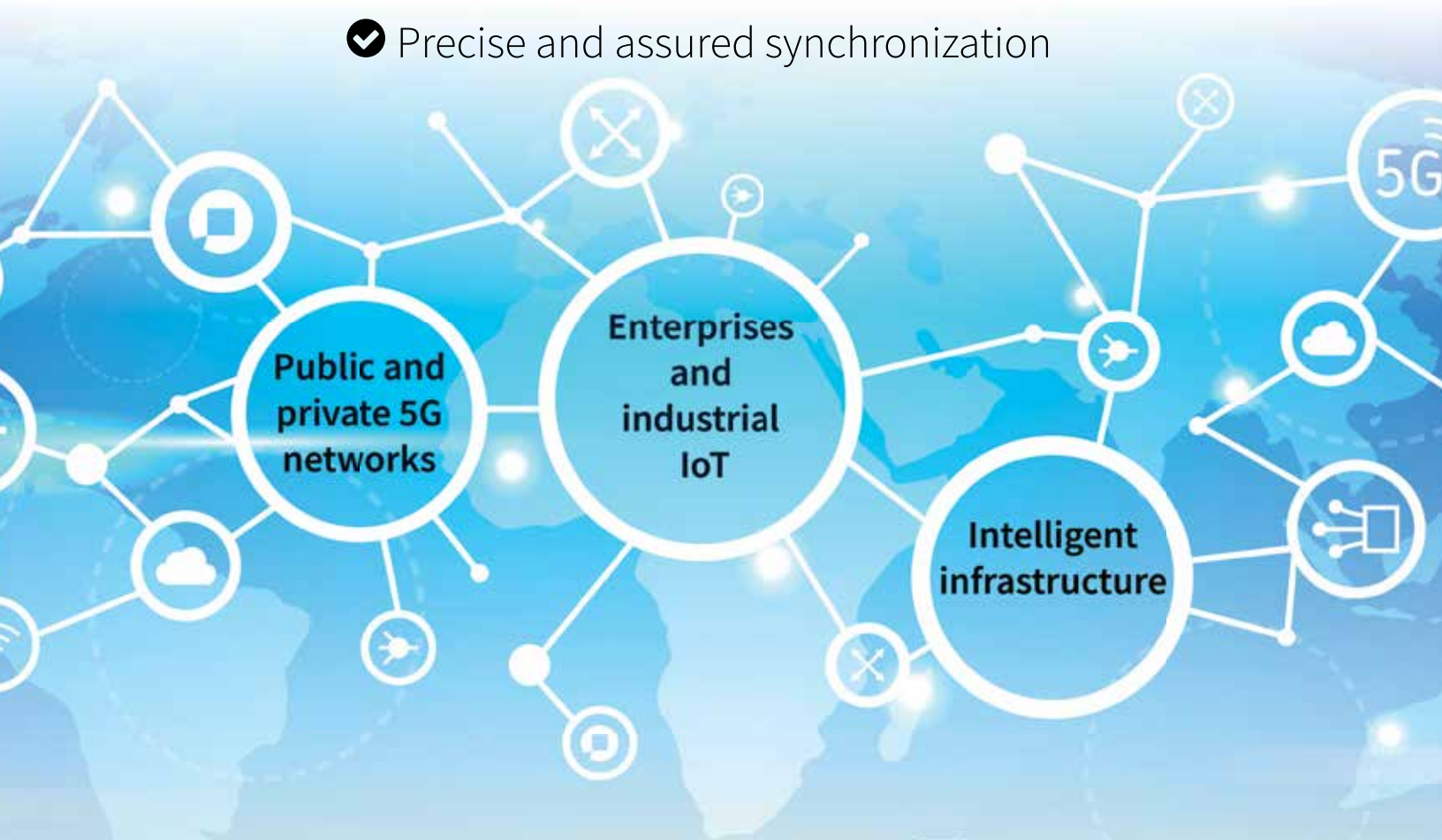
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Start Phasing in ATSC 3.0 Equipment Now

By Steven S. Ross
Editor-at-Large
Broadband Communities

The FCC-mandated transition period for American broadcasters is seven years, but new content forms (games, especially) or advertising opportunities may emerge to speed the transition. Look ahead at ATSC 3.0 capabilities when replacing audio, video transmitter and set-top boxes.

NextGen TV – the latest branding for ATSC 3.0 – has clear technical and moneymaking advantages over ATSC 1.0, the current broadcast standard. It is IP-based and Ethernet-friendly. But although the technology it requires is proven and not wildly expensive, the business case is not yet mature.

The standard, which has been used by Korean broadcasters since 2017, allows broadcasters to transmit data that can enhance the TV experience to deliver content optimized for everything from 4K Ultra HD to mobile phones. It lowers the potential for broadcast channel-splitting, but that revenue game is beginning to fade anyway.

The International Telecommunication Union (ITU) has endorsed ATSC 3.0 as a "recommended" digital broadcast standard. It therefore is likely that ATSC 3.0 will be used worldwide – subject to revisions but not a complete overhaul – until 3D broadcasting evolves. That said, only 60 TV stations in the United States (out of 1,700, of which about 900 are full-power) are expected to broadcast an ATSC 3.0 signal by the end of 2020. And ITU still has to update its digital handbook for ATSC 3.0.

There is also a wild card. During the transition, would existing broadcasters be required or even allowed to simulcast new ATSC 3.0 signals along with existing ATSC 1.0? The FCC is considering that issue now. Some big players, such as Microsoft, say the extra spectrum (roughly an extra 6-MHz TV channel for each current broadcast licensee that has a channel now) for simulcasting in ATSC 3.0 is not necessary. Most broadcasters commenting to the FCC seem to agree. After all, the first ATSC 3.0-capable TV sets won't even be on the market in the United States until later this year. Urban stations would likely find unused spectrum and willing simulcast partner stations anyway.

But what happens as the penetration of new TV sets increases? And what about customers who do most of their TV viewing on a computer, tablet or smartphone and can receive digital TV content now, through a broadband connection? Simulcasting would mildly broaden the number of potential customers in the transition.

The biggest barrier? ATSC 3.0 threatens existing revenue streams, especially fees paid by broadband deployers for mandatory carriage of local full-power broadcast TV signals. In this case, the long-term benefits far outweigh the annoyance of transition.

Steve Ross can be reached at steve@bbc-mag.com.

SOME SCENARIOS FOR ATSC 3.0 REVENUE

The IP standard is all-inclusive and accommodates heterogeneous network deployments. Judging by use of Broadband Communities' specific free financial modeling tool for such networks, the option is increasingly popular.

Cooperation among cellular and wireless broadband providers
With 5G cellular alone, microcells would have to be spaced every 200 to 500 feet without fiber backhaul. There's room in each 6-MHz channel if broadcasters don't use all ATSC 3.0 features. That bandwidth could theoretically be rented or swapped with broadband providers to reliably increase spacing. Likewise, content providers could switch between cellular and ATSC 3.0 seamlessly for secure over-the-air delivery to phones equipped with ATSC chips. There have been experiments with the idea in the United States and South Korea. Cooperation between satellite and cable/broadband deployers also is possible.

New revenue opportunities for broadcasters
ATSC 3.0 allows new video formats as well as more flexible audio, new signal redundancy tricks, advertising zoning, and even customer geotargeting.
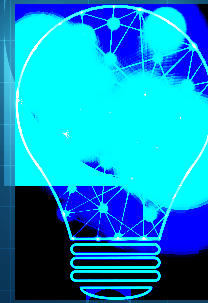
New help for hearing impaired
Almost 40 million adults have hearing issues, and the number is increasing as the population ages. ATSC 3.0's many more audio streams could allow consumers to, for instance, separate dialog and background audio for easier hearing. Broadcasters could eventually tag content with specific metadata that automatically adjusts specific customers' equipment to make it happen.

Driverless vehicles
Automakers, especially for operation in congested urban areas, want system upgrades and massive data-sharing among the cars. But 5G currently takes too long to establish a communication session. ATSC 3.0 could broadcast data and software updates to all vehicles in an area at once – even millions of them. That frees up the cellular system to handle mainly data uploaded from vehicles that would be aggregated for broadcast. Detroit-based broadcasters are collaborating in an early ATSC 3.0 deployment that automakers may use as a testbed.

50 Years and Still Innovating - Introducing Walker TAC

By Trey Hall
CTO
Walker and Associates

> *"Now, . . . customers can turn to the same company that helped design and implement their network for post-installation support. "*

Walker is expanding to deliver unparalleled Juniper network maintenance and TAC support.

During the past 50 years, Walker and Associates, Inc. has grown to support every aspect of your telecommunication networks. As a logistics and professional services provider, Walker prides itself on being the expert that broadband providers seek to provide consultative, hardware, and logistical solutions.

Like many of our clients, Walker and Associates grew up in the telecommunications space as a family-owned and operated company. As a robust national distributor, Walker and Associates handles an extensive range of products to support the delivery of high-speed internet, video, data, and voice services to residential, business, and mobile users.

In addition to products, Walker's professional services has evolved into a set of tools and resources that sustain full lifecycle network support, including:
  • inside and outside plant
  • cabling
  • kitting
  • virtual warehousing
  • cabinet integration
  • rack and stack
  • distribution

In addition to all of these services, Walker is now offering post-installation network support. With this new service Walker becomes your one-stop-shop for all hardware, logistics, and professional service network needs.

Expertise You Trust
As many of our clients are painfully aware of, maintaining the certifications and technical depth required for every networking possibility is cost-prohibitive to many telecommunication network developers. As a full-service, comprehensive logistics provider, Walker removes that

burden from our customers by allowing on-demand access to the expertise needed at just the right time. Our professional services are optimized for smaller telecommunications companies and include fiber pre-qualification, network audits, and security audits.

To ensure every customer receives the right combination of services and products, Walker has developed a consultative sales process across all technical domains in the network, including power, optical, cable, router switches, software, and security.

This deep technical expertise allows our customers to buy with confidence as we design an ideal solution for each project and maintain open lines of communication to answer any questions that arise during design, installation, turn up, testing, circuit migration, and troubleshooting.

Taking the Next Step
At Walker, we are always looking ahead. We strive to be at the forefront of innovation in our industry so that when our customers come to us with questions about the latest technology, we are ready with reliable, accurate solutions.

As part of this passion for innovation and full-lifecycle network support, Walker has recently added a robust and highly advanced technical assistance center (TAC) to its professional services offerings. A TAC that is endorsed, vetted and assisted by Juniper. Now, our customers can turn to the same company that helped design and implement their net-

work for post-installation support.

Since partnering with Juniper Networks® in 2011, Walker has consistently enjoyed Elite Partner status and was awarded North American Partner of the Year in 2019. In 2017, Walker and Associates, Inc. proudly accepted Juniper Networks' invitation to join as a Partner Specialized Service (PSS) Juniper partner, giving Walker the ability to deliver superior support to our clients in every way.

After accepting this invitation, we quickly got to work to determine how to best implement this new offering without compromising our commitment to superior service. We evaluated our in-house ability to deliver on the enhanced support model of Juniper J-Care and determined that providing the highest levels of service under the program could result in increased costs for our clients.

To prevent an increase in costs and ensure delivery of the highest level of TAC service, we sought out the expertise of an independent provider. We consulted with several firms and evaluated the capabilities of each candidate to meet our strict service standards. After much research, we have partnered with Arch Technology Solutions. This U.S. company and market leader of independent maintenance solutions will deliver superior Juniper support and maintain SLA driven escalation pathways to Juniper ATAC (Advanced Technical Support Center) and Juniper Parts Logistics.

Our new TAC team comes with a proven track record of providing support to

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regional and global telecommunications companies and enterprises, including AT&T, T-Mobile, BT, EE, Verizon, Orange and many others. The team is also vetted and championed by Juniper as a participant in this program and is the only provider permitted by Juniper to participate in this model with PSS partners. The best part about this new addition is that it comes without any additional costs for Walker clients and provides drastically improved support, response times, and SLA's.

Supported by Juniper Certified Engineers, the new Walker TAC provides:
- Certified JNCA - JNCIE Tier 1 to Tier 3 troubleshooting
- Software updates, patches, and fixes
- Lab Testing
- Dedicated support engineers
- Streamlined access to Juniper Certified Engineers
- Efficient tier assignment and tier skipping
- Case monitoring and management
- Guaranteed support
- Quality control
- Proven TAC with an average response across all severity levels of 6m50s and first call resolution rate of over 85 percent
- 24/7 support provided by U.S.-based engineers
- Escalation of all engineering, software, and RMA deliverables directly to Juniper
- All J-Care SLA's available: 12x5xNBD, 24x7x4, etc.

