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Editor's Letter

Although 22 years have passed since the Telecommunications Act of 1996 passage, our industry is still engaged with new opportunity and challenges. The rate of innovation far outpaces regulation, however, resulting in slower, more costly deployment of broadband services. Add to that the complexities of politics, both local and national, and we begin to understand the daunting task of bringing broadband access and choice across the country.

This issue of Skinny Wire accomplishes a few things in adding dialog to the topic of municipal broadband. Let's first say, however, that by municipal broadband we are referring to not only our nation's Tier I cities, but also the Tier II and Tier III cities ripe with need and opportunity. Success stories abound, and two are featured in this issue. Ciena, on page 6, recounts their engagement with Roanoke Valley Broadband Authority (RVBA), detailing the experience of bringing next generation broadband services to Roanoke and Salem, VA where fewer than 11% of the population had access to more than one ISP. And CommScope, on page 32 recounts their success story of bringing advanced fiber services to 300,000 underserved families in North Carolina. Both these stories speak of success by virtue of public/private funding ventures that resulted in new broadband services that enhanced community services, increased regional job competitiveness, and more.

As Chip Pickering, CEO of INCOMPAS, points out in his article, however, there is still much to be done. He points to current statistics that 89% of Americans have little to no choice in broadband services, limited by having only one provider as an option. How can our cities, communities, regions, incumbent carriers and others rise to the opportunity of creating new opportunities and new competition?

And then, of course, we have some technical articles from our most trusted partners. They weigh in on special considerations for infrastructure and technology to decrease deployment time and stretch the investment dollars. Their insight, as always, is spot on.

Walker's newest relationship is with the National Rural Electrical Co-operatives Association, and their content is strongly featured in this issue. You'll find Walker a first-time exhibitor at TechAdvantage in Nashville the end of February. We appreciate this new partnership with an association focused on innovation and collaboration, and look forward to years of work together. Be sure to check out their content, beginning on page 20.

My favorite quote from this issue, though is from my new friend Alan Fitzpatrick. In his article on page 4, he states "One thing is clear: where there is broadband competition, speeds go up and prices go down." Here's to the work, the collaboration, the breaking down of barriers that work in the interest of better broadband options for all.

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Public-Private Partnerships for Better Broadband

By Alan Fitzpatrick
CEO
Open Broadband, LLC

The need for fast, reliable broadband is stronger than ever before. Counties and towns across North Carolina are taking action to improve broadband for constituents, increasingly through a Public-Private Partnership model. This article describes why the need for broadband has become such a paramount issue, how a Public-Private Partnership model can work, and examples of North Carolina communities which are benefiting from this approach.

Why Broadband is such a Paramount Issue

Internet access is increasingly being compared to water and electric service as a fundamental right. A brief summary of driving factors:

1. North Carolina students require access to the internet for conducting research, accessing the school's online tools, and downloading their textbooks. In some areas of our state we see 20% of homes do not have a broadband connection. This Digital Divide creates a 'homework gap'.
2. Healthcare access is increasingly done online, from healthcare records, to researching a doctor, to online patient visits. Our rural citizens may have to take an entire day off work to visit a doctor, and as a result, may not go. Access to online healthcare can help.
3. We live in an era of user-generated content creation. Social media posts, pictures, videos we take on our smartphones – they are all user-generated content uploaded to the internet. Anyone who has uploaded 1000 pictures, or a 2 GB video file, knows that upload speed can mean minutes or hours, depending on your service.
4. Businesses use the Cloud more than ever before. Instead of files transferred across a company LAN to servers down the hall, they are sent to cloud servers. Businesses are increasingly dependent on broadband connections, and symmetrical access is a key component.
5. Gigabit internet has shown North Carolina what is possible. New entrants like Google Fiber and Ting are setting a high bar, and the municipal networks in Wilson and Salisbury are great role models. NorthState, Riverstreet, Spectrum, and some of the incumbents telcos are also taking action. Even wireless ISPs can offer gigabit speeds. My company, Open Broadband, is rolling out fixed-wireless gigabit access in each community we enter.