More to Come
Building out a full-service TAC allows Walker to achieve complete lifecycle support for our Juniper clients. In the future, we plan to expand with more OEM certified engineers with the goal of supporting all pre- and post-sale aspects of our complex products. Our passion for innovation demands that we continue to increase our ability to build, support, and sustain telecommunication networks through an unshakeable dedication to our client's success.

As we celebrate our 50th anniversary, it is with a great sense of satisfaction that we look back on all that we have accomplished, from supporting the introduction of high-speed internet across rural America to continuing to increase our logistical reach to include full lifecycle network support. We look forward to continuing to partner with our clients to bring network innovation and excellence to every aspect of broadband network development.

Migrating Power Utility Substations to IP Networking

By Jaime Jaramillo
Product Line Manager
Fiber Assurance Solutions
ADVA

We've all heard about the migration of power utility communication networks to IP, but now that it's a full-force trend, it's important to point out a critical component of the transition. The planning and delivery of timing services to both legacy and next-generation power utility equipment in substations is essential. All equipment that monitors and controls the distribution of power in the "grid" must itself be tightly monitored and controlled.

Configuration and performance data have traditionally been sent over point-to-point connections that use serial communications. As substations migrate to IP networking to realize the benefits of automation, audio and video communications for security, maintenance and other activities, a critical aspect of the migration tends to be left unconsidered: How do all these systems synchronize with each other to accomplish their intended activities?

From merging units to data collectors, from protection relays to environmental sensors and synchro phasors for measuring power and faults in the grid, all these systems and many more have traditionally used simple GPS-referenced clocks that connect directly to each piece of equipment so they can perform their functions on time and in coordination with each other.

Now that substations are migrating to IP-based communications – rather than having a dedicated timing device for each system (creating isolated, low-reliability references) – Precision Time Protocol (PTP) deployed at the substation and in the telecom network can be used to provide redundant, highly reliable centralized time-of-day, frequency and phase information. This centralized strategy can be leveraged for adjacent substations when planned correctly, thus lowering the overall cost of providing synchronization to all current and next-generation equipment. What's more, it enables the automation of substation functions and sensors, further reducing operating costs.

Next-generation timing equipment provides a highly reliable modular timing source that can be configured based on requirements at each substation. They support legacy timing signals such as T1/DS1 or E1 frequency signals as well as composite clock and IRIG signals so that current elements in the telecom network are supported as well as substation equipment. The advantage of these new timing sources is that they also support NTP, PTP and SyncE, which are IP-based timing signals so that, as substations migrate to IP, all systems will synchronize when needed. Since these signals are IP-based, they can be used in the substation and also distributed over IP networks to provide sync services to multiple substations. Thus, one clock investment can support all current timing requirements and, when new timing protocols are needed, the same device can be used to provide new timing services. This lowers the overall cost of providing timing during the migration to IP and enables cost reduction via automation. Oscilloquartz has a solution portfolio to meet any requirement in the migration to IP, including the most compact, SFP-based time servers designed for the edge as well as highly resilient cesium atomic clocks for the core.

What's Next for Network Functions Virtualization?

By Prayson Pate
CTO, Ensemble Division
ADVA Optical Networking

As a kid in the 70's, I can remember watching a cartoon on Saturday mornings called "Sealab 2020." Back then, 2020 seemed so far away. I felt like anything could happen by the time we got to 2020.

Now we're here, and a lot has changed. We still don't have groovy underwater cities, but we do have a lot of other cool innovations, like network functions virtualization (NFV) and universal CPE (uCPE). And the rate of change is always increasing.

In this fast-moving environment, what developments can we expect to see in the world of NFV and uCPE in 2020 and beyond? Here are my thoughts.

After growing, the SD-WAN space will shrink

SD-WAN has been the hottest area in networking for the last few years. And that heat has been reflected in M&A activity. We've seen some big acquisitions in the SD-WAN field, including:

- November 2016: Nokia acquires Nuage (as a part of the Alcatel-Lucent acquisition)
- August 2017: Cisco acquires Viptela
- December 2017: VMware acquires VeloCloud
- November 2018: Oracle acquires Talari Networks

But in 2019, there was a pause in acquisitions. The biggest news was about three new entrants:

- April 2019: FlexiWAN announces their open-source SD-WAN
- October 2019: ADTRAN enters the market with their SD-WAN offering
- November 2019: Palo Alto adds cloud-based SD-WAN

I think that we'll see more activity in the coming years. There are too many SD-WAN players and some big suppliers without an SD-WAN play. My top candidates for acquisition include Silver Peak and Versa.

AT&T adds COTS servers

AT&T says their FlexWare universal CPE (uCPE) service runs "on industry-standard x86 servers that we call the AT&T FlexWare Devices." But their "AT&T FlexWare Devices" are simply re-badged versions of the Juniper NFX250. This is a hybrid device that includes hardware forwarding and a compute module.

By using the closed NFX250, AT&T is limited in the variety of supported lineups of CPU, memory and storage – and cost. They are missing out on the benefits of right-sized commercial off-the-shelf (COTS) servers. They are also stuck with the Juniper supply chain, and can't locally source a server in hard-to-serve countries like Brazil.

I predict that AT&T will add a truly open platform based on a COTS server from one or more major manufacturers.

End-user applications will emerge as a key driver for uCPE

I often say the NFV is about bringing the power of the cloud to the communications network. When we deploy NFV at a customer site as uCPE, we have created an edge cloud. It contains compute, storage, networking, and control – all the aspects of the cloud. And they're all in a single box.

NFV is attractive for service providers. They can use the power of the cloud to deliver managed communications services. SD-WAN is the best example of this type of service, and is the number one driver of uCPE. But uCPE also opens up another possibility: managed on-site edge cloud hosting for end-user applications.

The service provider can deliver managed services on the uCPE, and also deliver virtual machines to the end-user. The end-user can use these VMs like they would in a data center cloud. But now they have the advantages of low latency and high connectivity speeds due to on-premises location of the server. This edge cloud model enables enterprises to eliminate their miscellaneous servers in small offices. They can host their applications on the same uCPE server that delivers their communications services. This is a win for everyone.

Political turmoil will continue – and will drive NFV

Trade wars, trade deals, and Brexit – oh my! All of this international intrigue will continue to give the global markets

ADVA uCPE Wins

heartburn. And it will also highlight the importance of a resilient supply chain – especially regarding alternate sourcing.

With NFV and uCPE, users can use best-of-breed suppliers to host their software VNFs. They can also change server suppliers when geopolitics complicates deliveries. That agility will continue to grow in importance.

In addition, it's much easier to change software than it is to change hardware. Enterprises and operators can avoid international compliance issues by changing software when needed.

ADVA will rack up more NFV wins
At ADVA, we've been in the NFV game since the beginning. And that experience is paying off. We're fortunate to be delivering NFV and uCPE solutions to leading service providers, enterprises and partners around the world. We've announced some like Verizon, Colt, TPx,

Singtel, Dell and IBM, and many others are not yet public. But when you chart out the wins over time, it's impressive – as shown on previous page.
This trend will continue, with more wins and more announcements made along with our partners like Walker.

Hedge your bets – use NFV
As Yogi Berra said, "It's tough to make predictions, especially about the future." With NFV implemented using open technologies like those from ADVA, you don't have to predict everything correctly. You can deploy now and make changes further down the line. And that's going to help you to get the future right.

Prayson Pate is ADVA Optical Networking's chief technology officer for the Ensemble division and is an evangelist for network functions virtualization (NFV). He speaks at industry events and writes posts and articles to inform, educate and entertain, mostly about NFV with plenty of innovation for good measure. These include The Real CTOs of NFV series.

Prayson received a master's degree in electrical and computer engineering from North Carolina State University and a bachelor's degree in electrical engineering from Duke University. Prayson has contributed to standards bodies such as the MEF and IETF. He is a named inventor on nine patents.

The Power and Promise of Fiber Networks

By Kara Mullaley
North American Tier 2/3 Market Development
Corning Optical Communications

As high-bandwidth connectivity influences our lives in ever more important ways, making proper investments in communications infrastructure to stay ahead of demand also becomes ever more important. It's staggering to think how dramatically the service and application experience has changed in the last 10 years alone. Entire new industries have launched thanks to connected possibilities, and the "internet of everything" is in its infancy.

Let's consider the installed base around us: the macro tower designed to look like a tree, the cellular antennas on the town's water tower, new hardware atop street lights, or maybe the spare fiber ports on the pole near your home. What you've witnessed is the expansion of fiber networks. But have you also noticed the next-level transformation?   Individual, purpose-built networks reach a point at which they are no longer economical or efficient. Operators reach a point at which installing and running networks the same way they've always done it stops making sense, consumer expecta-

tions shift, and performance expectations and deployment speeds start to change. Where big cell towers continue to maintain cellular coverage today, small cells will increasingly be necessary to ensure the future of 5G – and the applications that will arrive with it. Even the way information is stored and transferred within switching centers and data centers will change with the emergence of edge computing.

FIBER MAKES IT POSSIBLE
Optical fiber, invented by Corning in 1970, is thinner than a human hair yet able to carry information that connects the world. Because of its compatibility with other technologies and nearly unlimited bandwidth capacity, optical fiber can grow and adapt to future communications needs. Over time, fiber is continuously phasing out legacy copper infrastructure – spreading across continents and throughout cities. Perhaps much of your focus today is on delivering fiber ever closer to where people connect, whether it's in the horizontal portions of mixed commercial/residential

buildings or in rural areas.

To make sure there is enough fiber in place to support urban areas, remote regions, and everywhere in between, network operators are investing in communications infrastructure. Maybe you are moving fiber deeper into your community – into the cabinet or pedestal on a street corner, or onto the lamppost at the end of the sidewalk, or possibly even into homes and businesses. These investments are crucial to stay ahead of demand for high-bandwidth services.

With network transformation will quickly come the transformation of the services and applications that impact subscribers' daily lives, wherever they are. Our industry's ability to prepare communications infrastructure will help determine whether people, businesses and communities thrive. Tomorrow's infrastructure may not be any more visible to connected consumers, but they will notice your network's capabilities.

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CBRS LTE: Something New for WISPs

By Glenn Knox
Technical Consultant
NC DIT Broadband Infrastructure Office

CBRS! NEW LTE! New MIMO Technologies! The headlines, acronyms and hype seem to be everywhere. But, are existing Wireless Internet Service Providers (WISPs) paying attention and deploying these new broadband solutions?

The answer to that question is maybe. In most cases, a WISP is a smaller company that has their technologies, and often, their preferred manufacturer(s), already in their quiver. They experiment, but their capacity to experiment can be limited due to time, training, and available funds. These resources must be spread across areas where they know they can make a profit, and the new technologies require a new learning curve and changes to business models to implement and manage.

However, it is important that they consider the new technology options available. CBRS (Citizens Band Radio Service) LTE (Long Term Evolution) has the potential to deploy broadband out to end users like no other wireless-based system. Initial testing is proving that these systems are not only stable, but they are able to provide broadband at a scale that would have been unfathomable even a year ago.

But, these systems are new. In order to ensure that the deployments are done correctly, highly specialized training is needed for anyone installing and maintaining these systems

There are some WISPs here in North Carolina that have already taken the first steps, have been trained, and are deploying these new systems with great success.

Others? Not so much. They are quite content with staying with existing products and services. "Why upset the apple cart? We are doing fine!" they say.

This new technology would be a fundamental change to the existing business models that current WISPs use, not only in the care and feeding of the systems, but in the planning, design, and implementation. Many are not currently experienced in mobile deployments, in any of the additional "back end" uses of these new systems, nor the tie-ins to other systems, like a CAD dispatch and video to or from a mobile user. New technologies bring an inherent learning curve that may be difficult to master, and may require hiring additional staff that may not have been in a provider's budget.

However, these new technologies are going to help bridge the existing gap in rural broadband deployments because of their capacity and ability to work through some foliage. There are now software updates to some of the CBRS/LTE code that will allow roaming across individual nodes. The first deployments of CBRS gear centered on fixed wireless deployments, allowing a WISP or other CBRS deployment entity to target mobile users. For example, this could include providing secure private connectivity to first responders in a local region, utilizing bandwidth that is only theirs and is secure enough for this use.

While existing business models of a WISP may not be able to accommodate the necessary changes, with the massive need for expanded broadband deployments, WISPs are still going to be the best bet for deploying this technology.

It is critical to find ways to incentivize WISPs to employ and embrace these new technologies. Organizations such as WISPA have an opportunity to play a leading role in these efforts. They could arrange more training sessions with manufacturers and experts at annual meetings , and while WISPA, has been doing this, they must scale up their efforts to meet these new challenges. Other ways to educate WISPs and encourage them to consider new options could involve offering webinars and in-person training opportunities. Developing sources of outside funding could also help these WISPs adopt the new technologies, while reducing the financial burden of the transition.