One thing is clear: where there is broadband competition, speeds go up and prices go down. Unfortunately, many locations in North Carolina fall outside of these competitive service areas and may have no access to 25 Mbps broadband, or they only have one choice. Satellite, DSL, and cell phone hotspots are not cutting it.

Counties and towns across North Carolina are increasingly hearing from concerned citizens wanting access to affordable broadband. By law (HB129), NC government entities are essentially prohibited from launching new ISP service directly to residents (Wilson and Salisbury are grandfathered in existing footprints). So what's a county or town to do?

Counties and towns are increasingly issuing RFIs and RFPs to attract new ISPs. At Open Broadband we've participated in several RFI/RFPs, including Wayne County, Alexander County, City of Laurinburg, Chatham County, and Orange County. Persons County, the SWC Commission, Highlands, and Cullowhee are a few more examples. We've even seen a neighborhood HOA in Chatham County issue an RFP. There have been so many over the last 2 years I can't list them all!

## How a Public-Private Partnership Model Can Work

When a county or town wants to engage with an ISP to improve broadband access, the first step is to determine desired outcomes. The top priority we've seen in North Carolina RFI/RFPs has been increasing broadband availability, covering areas which do not have a 25 Mb broadband provider. Other desired outcomes include educational opportunities, economic development objectives, faster internet options, and a competitive entrant to "shake things up" and spur a positive competitive reaction from other ISPs.

One successful model has been a Private Investment, Public Facilitation approach. This is one of the approaches recommended by the Coalition for Local Internet Choice (CLIC - see http://www.localnetchoice.org/) and we've seen successful examples of this in North Carolina. This model typically includes:

- Making public real estate assets like towers, building rooftops, fiber, and conduit available.
- Sharing GIS information on these assets.
- Streamlining the permitting and inspection processes, such as one-touch-make-ready on pole attachments, and a dig-once policy on buried fiber.
- Providing an economic development incentive to attract ISP investment.

Open Broadband recently conducted a Broadband Feasibility Assessment for Alexander County (https://alexandercountync.gov/broadband-feasibility-study-shows-potential-in-alexander-county/) in which we recommended this approach.

This partnership model focuses on attracting private company investment, and minimizing the cost to the county/town. The ISP invests capital to deploy broadband, and the partner community seeds the effort with a small economic development incentive. This partnership approach results in very low risk to the county/town, and a modest public cost. Examples of Broadband Public-Private Partnerships in North Carolina
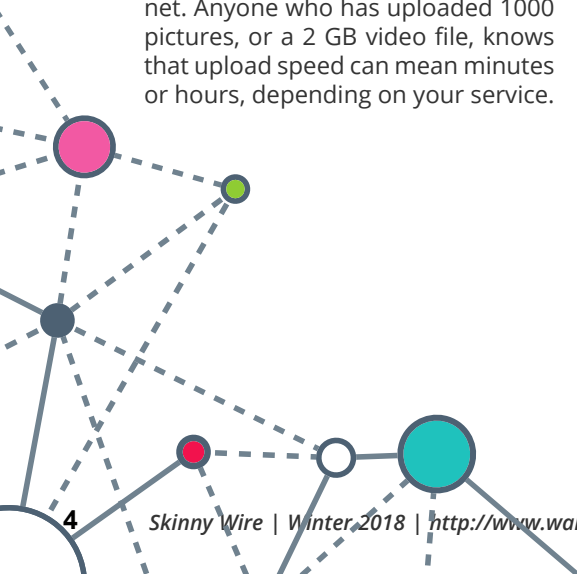
A highly visible example of this approach was the attraction of Google Fiber to Charlotte and the Raleigh/Durham area. Charlotte Hearts Gigabit, a community advocacy group of which I am a part, summarized the Google Fiber Checklist in a series of blog posts (https://www.charlotteheartsgigabit.com/blog/2014/4/8/charlottes-city-checklist-for-google-fiber-part-2). The Checklist included:

- Information about existing infrastructure: utility poles, conduit, and water, gas, and electricity lines.
- Access to existing infrastructure. In order to avoid duplicating poles and/or digging up streets Google asked for the ability to access and lease existing infrastructure.
- Help to make construction speedy and predictable. Google requested an efficient and predictable permit and construction process appropriate for a project of this size.

Ting Internet is another example in Holly Springs. By leasing town-owned fiber for its backbone, Ting has built out a fiber-to-the-premise network throughout much of Holly Springs and has started offering symmetrical gigabit Internet access to homes and businesses. As reported by CLIC, "key factors in Ting's decision to invest were the town's willingness to lease excess fiber in its backbone and adopt best practices. Among other things, the town offered efficient government processes, access to information and facilities, and facilitation and support—all of which boosted Ting's confidence in the community as an investment opportunity."

Open Broadband is following this approach and has projects in Gaston County, Wayne County, Stanly County, and previously mentioned Alexander County. In Belmont NC we've worked with the city to provide free public Wi-Fi along Main Street downtown, service to their Police Department, many city buildings, and a gigabit internet equipped innovation center - TechWorks. The investment is being made by Open Broadband, but Belmont and TechWorks are partnering in the effort. Mount Olive is fast approaching as our next deployment of this model.

For more information on Public-Private Partnerships for better broadband, I highly recommend the following resources:
- The NC Broadband Infrastructure Office, creators of the state broadband plan. They have an exceptional staff providing support for all communities in our state. (https://ncbroadband.gov/).

- The Coalition for Local Internet Choice (http://www.localnetchoice.org/). A national organization with a local division (CLIC-NC), they have excellent resources for public-private partnerships.
- NC Hearts Gigabit (http://ncheartsgigabit.com/) is a non-profit organization in which I am involved that convenes regular meetings across the state to share best practices, and promote universal availability of affordable high-capacity internet to create thriving local communities. Our first conference will be April 20 at the Rural Center in Raleigh (https://ncheartsgigabit.splashthat.com/).

I welcome constructive feedback, questions, comments, and different points of view. Reach me on Twitter @AFitzpatrick1 and connect with me on LinkedIn.

About the Author:
Alan Fitzpatrick is the CEO of Open Broadband, an ISP providing broadband internet service to underserved communities. Prior to Open Broadband, Alan had 20-years management experience in the Telecommunications and Software industries, including COO of DC74 Data Centers, COO of VoIP Services at ACN Inc., Sr. VP of Engineering for US LEC Corp, and founder and CEO of two software companies.

Alan is a promoter of a gigabit internet infrastructure in North Carolina, and co-founded Charlotte Hearts Gigabit, widely credited with attracting Google Fiber to Charlotte. He later joined as a co-founder of NC Hearts Gigabit. Alan is also an Adjunct Professor and enjoys teaching entrepreneurship and technology courses for Central Michigan University and Johnson and Wales University.

Alan has an MBA from Vanderbilt University and a B.S. in Industrial Engineering from Purdue University.

Collaborative, Open-Access Networks May Be the Winning Ticket

By Daniele Loffreda
Senior Advisor, Market Development, State/Local Government and Education (SLED)
Ciena

Communities large and small across the U.S. are embarking on initiatives to ensure that their citizens and businesses have equal access to affordable broadband services. Government leaders recognize that broadband infrastructure is a critical enabler of economic development, business expansion, job growth, educational improvements, and healthcare enhancements.

Ciena and Walker collaborated to design and deploy a 47-mile fiber network serving businesses, anchor institutions and residential service providers.