If we are going to bridge the broadband gap in rural America, getting these new technologies deployed will be a large part of the short-term solution.

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The Decade Ahead: Customers, Commerce and Competition

By Chip Pickering
CEO
INCOMPAS

2020

2019

2018

If we want the real benefits of Gigabit broadband and 5G service then we must dominate the decade in fiber building. America's policy leaders have made 5G a national priority, but to deliver on the promises of a latency-free internet powering the next wave of manufacturing, medicine, education and national defense capabilities, we need better wireless and wired infrastructure. Fast.

Faster, more affordable broadband deployment is driven by the three C's: consumers, commerce and competition.

Consumers' reliance on the Internet has exploded as our need to connect with family and friends, news, shopping, tele-commuting, and streaming services continues to rise.

On commerce, an open internet has democratized business, providing opportunities for start-ups and mom and pop stores on Main Street to attract global followings thanks to the creation of vast online markets. Plus online software and cloud migration have revolutionized the workplace for small and medium-sized businesses. Many businesses can't operate without the internet and increasingly seek a back-up provider for redundancy in case of outage.

So it's clear we need fiber everywhere. And that is where competition comes in.

Around the nation, state-by-state and town-by-town, the communities with the fastest broadband speeds and the lowest prices are in areas where a smaller competitive provider has entered the market. That small, local broadband builders are deploying fiber networks to achieve the next generation of Internet access speeds is important because of the capacity that fiber can deliver. While

5G promises to deliver faster speeds than any previous wireless service, it will rely on the fiber networks that enable the service. Fiber networks are capable of delivering terabits (not gigabits) of data per second, making them the best choice for scalable communications networks. Without fiber, our wireless companies will not be able to deliver the data-rich content that consumers crave.

Competitive builders are deploying in underserved urban areas, like Detroit where Rocket Fiber's gigabit speed network has attracted innovators and businesses downtown.

In rural America, farming and Ag Tech risks being held back by slow internet speeds. That's why companies like Gorge Net and Mammoth Networks are building fiber networks in rural Oregon and Montana. Many local builders are targeting areas where the larger incumbent providers have failed to upgrade their networks to fiber.

To bring 5G and competition to more communities we need an "all-of-the-above" broadband deployment agenda. Bipartisan leaders in Congress are on board, and the Federal Communications Commission (FCC) recognizes that the United States needs to win the race to 5G and to deploy these next-generation networks in order to preserve the country's ability to compete in the 21st Century.

To that end, all five members of the Commission has made clearing regulatory barriers for broadband deployment a priority. Chairman Pai's leadership on the digital divide is best highlighted by his efforts to end monopoly lock-up deals for apartment buildings and condo complexes—where over 30 percent of American's reside. Commissioner Brendan Carr has

worked to streamline deployment of 5G small cells (which are fed by wired fiber lines). Commissioner O'Rielly was highly critical of institutional roadblocks to competition at the local and municipal level. Commissioner Rosenworcel has long championed education and public safety programs that help schools, hospitals and community centers get connected to gig speeds faster via competitive government-funded programs. And Commissioner Starks, the newest member of the FCC, recently highlighted the benefits of competitive networks used by Government agencies that save taxpayers millions and run critical security infrastructure.

Furthermore, the Commission has used Universal Service funding to address concerns over the growing digital divide between urban and rural areas. The Commission has rightly focused its efforts on bringing high-speed broadband service to rural areas and to consumers desperate to engage in the digital economy.

But there is more work to do. The FCC is working to fix its broken broadband mapping capability, which has drawn universal, bipartisan scorn. Right now millions of customers are being miscounted as "served" or as living in a competitive region because the agency's data indicates that service providers "could" provide service as opposed to actually providing service. It's so bad the Secretary of Agriculture even called the maps "fake news."

Ironically, many large incumbent providers are rushing to use bad data from the broken maps to cut off competitive providers from customers. But we hope the FCC will rely on the record from last year's failed competition cut-off, where over

12 thousand customers wrote the FCC detailed letters calling on the Commission to save the Bridge to Broadband.

We also must do more to educate cities. While it may sound myopic, faster 5G adoption will hinge on fees, permits, deadlines and equal treatment. Having clear rules of the road in place, and reasonable policies that incentivize more competition will help. Thankfully, we can apply many of the same lessons learned about wireless build-out deployment—where reasonable fees and timeframes are set—to fiber.

America's cities should stick with what works: more competition. Having only one internet provider just won't do. The benefits of competition can be seen in places like the Bay Area of California, where it was a little local provider named Sonic, not the big guys like AT&T or Comcast, who broke every internet speed record for the fastest network.

If cities incentivize and provide equal treatment to competitors entering the market, then Gigabit networks and 5G benefits can become a reality. But without reasonable accommodations, fiber builders may have to pass on these extra-incurred costs to their customers, leading to a higher bill for these services.

Working together, with a focus on innovation and competition that benefits consumers and small businesses, our 5G dreams of a full fiber future are at hand. Because after all, relying on just one internet provider was so last decade.

About the Author
Chip Pickering is the CEO of INCOMPAS, the internet and competitive networks association. Chip was a six-term Republican Member of Congress representing Mississippi's Third District. During his time in the House, he served on the Energy & Commerce Committee, where he was vice chairman from 2002 to 2006, as well as the Science Committee. While chair of the Basic Research Subcommittee, he oversaw the transition to the commercial internet, and the establishment of domain names, registries and internet governance. He also successfully led a bipartisan legislative effort to codify net neutrality principles through the House in 2006. Before serving in the House, Chip was a key Republican Senate staffer in developing the 1996 Telecommunications Act. In addition to his work with INCOMPAS, Chip teaches at Ole Miss.

Broadband's Future in the United States

by John Scrivner
VP of Broadband
Live Oak Bank

When surveying American broadband's future, we must reflect upon the past. The United States has long considered it imperative to provide equal quality of life between urban and rural citizens. In earlier times this meant expanding public education, telephone service, electricity and clean drinking water to all, regardless of where they live. Yet, broadband remains an inequality between those who live within a metropolitan area and those who reside in rural areas of this country. It has evolved from a luxury amenity to a necessary means of staying connected to the economy and society as a whole.

Funding Broadband Growth
Top-quality, fast and abundant broadband service is important to everyone across the nation. We see unparalleled federal investment now devoted to broadband expansion and improvement into rural unserved and underserved markets. As an example, the FCC rolled out its initiative called the Connect America Fund which will disburse billions of dollars of federal money to create broadband infrastructure in rural communities over the next decade. Another federal resource is the USDA's Broadband ReConnect Program, which offers grants and low-interest loans specifically to provide broadband in eligible areas.

We also see many promising state broadband funding initiatives. In West Virginia, for example, broadband providers can apply for loan guarantees through participating banks, who receive an 80% loan guarantee.

These programs spur the growth of widespread, top-quality broadband services through public and private investment. Universal access to broadband across the United States is the next logical step in assuring rural Americans have equity in quality of life to those in American cities.

Broadband Platforms
It seems everyone is talking about "5G" today as if it is the only broad-band option. It certainly has a place of importance, but it is no panacea and it barely even exists yet. The technology to build it all does exist today. Millions of 5G base stations needed to make universal coverage of 5G in the United States do not yet exist. A better way to look at the importance of 5G is to understand that the underlying technologies and spectrum to build it will be rolled out via both fixed and mobile wireless broadband platforms using many similar technologies over time. Both serve up broadband wirelessly. So when one hears "5G" it should be understood this is more a broad suite of technology choices which fixed and mobile wireless providers will use to make broadband available in the future.

Historically, most think of DSL, DOCSIS and FTTx via national providers as being the broadband platforms of choice. At the same time, though not as well publicized, independent broadband providers worked over the last two decades plus to build fixed-wireless broadband and FTTx where they were often the "only" broadband available to anyone. These Wireless Internet Service Providers (WISPs) and FISPs along with many rural telephone cooperatives may not register as being the largest suppliers of broadband but the 2000+ WISPs and FISPs have been the ones building much of today's rural broadband.

This leads us to today and beyond. The landscape is changing. A brand-new band of spectrum called Citizen's Broadband Radio Service (CBRS) is emerging and expanding. Why is spectrum important?

The best analogy is to think of spectrum as farmland. A farmer needs flat, fertile ground to grow crops. Spectrum is to wireless providers, both fixed and mobile, as land is to farmers. CBRS is the first flat-fertile ground that independent broadband operators have ever had access to for widespread growth of broadband. CBRS originated from the earlier 3650 to 3700 MHz Part 90 "NN" spectrum

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2020:
A Broadband Odyssey

By Shirley Bloomfield
CEO
NTCA

A new year always seems to create a buzz of optimism for the possibilities ahead. But a new decade really spurs excitement for the future. With such a whirlwind finish to 2019, including the passage of several key rural broadband legislative priorities and additional funding appropriated for the U.S. Department of Agriculture's (USDA) ReConnect program, we at NTCA anticipate a very busy 2020.

With a lot on the docket, I like to make a list of what to keep top of mind in order to stay focused.

At the top of the list is helping NTCA members take advantage of opportunities presented by the Rural Digital Opportunity Fund (RDOF) announced by President Trump and FCC Chairman Ajit Pai last spring, which will provide $20.4 billion over 10 years to support broadband efforts across rural America. This is a positive step in our members' efforts to bridge the digital divide.

After a sustained advocacy effort urging the FCC to adopt rules that will enable future-proof networks capable of responding to consumer demand over time, I am delighted that the commission will consider auction rules that promise to strike an effective balance in delivering the best possible broadband services to as many rural Americans as possible for the available RDOF auction budget. NTCA led the charge in urging the commission to adopt rules that will enable future-proof networks—an effort that was lonely at times as we and a small handful of allies faced substantial opposition from certain parties promoting instead the deployment of networks that would deliver lower speeds for the promise of a lower upfront cost. Just like "dig once" policies, it is far more efficient to have policies that encourage providers to "build once" by deploying rural networks that are scalable and will offer services at speeds that are still relevant to customers a decade from now.

I am also encouraged by the recent FCC announcement of the "5G Fund," which would allocate up to $9 billion in Universal Service Fund support to deploy 5G mobile wireless services in rural America. Any efforts to deploy broadband to rural America have my support—if they are done right. Debates about the merits of 5G range from broad

Meanwhile, we have some parts of rural America waiting for "any G's," so realistic expectations are key.

Another issue that remains top of mind for 2020 is the consideration of concepts to reform the Universal Service Fund (USF) contribution system in order to provide adequate funding for the future. I also believe in continuing efforts to seek partnership opportunities for rural broadband providers both in their

> " . . . it is far more efficient to have policies that encourage providers to "build once" by deploying rural networks that are scalable and will offer services at speeds that are still relevant to customers a decade from now."

support to careful skepticism, but one thing about its deployment is undeniably true: there is no 5G without a fiber network. Right now, over 60% of customers served by NTCA members have fiber to the home and even still, our members aim higher.

Streaming video and other data demands enabled by 5G will test and strain spectrum resources and networks. Promised speeds therefore won't be realized without significant underlying fiber capacity, and in rural areas, the practical reality is that it will take fiber to nearly every home and business to make 5G work as it does in urban areas.

Fortunately, NTCA members haven't taken their eyes off the prize. While they use every possible technology to reach consumers in need of service in the near term, they have stayed focused on the goal of building networks for the long-haul—networks that will respond directly to increasing consumer demand for high-speed broadband and also enable evolving complementary 5G services.

endeavors to expand service, but also to grow and foster robust rural communities across the board.

We know where the problem is, now we just need to incentivize companies like NTCA members to be part of the solution, bringing service in collaborative ways to underserved areas outside of their current markets. This new decade is ripe with opportunity to do just that.

Shirley Bloomfield is chief executive officer of NTCA–The Rural Broadband Association, the premier association representing nearly 850 independent, community-based telecommunications companies that are leading innovation in rural and small-town America. With more than 30 years of experience representing the country's smallest independent telecom operators, Bloomfield is an expert on the role of federal communications policies in sustaining the vitality of rural and remote communities and the benefits rural broadband networks bring to the national economy.

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5G Is Your Business

(even if you are not in the mobile business)

By Francisco Sant'Anna
Senior Industry Advisor for Regional Services Providers
Ciena

5G is currently at the forefront of most technology discussions. The promise to deliver 100x faster data rates with 10x lower latency while supporting 100x more devices and carrying 1,000x more data (when compared to today's 4G LTE) will shape and enable the future of augmented and virtual reality, IoT, gaming, and industry 4.0. To deliver on these promises, mobile network operators (MNOs) are investing heavily in their networks. But the infrastructure that will support this revolution goes far beyond the MNOs. Wireline service providers and IT players of all kinds have the chance to play key roles in 5G, and will face new business opportunities and threats deriving from the market shifts it will bring about.

5G is more than upgrading the handsets, radios, and antennas that comprise the Radio Access Network (RAN). Most of the journey the data takes from the end device to the content on the cloud, or to another user, takes place in the wireline networks. As 5G removes the access bottleneck, the unrelenting traffic demand of bandwidth-hungry users and applications will pulse through the entire network, end-to-end.

The first segment that will need to quickly adapt is the packet-optical mobile backhaul infrastructure that connects the cell towers to the MNO switching offices. It will need to deliver much higher bandwidths at many more sites, boosting a wholesale connectivity business that is increasingly dependent on regional infrastructure providers. The 5G radio ultra-large bandwidth will require the use of high-frequency mmWave spectrum, where signal propagation is much more limited, creating the need for intense cell densification closer to the subscribers, mainly through the deployment of small-cells. It means numerous new cell-sites to connect, with unitary bandwidths that are shortly jumping from 1Gbs to 10Gb/s and stricter service levels. Mobile backhaul has been a key growth driver for fiber players in recent years and, as it surges with 5G deployments, new competition dynamics may arise.

Another significant shift on the wireline fabric will come from the transition of radio networks to centralized architectures (C-RAN model). The radio intelligence, the BBU (baseband unit) that once sat on the base of the tower, will be moved to centralized locations for cost and performance efficiency. This will create a new connectivity demand between remote radio heads (RRH) and BBUs, called fronthaul. These high-capacity and low-latency connections were initially thought to be served by dark fiber links, but as the 5G RRH will coexist with 3G and 4G radios generating backhaul traffic from the same cell site, a dedicated fiber may become impractical and non-cost-effective. In a more advanced model, the radio centralization can be done in 2 steps, splitting the BBU between a distributed and a central unit, producing the need for one additional link between those elements, called midhaul. These new architectures will create new possibilities for packetized fronthaul and midhaul (or xHaul, in a more comprehensive term), which can result in new service revenue opportunities for networks that can adapt to deliver the advanced performance requirements.

Besides mobile broadband and the wholesale opportunity, 5G is expected to create a new paradigm for fixed broadband access. With 5G-powered fixed-wireless access (FWA), MNOs will be able to offer 'good-enough' last-mile to support many basic business applications,

> ## "Technology companies need a concrete plan to build adaptive capabilities and set the path to more responsive and flexible networks."

which combined with SD-WAN solutions may have the power to reshape the business services market. New alternatives are likely to arise in areas where there has never been competition, and local incumbents could be threatened and need to reinvent their offerings.

The edge is becoming the spotlight. New applications reliant on AI models and neighboring information for immediate decisions, as is the case of self-driving vehicles, will require such small latencies that processing data on the edge of the network - closer to the action - will be a must. Distributed infrastructure may become a valued asset in this new game, and old central offices, street cabinets, and regional data centers may find new purposes in propping up the virtualized edge infrastructure that will allow these new applications to run efficiently.

5G will take IoT applications to another level, boosting the productivity of most industries. Systems, devices (sensors and actuators), and networks will be integrated with analytics and AI in industry-specific solutions tailored to solve industry-specific business challenges. This sets the stage for the rise of specialized tech-

nology integrators, positioned to lead the service relationship with enterprises. As solutions get more sophisticated, connectivity gets further commoditized, and differentiation entails a deeper understanding of customer problems.

Preparing to adapt is the way to thrive in a market that will be radically disrupted by 5G. Technology companies need a concrete plan to build adaptive capabilities and set the path to more responsive and flexible networks. The combination of a Programmable Infrastructure, Analytics and Intelligence, and Software Control and Automation is the key that will allow you to excel at a game of continuously shifting rules.

At Ciena, the 5G revolution is embedded in everything we do. From providing open and scalable solutions that cope with the bandwidth growth to extending our leadership from the mobile backhaul to the 5G xHaul space, from enabling smarter Adaptive IP™ architectures to empowering the virtualized edge, Ciena is committed to helping its customers and partners to adapt.

Francisco Sant'Anna is Senior Industry Advisor for Regional Services Providers. In this role, he leads Ciena's initiatives in helping these providers evolve their networks to meet their current and future business challenges through hardware, software, and services technologies.

Francisco is a Telecommunications Engineer with a Master in Telecommunication Systems, with 20 years of experience in the service provider industry.

FOUR FACTS ABOUT 5G AND FIBER

5G WILL...

1 DEPEND ON A DENSE NETWORK OF SMALL CELLS

1 SQUARE MILE COULD NEED **60** SMALL CELLS

2 REQUIRE FIBER TO CONNECT SMALL CELLS

COPPER: LIMITED BANDWIDTH

MICROWAVE: NOT SCALABLE

FIBER: JUST RIGHT

3 NEED A SUBSTANTIAL AMOUNT OF FIBER

1,390,816 MILES OF FIBER CABLE WOULD BE NEEDED FOR FULL 5G SERVICE TO JUST THE **TOP 25** METROPOLITAN AREAS IN THE USA

4 NOT REPLACE FIBER CONNECTIONS TO BUILDINGS

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FCC Takes Steps to Close the Digital Divide by Adopting the Rural Digital Opportunities Fund

By Lisa Youngers
President and CEO
Fiber Broadband Association

The Digital Divide. We all talk about it and know we want to help bridge that divide. The numbers tell us that close to twenty million Americans in rural areas still lack broadband access. Not only does a lack of access cut consumers off from educational and professional opportunities but in order to play in our digital future, every home and business needs fiber connectivity.

More specifically, bridging America's digital divide requires fiber broadband. The good news is fiber deployment is on the rise. Today, 46.5 million American homes have access to all-fiber networks and 20.5 million are connected with fiber. But there is more work to do.

Also good news, we know it is feasible for virtually all Americans to benefit from FTTH networks. This past September, the Fiber Broadband Association released a cost study, conducted by strategy consulting firm Cartesian, that examined the costs associated with deploying all-fiber networks to homes across the US. The study showed that consistent with current deployment rates and additional private and government actions, over the next ten years, we can increase the number of American homes passed by all-fiber networks from 40% to 90%. Further, Because of the great progress we've made in deploying all-fiber networks to date and advances deploying all-fiber networks cost-effectively, the total cost to pass 90% of American homes is much lower than estimated a decade ago, about $70 Billion. Last month, the Federal Communications Commission took a major step to bring much needed high-speed, future-proof connectivity to some 6 million currently unserved homes. The FCC voted to adopt an order and rules to implement its $20 billion Rural Digital Opportunities Fund (RDOF). The Fiber Broadband Association supported this action to favor gig networks. Not only will the new program propel direct fiber connectivity to unserved locations, but it will help to drive fiber further into communities. That is critical as fiber is the needed infrastructure to support 4G and 5G networks, wireless networks, smart community and IOT applications as well as smart grid and other next generation services. Without fiber, those next generation promises cannot occur.

What are the next steps to implement the RDOF? 2020 will be a busy year. At the end of February, the FCC will seek input on RDOF auction procedures. We expect these procedures to look similar to those used before in the FCC's CAF II auction proceedings. The FCC also will release a preliminary list of eligible census blocks for RDOF funding and initiate a challenge process.

We expect the FCC will issue the final auction procedures and a final list of eligible areas for funds by mid-2020 with the RDOF auction set to begin in the 4th quarter.

I am eager to continue advocating for the deployment of all-fiber networks so that all Americans can benefit from access to the highest quality connectivity possible. The RDOF helps to move us all closer to these goals.

" . . . consistent with current deployment rates and additional private and government actions, over the next ten years, we can increase the number of American homes passed by all-fiber networks from 40% to 90%."

About the Author

Lisa R. Youngers currently leads the Fiber Broadband Association as its President & CEO — the largest trade association in the Americas dedicated to all-fiber-optic broadband. Youngers brings two decades of communications experience to the Association ranging from wireline/ wireless telecommunications, satellite and broadcast to state infrastructure. Most recently, Youngers was CEO of Nextlink Wireless, where she drove all operational, technical and financial aspects of the business as well as M&A activity. Prior to leading Nextlink, Youngers was Vice President and Assistant General Counsel of Federal Advocacy and Strategy at XO Communications where she led the company's initiatives involving federal policy, operations and technology. Before that, she served as Federal Regulatory Counsel for General Communication, Inc. and MCI advocating on competition issues. Youngers also served as Assistant Attorney General for the state of Minnesota as counsel to the Public Utilities Commission and the Rail/Trucking Safety Board. Youngers is a member of the Minnesota and District of Columbia Bars. She earned her bachelor's degree from the University of Wisconsin-Madison and a JD from the Mitchell Hamline School of Law.

The View of ICT in the Next Decade:
Broadband Without Boundaries

By Heather Burnett Gold
CEO
HBG Strategies

The Problem

Today, according to the FCC, nearly 30 million Americans in rural areas do not have access to home Internet services with speeds of at least 25 Mbps down and 3 Mbps up, the standard of minimum comparability to urban/suburban areas. Even where present, there is no guarantee that the networks delivering that service will be future proof – meaning capable of expanding capacity as the demand for more bandwidth grows. Only one technology can be guaranteed future proof with seemingly infinite capacity for expansion and that is all fiber optics.

Why is this important? Because bandwidth growth here in the US will continue to expand exponentially. As the CISCO VNI data has estimated, globally monthly IP traffic will reach 50 GB per capita by 2022, up from 16 GB per capita in 2017. In North America, the average fixed broadband speed will reach 94.2 Mbps per capita, a 2.2-fold growth from 2017 (43.2 Mbps). In its 2019 Report for the Fiber Broadband Association, RVA, LLC revealed that Fiber to the Home (FTTH) available connections grew 15% in 2019 to almost 70 Million homes of which approximately 40% are connected.

But our rural areas are being left behind. RVA, LLC found that the distribution of available speeds by geography varies widely with urban/suburban areas exhibiting an average blended (down and up) 65 Mbps, exurban/rural 37 Mbps and very rural 24 Mbps. And correspondingly, FTTH availability varies greatly as well with urban/suburban areas with a 40% availability of FTTH, rural barely 25% and very rural less than 18%.

And it is not just Internet access that requires intentional investment in fiber optics but our electric grid as well. An article in Energy News from September 2018 reporting on a study by Richelle Elberg prepared for Navigant Research states that she had found that the data

now available from connected devices to improve grid reliability, safety, resilience, and operational efficiency will require massive investment in networking as the ways that utilities solve connectivity problems are diversifying. Utilities are projected to spend nearly $100 billion on networking and communications equipment and services over the next decade. And while not all of this $100B will be spent on fiber optics, a considerable percentage will be, and she suggests that utilities either invest in fiber or partner with companies that have. The purpose is to improve communications for sophisticated grid management (including smart sensors) in a world of highly distributed energy and interconnected devices as well as potentially capitalize on selling dark fiber to other carriers.

Further the imperative for more rural deployment of fiber optics goes beyond the growing digital divide between rural and comparable suburban/urban areas and straight to what consumers want, which is the same level of internet services enjoyed by their suburban/urban counterparts.

The experiences of providers that have deployed FTTH in rural areas proves that the demand is there. Take rates in rural areas for FTTH can top 60% compared to 35-40% in suburban/urban areas.

The Solution

As rural communities face the challenges of limited broadband, citizens have banded together to find solutions that meet their needs. Often the easiest solution is to turn to either their citizen owned electric cooperative or publicly owned electric utilities.

Since the mid-1930s, rural electric cooperatives have provided small communities and agricultural areas with the essential service necessary to keep their citizens connected. Funded with long-term, low-interest loans, these coopera-

"Take rates in rural areas for FTTH can top 60% compared to 35-40% in suburban/urban areas."

tives have shown they know how to build, operate and maintain essential wireline infrastructure.

Now those same cooperatives are beginning to build networks to provide the essential service of the 21st Century – broadband services on fiber-to-the-home networks. It is natural that the very coops that served rural communities in the 20th century with electricity would seek to ensure their members are part of the 21st century global economy.

In the CAF II Auction in 2018, tens of electric coops won the right to build all fiber networks into these communities. In the RVA, LLC annual survey, it was found that rural electric coops already providing FTTH has increased from 35 in 2016 to 111 in 2019. And we expect that this participation is going to be getting a big boost from a dramatic change in how federal funding for broadband is distributed.