The Roanoke Valley in Southwest Virginia includes the cities of Roanoke and Salem, and Roanoke, Botetourt, Franklin and Craig counties. In 2011 local business leaders and government officials faced

speeds throughout the area lagged both national and state averages. Only 8% of the region had access to fiber, only 4.5% could access 1Gbps speeds or faster, and only 11% were able to choose from more than two ISP options.

Due to state statutes limiting municipalities from offering competitive services to residents, the RVBA focused on providing services to businesses and anchor institutions. Funding options were limited because the region was deemed too small to attract enough private investment, but too big to apply for federal broadband grants. Following extensive discussions with service providers, local and county governments, vendors, businesses and citizens, the RVBA decided to deploy a wholly-owned, fiber optic network.

The Authority opted for an open-access policy that allows multiple Internet Service Providers to use the network to get closer to residents throughout the valley and reducing their operational costs. The RVBA believes that open-access networks provide lower prices and better consumer choice by enabling new and innovative ISP's to enter the market and compete for residential customers.

They also realize the need to strike a difficult balance between being good stewards of public funds, achieving the vision of ubiquitous broadband, and allowing for the pressures faced by private partners to achieve a reasonable return on investment. If they get it right, they will have a financially sustainable, next generation network that achieves the vision of broadband for all. If they get it wrong, they waste tax payer dollars and fall further behind the economic growth curve.

In practice, many community broadband projects involve a group of municipalities cobbling together multiple sources to build out a network. One example of this approach is the Roanoke Valley Broadband Authority, a project in which

rising unemployment rates and stagnant commercial growth. They agreed on the need to diversify the local textile and manufacturing based economies by recruiting businesses in high-wage industry clusters. They also wanted to attract technology startups, develop a skilled workforce, improve literacy and graduation rates and attract young professionals to work in the region. They realized that all these objectives required affordable, high-speed connectivity.

The findings of a comprehensive broadband study and recommendations from a newly formed broadband task force resulted in the creation of the Roanoke Valley Regional Broadband Authority (RVBA). The study found that broadband

The RVBA had to overcome resistance from incumbent service providers, address funding challenges and alleviate concerns about a government entity managing a network. The decision to follow a multi-phase, success-based project approach, was crucial in overcoming all three hurdles. Other key enabling steps included

- Developing cooperative agreements for localities with technical specifications and commercial terms for operating the network and exchanging data across municipal boundaries
- Enacting "dig-once" requirements for construction projects, including the placement of open-access conduit for optical fiber
- Communicating frequently and transparently with the public

Construction on the initial 47 miles of fiber began in April of 2015, focusing first on the cities of Roanoke and Salem. Construction was completed and the network was "lit" the following year. The design features a redundant fiber ring that leverages converged packet optical and packet network technology. Scalable to 200Gbps, the network footprint covers more than 200 business parks, large institutions, government facilities and small businesses.

The RVBA launched three types of services targeted towards businesses, institutions and Internet Service Providers: data transport, transport service plus Internet access and dark fiber. Based upon service subscriptions from customers like Western Virginia Community College, Feeding America Southwest Virginia, the Western Virginia Water Authority and Meridium1, the RVBA began a 25-mile expansion to pass another 650 premises. In September of 2017 the RVBA announced that ABS Technologies, one of the first ISPs to use network, had decided to expand its services to residential customers2. The ISP stated that without the RVBA fiber network, there was "no way" the company would have been able to pursue a residential buildout. And while RVBA will continue to offer business services, Executive Director Frank Smith reiterated that "the whole purpose of the network is to have other providers ride the network, and we want to make sure we're providing that backbone infrastructure for them." Planning is already underway for a potential phase III expansion of the network. One additional benefit to the greater community is that incumbent service providers have had to significantly reduce prices to keep up with the new competition.