32   *Skinny Wire | Winter 2020 | http://www.walkerfirst.com/literature/skinny-wire/*

On January 30, the FCC voted to approve the $20.4B Rural Digital Opportunity Fund (RDOF). RDOF implements a competitive auction for many rural areas previously served primarily by independent Telcos such as CenturyLink and Frontier. Key points from the proposal include:

1. The bandwidth definition of unserved has been raised to 25/3 Mbps, which represents a dramatic improvement over previous 10/1 Mbps standard.
2. Almost ¾ of these funds will be available for reverse auctions later this year in census blocks where no service at this level is currently available.
3. Bids providing higher speeds with lower latency bids will be scored higher, meaning there should be a predeposition for fiber optic providers who can meet the price point. It is commonly accepted the electric cooperatives are best situated to benefit from this auction.
4. The 2nd round, representing approximately $4 B, will target partially served areas which lack access to the 25/3 Mbps standard.

In addition, the USDA through its Rural Utilities Services Division, has entered its 2nd year of its Reconnect Program. The ReConnect Program will provide up to $600M in fiscal 2020 of funding through loans, grants and a combination of the two. The purpose of the funding is to facilitate last mile broadband deployment in rural areas that do not currently meet a standard of 10/1 Mbps. It remains to be seen if RUS will increase its standard now that the FCC has done so.

There is also supporting activity coming from states and private partners in removing investment barriers and in providing enhance funding for rural broadband deployment. These activities are often in conjunction with some of these federal programs or by working with each other in public/private partnerships.

Examples of states granting some form of legal waivers/incentives to IOUS for furthering their fiber middle mile deployments include Alabama, Virginia and Mississippi. States with recently expanded funding for last mile deployment with criteria for latency and future proofing that favors fiber include Alabama and Virginia.

The Future Without Boundaries
What does this all mean for ICT in the next decade? It means that no child's zip code will determine its level of educational attainment, that no person will lack access to sophisticated healthcare because of a choice to live in a less congested area and that all of our citizens will be fully integrated into the global economy and capable for creating the lifestyle they want for their families.

Heather Burnett Gold

Heather Burnett Gold is the CEO of HBG Strategies, a consultancy engaged in broadband education targeted to enable fiber deployment among underserved communities.

A thirty-year plus industry veteran, Gold most recently served as the President/CEO of the Fiber Broadband Association. Prior to that she was the SVP of External Affairs and Access Management for XO Communications.

Gold holds BA (magna cum laude) and MA degrees in Economics from Tufts University and an MBA in Finance and Marketing from Washington University in St. Louis. Gold also completed the General Management Program of the Harvard Business School. She was honored by the Washington Business Journal as one of its 2010 Women Who Mean Business and was recognized by Fierce Telecom as one of its Women in Wireline for 2013.

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Disrupting Legacy ICT Business Models

By Alan Fitzpatrick
CEO
Open Broadband, LLC

It's never been a more exciting time in the information and communications field. Capabilities, capacity, speeds, and performance outputs continue to evolve and improve, and it isn't slowing down. Fiber to the premise is becoming a standard practice in some communities. Gigabit internet fiber is being deployed by the incumbent telecoms, fiber companies like Ting and Google Fiber, and municipal networks in the states that allow them. Celestial networks like Starlink are targeting the global need for broadband access. At the terrestrial level, mmWave wireless technology now enables wireless ISPs to offer gigabit speed services, and CBRS deployment will further expand fixed-wireless broadband.

Technology improvements are great, but what we see coming may be even more impactful - a change in the business model of service providers. Three areas key to driving value in the ICT business model are a focus on transformational benefits, the power of distributed people and data, and the power of the crowd.

Transformation

Users of ICT service are not just wanting to pay for the services. Users want to pay for having their lives transformed by the services. For a residential user it may be the ability to work from home for any company in the world. We've seen this firsthand in rural parts of North Carolina. Or access to remote healthcare, live online video classes, or access to more job information. And yes, entertainment is also transformational in the minds of many people.

We've seen college campuses extending into rural areas, creating new remote campuses with experiential learning opportunities for the students. Businesses are improving productivity by reducing the time taken to transmit large files. One of our customers is an orthodontist leveraging gigabit internet connections to reduce the time taken to upload a file to Invisalign from 42 minutes to less than 1, freeing up an expensive imaging machine for the next patient.

Many service providers continue to focus on delivering a service. However, a business model focused on understanding the pain points of the users, and helping them achieve the transformational aspects of the technologies, is going to be required for service providers to be successful.

Decentralization

The ICT technology improvements will continue to enable businesses to decentralize their workforce. Computing technology, connected through high-speed fixed and wireless networks, equip a user to perform work anywhere and anytime. We've seen examples of remote control of medical robots over high-speed, low-latency networks and geneticists downloading the human DNA sequence to their home office. Work will continue to become more and more decentralized, opening up opportunities for high-paying jobs in rural areas.

Decentralization also changes the delivery mechanism for data. Netflix was an early adopter of data center at the end, moving their servers closer to the user. Not only did this greatly reduce their network transport cost, but it made the user experience much, much better. I believe this approach will accelerate along with the deployment of faster connections throughout the county. Amazon Web Service and Microsoft Azure are certainly poised to be beneficiaries of decentralized data storage, delivering more responsive applications than ever before.

The Crowd

As technology brings more people online with faster connections, the power of the crowd continues to grow. People can work performing tasks-on-demand on any number of platforms including TaskRabbit, Fiverr, Gigster, DesignCrowd, and Upwork. Kaggle is another interesting business model, offering a data scientist-on-demand. ICT improvements enable businesses and workers to perform jobs-on-demand, a trend that is accelerating and creating a large value differentiator for those business leveraging this in their business model.

Interesting business examples include the LEGO Ideas platform, crowdsourcing user ideas for new LEGO sets. NASA regularly runs crowdsourcing challenges for a variety of projects, running for several years, and attracting contestants from

> **" . . . smart service providers will listen to the needs of the communities and help them achieve the goals they have in mind."**

all over the world. Another interesting model is DealCloud in Charlotte NC, who created solutions purpose-built for the private equity and growth capital firms. The use of the crowd for both the organization, and the worker, will radically change the business model of how work in ICT gets done.

The crowd also manifests itself in the increasing expectations and demands for better service. We see communities across the county launching their own broadband networks as the for-profit industry is not meeting their needs. Rather than fight against this demand, smart service providers will listen to the needs of the communities and help them achieve the goals they have in mind. Conduct a survey in any community and you will quickly learn what is desired.

It will be exciting!

The pace of technology evolution and deployment is extraordinary. But the changes in business models that leverage transformation, decentralization, and the crowd may be even more powerful in the coming years. Our industry has a long tradition as being champions of change, and the coming years are sure going to be exciting.

The Future of ICT for Electric Utilities

By Bob Lockhart
VP Cybersecurity, Technology and Research
UTC

We each consider the future through our own peculiar lens. What is earth-shattering for one person, is run-of-the-mill stuff for the next. Change implies a starting point and an ending point, and we are not all at the same starting point.

That perspective is helpful when considering how the Information and Communications Technology (ICT) future looks for electric utilities. Our starting point is in a distant, pre-ICT past. Unlike many other industries, utilities use ICT to manage a physical infrastructure that has evolved over more than a century. Evolution might be overstating the reality; perhaps it is better to say that our infrastructure has congealed. Regardless, electric utilities' physical infrastructure is immensely complex. And the reliable supply of energy provided by utilities is foundational to all other visions of the future in this issue of Skinny Wire.

Until about 20 years ago, it was commonly held that if Thomas Edison came back today, he would instantly recognize our electricity grids and how they operate. In the last decade, however, innovation on a massive scale has delivered a grid in transition to the future – a grid that Mr. Edison would have trouble fathoming. Marty McFly would likely be comfortable, though.

It's All about Convergence
Convergence is key for utilities. Utilities have traditionally operated in silos, and for good reason. Silos get a bad rap, but that is not always deserved. For instance, utilities desperately need to keep things like high-voltage transmission siloed away from our homes and offices. The two do not mix safely. So, silos. But now that we have overlain data and applications upon those silos, there are benefits to some level of convergence.

Perhaps the most transformational convergence for utilities is their data. Where other industries manage abstract entities such as account balances and retail transactions, utilities manage massive physical entities, like those power lines and steel towers that you might see near your homes or along highways. Physical entities possess layers of complexity absent from the abstract world. For example, account balances don't have to be ruggedized for weather, and they don't wear out after several years of use. But industries that rely upon a physical infrastructure must manage the intricate and sometimes unpredictable interplay of the concrete and abstract attributes of their assets.

Consider how different departments of a utility view a smart meter. For the distribution side, it's an early warning system for problems on the grid. For load planning, it's a historical data source. For accounting, it's a cash register. And for procurement, it's one of several million identical assets that must be optimized. Those varied perspectives rarely overlap and getting them into a single database has thus far proved challenging.

But the convergence is necessary. While perhaps humble in the grand scheme of innovation, simply merging all the attributes of an asset into one source holds remarkable promise for future efficiencies and enhanced services. Utilities will figure this out, but it will not be quick, it will not be easy, and it probably will not be an identical process from one utility to the next.

Data will converge, and so will applications. Capabilities that appear similar, such as case tracking systems, diverge massively inside utilities. Systems that track Enterprise-IT problem resolution have so far been unable to handle the same problem resolution tasks for utilities' operational assets. Once again, the added complexity of physical attributes had muddied the waters. Enterprise IT systems, even after 30 years of development, have trouble understanding the nuances of "location" in a substation, for instance. But the same people and resources are often deployed to resolve problems in both the IT and the operational realms. The current lack of integration makes staff and resource allocation a nightmare. Utilities will in time have a single capability to manage all work and problem resolution across all aspects of the utility. It sounds simple but this will be a tremendously sophisticated capability. Other capabilities are in need of a similar merger across IT and operational boundaries, such as project management.

> *"Until about ten years ago, it was commonly held that if Thomas Edison came back today, he would instantly recognize our electricity grids and how they operate."*

Except when It's about Divergence

Ironically, all this convergence will enable divergence. And this is where it gets fun. Applications will diverge as well. Edge intelligence will capture data locally and when possible, process it locally too. Early adoptions exist, such as smart streetlights that may include weather sensors, particulate matter sensors, or even gunshot sensors. In time, utilities and municipalities may tailor their services down to a neighborhood level, even down to a single block. All this requires processors out at the edge that act on their own, using a combination of locally captured and centrally supplied data. Moving work out to the edge of the grid will remove the burden of ever-increasing computational power needed at the central site. It will also enhance cybersecurity by eliminating single points of failure for services provided by utilities.

If edge intelligence sounds familiar, it should. It's an update of the Enteprise IT client/server architectures that came about 30 years ago. Now in 2020, utilities are just about ready to adopt a similar distributed processing model in their physical infrastructures. Meantime, Enterprise IT is reverting to a web-based processing model that strangely resembles the mainframe paradigm of the 1960s. Which somehow paints a vision of the future as perhaps an update of the best ideas from the past. Whatever has been, will be again...

Where Does This Leave Us?

Some of these predictions for the future sound like a 1990s vision of Enterprise IT. Are utilities really that slow to change? We think of it as cautious, rather than slow. There are two reasons first this. First: reliability is not negotiable – if electrons stop flowing, the future never arrives. Second: utilities' physical assets often have service lives measured in decades. We only grudgingly accept Moore's Law over here.

Which leads to a most curious conclusion: Utilities' measured march into future ensures reliable electricity – so that other industries can careen headlong into the future!

Bob Lockhart is the Utilities Technology Council's Vice President of Cybersecurity, Technology, and Research. In that role he manages the association's programs of work for cybersecurity, IT/OT convergence and technology initiatives, plus all of UTC's research activities. Mr. Lockhart has nine years' experience in control systems cybersecurity, with over 25 years' total experience in information security. He was previously Navigant's Research Director for cybersecurity, transmission, distribution, smart metering, demand response, home energy, software, telecommunications, and data analytics. Before becoming a market researcher, Mr. Lockhart had a 31-year career in IT outsourcing with EDS. He has held a current CISSP certification since 2002

So, what happens when data and applications converge? The data flows become mammoth. Consider a single use case: synchrophasors, which measure phase angles and can give early indication of a developing fault in a transmission circuit. Their edge-measurement device – the phasor measurement unit (PMU) – can produce thousands of phase-angle readings per second. So, a single PMU may produce 500 million phase-angle readings per day. And a large transmission network may have hundreds of PMUs. The throughput requirements will become enormous – remember this is just a single-use case. Add in increasingly detailed Geospatial Information Systems, streaming Augmented Reality videos for on-site guidance in dangerous procedures, and the data needs skyrocket.

So, the future of utility convergence is, first and foremost, data. Data in transit. Utilities see this future coming: in a recent UTC survey, utility telecommunications expected a tenfold increase in throughput required just in the next five years. Look 15-20 years into the future and the prospects are daunting. We will likely see advances in throughput that are not yet a gleam in the eye.

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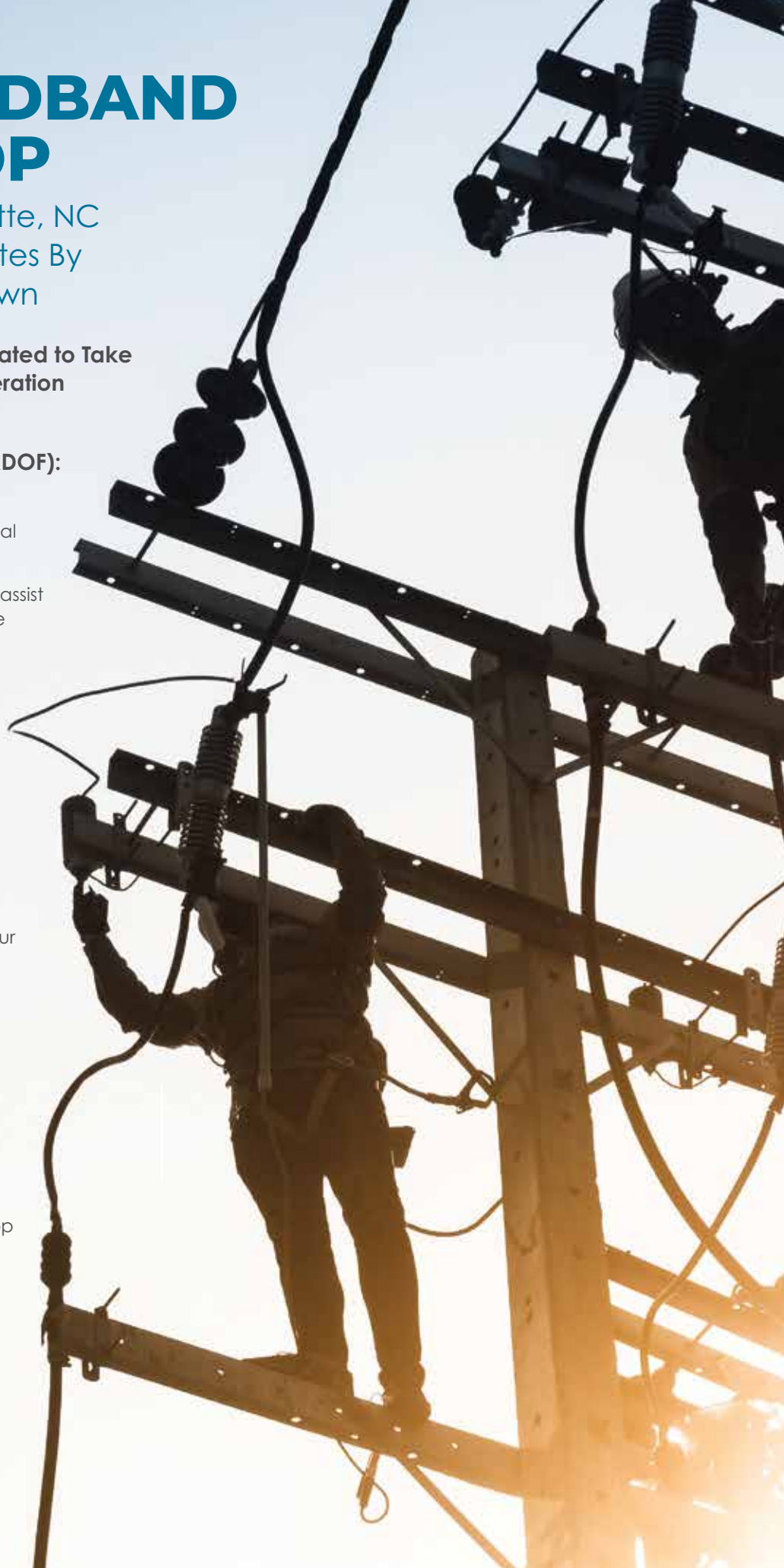
It's Going to be an Electrifying Year of Broadband Growth!

By Ravi Hichkad
Manager of Community Broadband Initiatives
ADTRAN

Many electric utility providers today are leveraging fiber broadband access to empower their communities in unprecedented ways. We see gigabit services allowing even the smallest communities to fully participate in today's globally connected marketplace, bringing economic growth, access to better educational and healthcare resources, and a host of other opportunities that will change lives for the better. As we peer into the crystal ball for 2020, we can expect an increasing number of electric utilities to undertake transformative broadband builds for their communities this year. Several key considerations they should keep in mind around broadband solution development are highlighted below.

Fiber Connects
Fiber to the Premises (FTTP) access offers the best path for electric utilities to build broadband networks, providing the lowest cost of ownership and highest service density. It's important that utilities apply a broadband access approach that simplifies high capacity services delivery. By deploying a Gigabit Passive Optical Network (GPON), utilities can implement and maintain fiber infrastructure with simplicity in the delivery of broadband services with limitless bandwidth. The architecture for this model requires the right fiber access platform and Optical Line Terminal (OLT) to provide ultra-flexible, high-capacity, deep fiber solutions that work seamlessly with Optical Network Terminals (ONTs), the service delivery equipment on a customer's premises. When done right, the efficiencies around such an end-to-end GPON deployment strategy perfectly align with the needs of utilities.

Growing the Network
Utilities understand the need to ensure today's networks will scale for tomorrow's demands, so when weighing fiber network plans, bridging the gap to next-generation 10 Gigabit network infrastructures is an important consideration. Today's FTTP networks are under tremendous strain as high-bandwidth applications continue to grow and consume capacity. As more utilities become communications service providers, they need to identify the right next-generation access strategies to ensure a competitive network today can transition to a future network that addresses expansions in residential and business services as well as other applications. 10 Gigabit Passive Optical Network (10G PON) architectural solutions can effortlessly and incrementally unlock additional network capacity as needed, maximizing service flexibility with minimal cost.

Subscriber Experience is Critical
As utilities become communications service providers, they need to plan for upfront integration of network and subscriber information, to ensure quality of service for their customers. Utilities should consider deploying services that deliver the power of the broadband network throughout the consumer's home, distributing access anywhere and everywhere with robust Wi-Fi solutions. Service providers can best realize new revenue opportunities with residential broadband by deploying network devices that optimize the subscriber experience while reducing complexity in the home network. These products, including residential gateways and mesh Wi-Fi solutions, must deliver a rich, advanced feature set that is extensible throughout the home.

Personalized subscriber experience is perhaps the most important piece of broadband service delivery today. Operators should leverage tools that emphasize operational efficiency, elevate customer focus, and ultimately improve the subscriber experience. Real-time analysis of subscriber data, for example, enables broadband service providers to gain insight into their subscribers, identify network status to actively troubleshoot problems, and often fix them without the need for a costly truck-roll. Such tools are also critical in helping to identify problems such as billing system inconsistencies or improperly provisioned circuits, all of which cuts down on lost revenue.

Fixed Wireless Access Options
While full fiber networks present the ideal infrastructure for utilities to deliver next generation broadband service, there may be certain in cases where the economics for FTTP aren't immediately practical. In these instances, a hybrid network approach of fiber along with fixed wireless access solutions present an alternative pathway to connecting homes and businesses. Fiber extension through self-organizing fixed wireless access architecture allows service providers to mitigate complex installation processes and increase ROI, while supporting the same quality of service provided by FTTH solutions.

At Your Service
Successfully executing a broadband network build, improving operations, and boosting subscriber experience all require the right technology and operational expertise. Given that such resources may not always reside in-house for utility providers, they should look to engineering partnerships as an essential tool. Many utilities find the benefits of network implementation services to be especially helpful, in terms of planning and building networks, then making deployment as simple as possible. Network audit services have proven equally valuable and offer utility providers a comprehensive evaluation of infrastructure, to optimize efficiencies and enable a better understanding and improvement of network operations.

Partnership is Key
ADTRAN has a unique understanding of the changing environment electric utility providers face today. As broadband continues to transform the way we all live, work and play, ADTRAN is enabling countless utilities around the country to deliver the connectivity and communication solutions their communities need in order to grow. We offer the most complete broadband access portfolio on the market today, with rapidly deployable solutions that maximize existing infrastructure and include world-class services and support.

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ELECTRIC CO-OP BROADBAND BUSINESS MODELS

By Cathy Cash
Senior Writer/Editor
NRECA
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Electric cooperatives entering the retail broadband space have experimented with business model options, which vary according to state law and local circumstances:

Wholly owned, for-profit subsidiary

- Electric co-op owns the fiber assets and network and leases them to a subsidiary, or a subsidiary owns the fiber and leases access to the parent co-op to support electric operations.
- Subsidiary operates the fiber network and delivers communication services to members.
- Subsidiary collects payment from broadband service subscribers.
- Net profits from broadband service are allocated to electric co-op members as capital credits.
- Subsidiary has its own manager, engineers, and other staff, including customer service professionals. Some staff may be shared with the parent company, requiring the proportional allocation of cost.
- Depending on state law, firewalls may be required to prevent anti-competitive activities.

Not-for-profit subsidiary

- Co-op owns the broadband network, assets, and other infrastructure or the fiber is owned by the subsidiary, which leases access back to the co-op to support electric operations.
- Staff hired to deliver broadband services are employees of the electric cooperative.
- Subsidiary generally begins operations with a focus on serving customers within the co-op's service territory.

Operating division of the cooperative

- Co-op owns the broadband network, assets, and other infrastructure.
- Some co-op employees' duties span both electric and broadband businesses.
- Electric and broadband divisions generally require separate accounting records.
- Marketing the broadband business to co-op
- members may be simplified, given the established relationship between co-op and members.
- Broadband take rate may be higher based on members' established relationship with the co-op.

Acquire or partner with an existing internet service provider (ISP)

- Electric co-op acquires a local ISP. Partnerships take several forms, including entering a managed services agreement, fiber/asset swap, one entity handling customer service, or creation of a new entity as a joint venture.
- May quickly expand broadband build.
- ISP brings internet network assets, expertise, and services, such as fiber, circuits, data center colocation, VoIP, design, and implementation.
- May reduce risk of co-op entering broadband business.
- May facilitate gaining non-member broadband subscribers.

Certified competitive local exchange carrier (CLEC)

- Electric co-op spins off a CLEC that will deliver broadband to its territory and beyond.
- The CLEC may be regulated by the state and Federal Communications Commission (FCC).
- The CLEC may be designated as an eligible telecommunications carrier and qualify to seek financial support from the FCC and certain universal service funds.

Some state laws prohibit cross-subsidization between entities or lines of business. For all business models, cross-subsidization should be avoided. NRECA recommends that co-ops work with their attorneys and tax professionals to determine the business model that works best for their systems.

For more information on electric co-ops in broadband, see NRECA Broadband: Co-op Case Studies at cooperative.com/programs-services/bts/Pages/Broadband-Co-opCase-Studies.aspx.

2020 Vision: Not So Clear for Utilities

By Bobbi Harris
CMO
Smart Water Smart City, LLC

After internet research of utility industry articles and analysts reports from 2000 to 2015, it is interesting to note the year 2020 was to be a big milestone in utility infrastructure and telecommunications. While many trends have continued and some predictions have become closer to reality, there is still much uncertainty when it comes to utility and critical infrastructure communications. It was predicted that there would be global electrification and all smart meter deployments would be nearly completed by now. It was predicted that Home Area Networks (HANs) would be prevalent cross NA and Europe. It was predicted that EVs would be commonplace. It was predicted that Machine-to-Machine (M2M) connections in utilities would grow to 1.5 billion worldwide and Smart Meters would account for 99% of M2M connections in the utilities market. It was predicted that integrate data across diverse and complex IT systems, would enable immediate, role-based access via multiple communication channels such as desktop, laptop, "PDAs," phone, e-mail and Internet. It was predicted that the Industrial Internet would present utilities with a dizzying number of new applications, using ALL the data gathered from ALL the devices... and many more utility technology predictions...all by 2020.

So how did those predictions work out? Are utilities across the country able to use all the data from all those deployed devices? Have the promises of a "smart grid" been fully realized? Did the alphabet-soup of applications like CIS, GIS, OMS and DMS solve the utility challenges?

Customer information systems (CIS) for utilities have been around in some form or another for more than 30 years. In the late 1990's, when utilities first began to embrace new software innovations to help manage their customer relations, the market comprised vendors selling "mission critical enterprise systems" focused primarily on operational customer relationship management

(CRM) functions such as account maintenance, order processing, product and service management, billing, credit collection and accounts receivables, with some collaborative customer interaction functionality. This was the nirvana of a modern grid. Utilities deployed sometimes expensive, cumbersome and siloed enterprise solutions tied individually to different processes. However, this approach was marked by the need for numerous interfaces, heavy maintenance requirements and unnecessary data replication or manual data capture, resulting in a high cost of ownership and slow responsiveness to changing markets.

In the last decade, carriers have sunset TDM and analog circuits, so doing nothing about utility telecom infrastructure is no longer an option. Utilities cannot rely on the telecom technologies that they have historically depended upon and information is moving to wireless broadband, narrowband IoT and fiber as communications for operational technology needs. As the transition to IP-based next generation networks has accelerated, there is no single answer to replacing a TDM service. Geography, bandwidth, and application support are factors that impact the replacement technology for an individual substation or distribution network. Understanding what the options are and how each will impact the

> **" . .. the discrepancy between investments and measurable success will be even more critical to utility leaders."**

network is very difficult without physically building test networks, which is costly, time consuming, and resource intensive. Is the 2020 vision for utility telecommunications clear?

Virtual networking or Network-as-a-Service (NaaS) may make connectivity easier, but it complicates automation of lifecycle processes. Simulators modeling the behavior of the network under a specific set of conditions can be used to help predict how effective or disruptive new devices and applications will be to the system. For most mission critical infrastructure, it is not practical to have a test environment that is the same size as the production network, especially with thousands of smart devices being installed every year on the old network. This makes the task of recreating different design scenarios not only hard but in many situations impossible.
- How do you assess the impact of 25,000 smart devices on the system?
- Do you buy and install devices in a warehouse to recreate the network?

- How do you test the IP transition plans with new IP-based equipment and really know what impact that equipment will have, or which design option is the better?
- Trial and error on a small test network? How does this scale?

Telecom network simulators enable the telecom engineers to setup a scalable simulated network with hundreds of thousands of devices. They can then simulate different combinations of routers, switches, firewalls, and wireless local area network (WLAN) controllers from many different manufacturers, without having to purchase even one or impacting the production network. One of the fundamental issues with designing and implementing a Software Defined Network (SDN) is that there is no single solution for all regions of the network. This means that every design and implementation of an SDN is different – presenting significant challenges.

Now in 2020, the discrepancy between investments and measurable success will be even more critical to utility leaders. The initial euphoria of the smart grid has evaporated, and utilities have become more conservative in their solution appraisals. Migration to high-speed networks, increased adoption of smartphones and other connected devices, and greater demand for services like video and mobile navigation are driving the need to upgrade networks for resource-hungry applications. This is a complicated task considering there are new challenges appearing every day. Today's utility telecom networks are changing due to the afore mentioned IP transition, SDN and planning for 5G deployments. Any one of these by itself presents the telecom engineers with major design issues; Put all in play and the meaning of optimal networks itself becomes unclear. The need for and benefits of new simulation tools to help in the utility telecom engineering process are clear: reduce the overall cost of the network – allowing the sharing of operations, administration, maintenance and provisioning; and allow the deployment of new network-based critical applications that utilize data, voice, and video to exploit the synergies they create.

Perhaps over the last 20 years, smarter technology, better analytics and new communication networks offered a different set of strategies for utility leaders. So, what will the utility leaders of 2020 face and how will they set visionary strategies to meet the next decade of demands? Do you have 2020 vision?

with an additional 100 MHz of new adjacent space added in the 2015 CBRS order. This band will be the first real competitive opportunity for WISPs to offer quality point-to-multipoint delivery of fixed wireless Broadband services identical in quality to cellular much-hyped "5G." This will be the fertile ground WISPs have longed for over the last 20 plus years.

What About Fiber Optics?

Fiber optic broadband is arguably the ultimate broadband platform. If no other factors are taken into account except for sheer broadband performance, then this would be a correct assumption. For practical purposes, fiber optic broadband is not the only choice and will likely never be the only choice for broadband. There are several reasons. First, technology always finds new ways of making wireless, coaxial and other existing platforms capable of delivering the broadband services needed to meet demand via firmware and often hardware upgrades. Time and cost play a large part in why fiber is not always the best choice, as fiber can take 10 times longer to deploy and cost 10 times more. Fiber almost always wins when it comes to lifespan between upgrades. It is not at all uncommon to see a 20 plus year design lifespan on a fiber deployment. Fiber is also very low cost to maintain. When installed underground, fiber remains intact often for decades.

Over the next 30 years, we will achieve universal access to broadband in this country. It will take hundreds of billions of dollars in public and private investment to reach that goal. Nearly every platform we see today for delivery of broadband will improve to meet the increasing goals of speed, capacity and latency. The end result will be a robust variety of broadband options to all Americans. This will reshape our nation in ways we cannot possibly fathom today.

John Scrivner serves as Live Oak Bank's resident broadband industry expert. John shares his knowledge gained from 10 years of experience in the cable television industry and 17 years operating a broadband Wireless Internet Service Provider (WISP) operation. He also helped create and operate the Wireless Internet Service Providers Association (WISPA) serving originally as its founding president and later as treasurer for several years. If you are looking to expand your broadband company, buyout your partners or buy the broadband company next to you, John works with the broadband lending team to develop custom loan options specifically for broadband business owners.

GO/NO-GO
Making the right decision on broadband for your co-op

By Cathy Cash
Senior Writer/Editor
NRECA
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Less than 25 miles separate them, but two small rural electric cooperatives in Southeast Virginia are a world apart when it comes to internet access and all the opportunities it brings.

Electric cooperatives across the country have taken up the cause of rural broadband, finding ways to provide high-speed, reliable access to their communities when no other provider would. Dozens have already begun build-outs. Hundreds more are considering it.

But for all the value co-op broadband brings, making the "go/no-go" call can be complicated. Essential factors like calculating total cost, state laws and regulations, financing options, geography, available technology, member interest, pricing, and actual take rate can quickly muddy what might at first seem like a simple business decision.

"The equation is far from straightforward," says Brian O'Hara, NRECA's senior director of regulatory issues for telecom and broadband. "A co-op has to meticulously look at all the factors individually and in relation to their own unique situation."

What follows are the stories of two Virginia co-ops that took divergent paths on providing retail internet access.

Prince George Electric Cooperative: 'They asked for this'
It began with a goal and a partnership. And a lot of money.
Prince George Electric Cooperative (PGEC) wanted to deliver broadband internet access through fiberoptic cable to every member in its Southeast Virginia service territory.

Leaders in Prince George County believed in the co-op's vision and, in 2017, provided $1 million for a pilot program to connect 500 members by 2021.

PGEC got the job done two years ahead of schedule.

More government partnerships emerged with more grant money, and the co-op solidified its decision to step into broadband. Now its subsidiary, RURALBAND, is well on its way to delivering the highest internet speed available to its rural members.

"We are building a fiber network like we did electricity 80 years ago: Start in a core location and build out to central points to serve everybody," says Casey Logan, president and CEO of the 12,000-meter co-op based in Waverly, Virginia.

"As more members came on, we were able to take electricity farther and farther out to rural areas to have everybody served in 1950s. With broadband, we're going to do it in four to five years versus 20."

Logan, the co-op's chief engineer during the pilot, recalls how PGEC helped spotlight the need for rural broadband at a 2018 gathering of 200 state legislators, members of the governor's cabinet, and state agency officials.

In the Prince George Central Wellness Center—an early recipient of the co-op's broadband service— PGEC livestreamed Ted Raspillar, president of John Tyler Community College, 20 miles away, as he spoke on the importance of broadband to rural America.

Raspillar talked about "the opportunity to bring education to rural America, to bring certification training to firehouses and in public buildings, and how that would allow students to acquire degrees much closer to home," Logan says. "That seemed to spur a lot of energy on how electric cooperatives could meet the needs of our communities, where no other solution has been provided."
After the meeting, more funding followed, and PGEC prepared to expand fiber-to-the-home service across its electric service territory.

Sussex County and the Virginia Tobacco Region Revitalization Commission gave RURALBAND a $1.2-million grant in 2018 to connect 500 homes. This year, Surry County offered $1 million over two years to hook up 500 homes by 2020.

PGEC also won $15.4 million from the Connect America Fund II (CAF), a Federal Communications Commission (FCC) program that incentivizes broadband providers to serve specific rural areas. The 2018 CAF auction was the first time the FCC opened the fund to electric co-ops, and 32 co-ops won 35 bids, securing more than $250 million over 10 years.

"We were one of the fortunate winners in Virginia as far as the CAF auction goes," Logan says. "We are very excited about this project and look forward to serving the community and our members."

The co-op's foray into broadband began with a fiber-optic backbone network for communications among its substations. RURALBAND leases unused bandwidth, or dark fiber, from this loop and connects it to a "middle mile" built by a state and private consortium that links to the internet through a data center in Ashland, Virginia.

RURALBAND plans to deliver broadband to all PGEC members even though the co-op averages between four and eight meters per mile.

"It's the electric co-ops being put in a situation to create opportunities for rural America, just like the Rural Electrification Act" of 1936, Logan says. "Eighty percent of our members have no high-speed option available to them. Our members need this. They asked for this. Our response as the electric co-op in their

paper and began a feasibility study.

The co-op had been eyeing the progress of other electric cooperatives deploying broadband. It considered a hybrid model that would run fiber across its overhead electric system, build fiber to the curb and then shoot wireless "last mile" connections for residential areas in its service territory.

minimum requirements for broadband—25 megabits per second (Mbps) to download data and 3 Mbps to upload. But running 100 percent fiber would have been prohibitive.

"We don't have a clean connection in our service territory to connect our substations" with fiber, Thompson says. "The cost to get through our connection points would be very expensive."

"Eighty percent of our members have no high-speed option available to them."

community is to give it to them."

Community Electric Co-Op: Overwhelming costs

For Community Electric Cooperative (CEC), the decision to forego providing broadband came down to dollars and cents.

The estimated cost of deploying high-speed internet access to unserved members was too high to justify CEC's investment, says Jonathan Thompson, chief operations officer at the 11,000-meter co-op, tucked in bustling Tidewater, Virginia.

"We operate in a somewhat conservative mindset when it comes to utilizing members' money," Thompson says. "When we plugged the [operations and maintenance] costs in, it was too much to recover considering the volume. That ultimately set us on the track of not doing it."

The co-op serves the suburbs of the state's largest urban centers: Virginia Beach, Norfolk, and Hampton Roads to its east and Richmond, the state capital, to its north. Many sprawling new neighborhoods there get their broadband from national, for-profit providers. Only the most rural or remote members lack an internet connection.

But when Isle of Wight County inquired if the co-op could bring broadband to its unserved residents, CEC put pencil to

The price tag for Isle of Wight broadband came in at $11.2 million, and a "rough extrapolation" for CEC's entire service territory reached $35 million to $40 million, Thompson says.

"We would have had to build out five to 10 miles to get to the first customer," he says. "That was going to cost quite a bit."

And those costs skyrocketed when factoring the region's low density.

CEC determined that 18 percent of the county's population was without internet access. It then applied the national average take rate for broadband of 29 percent.

"We had 900 people we felt confident would pay for the service," Thompson says.

Even if the co-op picked up more subscribers along the way, the take rate would remain below 2,000, he says. At that level, subscribers would have to pay $250 per month for "the bare bones cost of service" and getting the equipment up and running.

"From a business standpoint, the return on that was going to be very thin," he says. "At $250, there is no way the take rate would be 29%. It would be a lot lower."

The wireless equipment the co-op was considering would have met the FCC's

Further, Thompson explains, CEC's "chopped-up" service territory would complicate a broadband build-out and add costs for negotiating access to customers of an investor-owned utility and a municipality in the area.

"We would have to cut joint-use agreements [with the other utilities] and pay joint-use costs to go across their territories and get to their customers who fell into the unserved areas," he says.

The co-op's research also found that building a fiber network from its facilities to members' homes would consume about 10 percent of CEC's capital costs.

The co-op's board was "in total agreement that we couldn't risk that volume of money with such a high retail rate number and for such a low rate of return," Thompson says.

For now, CEC is keeping an open mind for delivering rural broadband. If prices fall on technology and equipment to get the job done at less cost, the co-op would reconsider taking on the task, Thompson says.

In addition, CEC would "happily partner with anyone willing to own the risk," such as neighboring co-ops or incumbent providers.

"We are shutting the door for now, but if anything changes with the calculations, we definitely will be interested in exploring it again," he says. "But until we see a drastic change, we are done."

IN THE
SPOTLIGHT

By Randy Turner
Director, Marketing Communications
Walker and Associates

MATTHEW COONEY

Matthew joins Walker and Associates in the role of Optical Business Development Inside Sales Executive, and is based in the Welcome, NC office. He is a graduate of Guilford College with a Bachelor's degree in Exercise Sports Science, and History as well as an MBA from The Florida Institute of Technology. He worked the last 10 years primarily in the wireless industry, spending 7 years at Verizon. While there, Matthew advanced from his role as a front-line sales associate to General Manager, overseeing sales teams responsible for inside/outside sales efforts and outstanding customer service. Most recently Matt held the title of Market Manager at The Revenue Optimization Company, leading teams to outstanding wireless sales results within box retailers across the NC Triad Region. Matthew brings a strong Inside Sales background to the newly formed Ciena Tiger Team, and has emerged as an immediate asset to Walker with its ongoing regional service provider activities.

matthew.cooney@walkerfirst.com
336-731-5289

PAUL HANNASCH

Paul Hannasch joins Walker as a Major Accounts Specialist who engages all levels to grow relationships with select customers, advocating for better supply chain management, project management and network solutions that advance his customer's strategic missions.

Paul has over 20 years working in the telecommunications industry, having launched his career with Midwest IOC customers and later, Tier 2 customers such as TDS, CCI, Century Link, and Frontier. Paul's tenure also includes working for manufacturers such as Paradyne, ADTRAN, PSI PowerTec and Zhone. Paul studied Computer Science at University Wisconsin River Falls.

paul.hannasch@walkerfirst.com
336-731-5354

NICHOLLE BRITT

Nicholle Britt has moved from her position as the Inside Sales Manager at Walker's GA office to assume new responsibilities as Walker's new Electric Cooperative Business Development Manager. Nicholle has 22 years in the telecommunication distribution industry. She joined Walker through an acquisition of Windstream Supply in 2009. Since then she managed the Georgia Inside Sales Department, working closely with customers and suppliers to drive sales and superior customer support. Her experience in previous roles allowed her to work with numerous markets, technologies and manufactures, making her an ideal fit for this newly created role. New work in the electric cooperative market as a result of new federal funding programs such as RDOF, along with legislative changes that clear the way for rural broadband expansion means new opportunities. Walker is excited about having Nicholle in this role, designed to help electric cooperatives discover new resources that will help them upgrade, protect and expand their networks. Nicholle holds a Business Operations degree from DeVry University and a MBA from Keller Graduate School of Management.

nicholle.britt@walkerfirst.com
336-731-5438

HARSHA JAYAWICKRAMA

Harsha Jayawickrama is currently an Optical Business Development Engineer at Walker and Associates. Prior to Walker, Harsha was a Principal Engineer at Ciena Corporation, supporting the Enterprise Sales Group with Optical, Ethernet, and Blue Planet software sales engagements. Earlier, he held various positions with Nortel Networks, including: Enterprise Network Solutions Architect, covering Routing, Switching, and Voice in the New York Metro area; Optical Business Development lead for the East Coast; and Account Manager for Optical Sales. Prior to Nortel, he was the Sales Engineer Manager for Bay Networks in the New York Metro area. Prior to that, he was a Senior Sales Engineer for Synoptics Communications, cover-

ing Network Equipment and Software. Prior to Synoptics, he was at Codenoll Technology Corporation, a vertically-integrated optical equipment manufacturer, where he held various positions including Director of Research & Development for Optical Networking. Harsha holds a BS degree in Electrical Engineering & Computer Science and a BS in Economics from the Massachusetts Institute of Technology.

harsh.jayawickrama@walkerfirst.com
336.731.5277

JOEY MANNO

Joey Manno assumed a new role with Walker in its Commercial Sales Insides Sales Teams as an Inside Sales Executive, moving from his role as an Inside Sales Executive for Federal Customers. He is a Marine Corps Veteran and UNCCH Alum. Joey began his career at Walker and Associates as an ISE in 1998, then moved into the structured cabling industry as a Manufacturer's Outside Sales Rep for Data Connect from 2001-2013. Manno spent three years as Branch Manager of a datacom and security distribution supplier and is excited about his new opportunities within the commercial inside sales organization. Joey enjoys spending his time with his wife, Sherri and their four children.

joey.manno@walkerfirst.com
336-731-5372

RYAN SEENANAN

Ryan began working at Walker and Associates last year as a Customer Service Representative, and was recently promoted as a Sales Executive to manage a named account. Ryan earned his BA in Business Administration and Management from the University of NC at Charlotte.

Outside of work, Ryan enjoys community service. In particular, he has volunteered often with Habitat for Humanity. His hobbies include hiking, fishing and travel.

Ryan officially began his new responsibilities January 1, 2020, and is anxious to take on new challenges. He states "I am grateful for this opportunity and the chance to further my career in the telecommunications industry with a company as prestigious as Walker and Associates."

ryan.seenanan@walkerfirst.com
336-731-5366

JOE DEFRANCO
RETIREMENT

Joe DeFranco, Walker's Director of Federal Sales, retired in 2019 from his storied career in telecommunications. Joe joined Walker in fall 2017 as Director of Federal Field Sales. Previously he was the VP of Federal Sales for CommScope with an 18 year career there in technical and sales roles primarily serving the Enterprise markets. Prior to CommScope, he achieved the rank of Lt. Col in the Marine Corps from 1976 – 1998 serving in variety of command and staff positions in communications, artillery and Joint Staff Assignments. He is a graduate of Western Illinois University, Naval War Academy and University of Illinois. We wish Joe the best as he enters retirement, enjoying more time with his family, friends and hobbies.

JOYCE NEEDHAM - RETIREMENT

Joyce Needham began her career at Walker as a Sales Executive in November, 1987. Her initial responsibilities were with the Bell Operating companies across the US. Eventually she handled a variety of geographical territories based on the re-structuring of the inside sales organization as the company grew during the 1990s

Over the last 16 years her territory consisted of TDS and other accounts in Illinois and Wisconsin. In her final years at Walker she managed a named account, which included managing projects with them and their 30+ contractors.

Joyce retired December 31, 2019 but will continue working part time for a few months to help with transitioning her replacement in account management responsibilities. She is looking forward to catching up on several projects at home, plus flipping and selling a house or two. She also expects to spend more time at the beach, plus take some day trips around her home state of NC. She also expects to spend a little time in a front porch rocking chair! What a change in pace! Best wishes for a long and happy retirement, Joyce!

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Create a Meaningful, Relevant NEXT

By Sam Horn
Author of SOMEDAY is Not a Day in the Week

If I were to tell you that you'd only get six or seven of something your entire life, you'd understand it was special and value it, right?

Well, most of us only get six or seven decades in our life, (if we're lucky), and we're starting a new one now. So, have you reflected on the previous decade? Remembered and imprinted highlights? Are you looking ahead to your goals for this new decade and how you intend to achieve them?

Here's your chance. Sit down to a good meal with someone you care about. Or, share and discuss these questions at a team meeting at work. Answer these questions one-at-a-time. Take your time. After all, there's no present like the time . . . and a decade deserves it.

1. WHERE were you living ten years ago? Were you happy there? Why or why not?
2. WHAT were you doing ten years ago? Was it fulfilling? Frustrating? How so?
3. WHO were you spending most of your time with ten years ago? Were they good for you - or not so much? How so?
4. Could you have predicted WHERE you'd be living right now? Are you glad you're living in this home, this city, this part of the world? Why so or why not?
5. Could you have predicted the WORK you're doing now? Are you satisfied? Disappointed? Why so?
6. Could you have predicted the FRIENDS – FAMILY - COWORKERS you have now? Are they different? The same? Are you close? Connected? Why or why not?
7. What's the biggest SURPRISE from the past ten years? Something you didn't see coming couldn't have guessed would happen?
8. What's the biggest REGRET you have? Something you wish you could do differently if you had the chance? How has it affected you?
9. What was the MOST CHALLENGING part of the past ten years? Something that knocked you on your heels, took a toll on you? How have you dealt with it?
10. What was the most SATISFYING aspect of the past ten years? Something you experienced, contributed or achieved that was deeply rewarding? Who are the three people you're most GRATEFUL for? Why?
11. How have you CHANGED? Are you a better person, parent, partner, leader? How so?

Now, look ahead to the NEW decade.
1. What are 2 things you can do at home and at work on a daily basis – that no matter what happens that day – as long as you do these, it will be a good day?
2. What is a habit you want to keep? What is a habit you want to start, stop, do differently?
3. Who are 3 people you want to spend more time with? How will you make that happen?
4. How will you add value and contribute your gifts to the world?
5. What is a dream – something that is calling you – that would add meaning and joy to your life and career? When and how will you set that in motion?

Pablo Picasso said, "The purpose of life is to find your gift, the meaning is to give it away."

As we start this new decade, are you clear about your gifts? Are you giving them away so you are making a difference now, not someday? When we look back at our life and career, THIS is what will matter. Did we connect? Did we contribute? Did we make the most of our gifts?

If we want to stay personally and professional relevant, if we want to thrive as an individual and as an organization, it is up to us to make that happen. Too often, we set aside reflection because we're just too darn busy. The result of that? We miss our life. As Paulo Coelho says, "One day you're going to wake up, and there won't be any time left to do the things you've always wanted to do."

A client told me these DECADE questions motivated him to join Entrepreneurs Organization. He told me, "When I looked back over the past decade, what stood out is how stressed I've been. I feel constant pressure to pay the bills, run the business, solve all the problems and make everything work. What I realized is … I've been trying to do all this on my own. A buddy has been asking me to join

"There is no present like the time."

EO for years, but I've always been 'too busy.' He told me, 'That's exactly why you should join EO. You'll have a chance to talk honestly about what's really going on in your company instead of trying to figure it out all on your own. Plus, your forum mates are all business owners who have 'been there, done this' so their advice will save you a lot of time, money and hassle."

My client told me, "I just got back from my first EO meeting. All I can say is, 'Why didn't I do this sooner?' I already got an idea on how to handle a sensitive personnel issue I've been putting off because I just didn't know how to handle it. And I can hardly express what it meant when a man shared how his 6 day work week had taken a toll on his marriage and I realized I'm not the only one."

Are you busy, stressed, feeling a bit burned out? Are you trying to figure it all out by yourself? If so, maybe one of your resolutions for this year is to get involved in a professional organization that gives you opportunities for heartfelt discussions.

Lily Tomlin said, "Remember, we're all in this alone … together."

A new decade is a fresh start. How will you make the most of yours? Going deep into these DECADE questions is a start. So is reaching out to others so you're doing your life and career together … instead of trying to figure everything out on your own.

After all, when author E. M. Forster was asked the meaning of life, he said two words, "Only connect." Here's to creating meaningful, relevant connections for all involved … in the years ahead.

- - -

Sam Horn, CEO of the Intrigue Agency and 3 time TEDx speaker, - is on a mission to help people create a quality life-work that adds value for all involved. Her books have been featured in NY Times, on NPR and taught to Boeing, YPO, Intel, ASAE, Cisco, Accenture, NASA.

CONNECT

As an active member of multiple state, regional and national industry associations, Walker and Associates is strategically engaged with organizations supporting telecommunications markets. We demonstrate our commitment through event sponsorships, contributing educational content and advertising, and exhibiting at conferences and expos.

Look for us at the events listed here, and refer to the Upcoming Events section of our website, https://walkerfirst.com, for additional details.

We look forward to seeing you at these events!

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UTC Region 7	New Orleans, LA
MARCH 2020	
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NRECA Tech Advantage	New Orleans, LA
ITA Showcase Northwest	Portland, OR
UTC Region 3 Spring Meeting	Franklin, TN
NTA Technology Day	Grand Island, NE
Big Sky Tech Fest	Havre, MT
MTA Annual Convention	Minneapolis, MN
CalCom Tec Expo	Sacramento, CA
UTC Region 6	Overland Park, KS
ICA Annual Meeting & Expo	Des Moines, IA
FNA Conference Summit	Jekyll Island, GA
TANE Spring Symposium	South Portland, ME
SCTBA Annual Convention	Charleston, SC
ACE / RUS Symposium	Oklahoma City, OK
APRIL 2020	
TCEI Expo	Belton, TX
Berkeley Lab	Berkeley, CA
UTC Broadband Workshop	Charlotte, NC
OTA Outside Plant Seminar	Newport, Oregon
Broadband Communities Summit	Houston, TX
AFCEA Belvoir Industry Days	Oxon Hill, MD
MAY 2020	
ANMTA Spring Conference	Santa Ana Pueblo, NM
NDTA TOC Conference	Fargo, ND
ATA Annual Meeting	Fairbanks, AK
Mountain Connect Broadband	Dillon, CO
WSTA Annual Conference	Lake Geneva, WI
UTC Telecom and Technology	Providence, RI
NTA Spring Conference & Annual Meeting	Lincoln, NE
KTA Annual Meeting	Lexington, KY
JUNE 2020	
INDATEL Summer Symposium	Minneapolis, MN
Tri-State Conference (hosted by SCTBA)	Charleston, SC

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