This multi-community model, in which a central public broadband authority offers capacity to multiple ISP and service providers while a central broadband authority offers basic services to anchor institutions has proven successful in many projects across the U.S. This model is not without its challenges however. The ability to secure agreement on strategy, control, funding and operations between multiple jurisdictions is no easy task. In the examples cited above, some cities and counties were "all-in" from the beginning, while others joined in later phases of the project. Others declined, choosing instead to pursue an individual course of action. The challenge of how to get disparate municipalities and counties to agree on a common goal of ubiquitous broadband can seem insurmountable, and frustrating.

Dr. Flo Raitano, Executive Director at the Denver Regional Council of Governments (DRCG) points out that there is no "magic bullet". The DRCG includes fifty-nine member governments serving a region of over 5000 square miles. Dr. Raitano has learned that it is critical that each member participate in drawing up guidelines and policies. It is also important that the central broadband authority acknowledge that each individual member has a different vantage point, and may need to approach implementation using a different strategy to achieve a common regional outcome. For Dr. Raitano the most critical factor may be designing a partnership and network platform that is generic or broad enough to accommodate a variety of solutions and approaches.

Communities contemplating a broadband initiative need to consider the degree of risk tolerance, potential benefits and degree of desired control3, at both the collective and individual member levels. They also need to decide which of the various broadband investment models – ranging from the traditional models to the emerging public-private partnership approaches- works best for them. Finally, they should take heed of lessons from the successes and failures of other community broadband projects. The model that has the best track record to date is some variation of the hybrid open-access approach, which involves a public broadband authority owning and operating a core network and selling services to businesses and anchor institutions, and allowing multiple ISP's to leverage the network to sell services to residents. This approach combines the best capabilities of the public and private sectors, and empowers the community with an active role in shaping the future of local internet access.

1"RVBA Poised to Help City Schools", RVBA Press Release

2"Roanoke Valley Broadband Authority Moving Ahead", Community Networks

3Hovis, Joanne; Schulhof, Marc; Baller, Jim; and Stelfox, Ashley. "The Emerging World of Broadband Public–Private Partnerships: A Business Strategy and Legal Guide." Evanston, IL: Benton Foundation, May 2017. benton.org/broadband-public-private-partnerships-report

Daniele Loffreda is Senior Industry Advisor, State/Local Government, Education and Healthcare market development. In this role he leads Ciena's initiatives to apply hardware, software and services technologies to help these sectors ensure that their networks have the capacity to support their digital transformation, optimize their cloud strategies, consolidate infrastructure and improve data security.
Daniele has more than 20 years of experience helping the public sector leverage Information, Communications and Technology solutions provide greater value to their constituents, improve their operations and generate higher returns on public funds.

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Learn more at adtran.com/broadband

Success Factors for Municipal Networks

By Timothy Brown
Director, Security and Virtualization
Network Utility Force

Walker and NUF have individually and jointly been participating in many municipal broadband deployments over the past years. These experiences have placed us in a position to identify success factors for municipal deployments.

One significant observation from this time is that there is often too great a focus on residential customers, even though ROI can sometimes be achieved faster by focusing on municipal, regional government, and business customers.

Customers for a municipal broadband network often span spaces in the marketplace that have very different classes of service. On one side, residential customers seeking Internet access are often coming from DSL or cable networks and have expectations associated with experiences they've had with those networks (either from other places they've lived or from existing service they have within the municipality). On another side, business customers are looking for ways to reduce expenditure but wish to concentrate their spend within their local business climate for a variety of reasons while still maintaining the same or better functionality. On the third and final side of the triangle, municipal consumers such as utilities and public safety customers often have vastly different requirements than either business or residential customers.

To satisfy these different market segments, a municipal broadband network has to have good operating and start-up capital, depth of services, alignment between stakeholders, performance, reliability, and customer service.

Many municipal networks focus on spending their grant, SPLOST or other funds on the physical plant. In general, budgets are often correctly focused on the physical plant and associated core network equipment (e.g., GPON, direct fiber or wireless termination gear, etc.) but fail to include network management, monitoring (required by Federal and/or state statute), and infrastructure servers. If you cannot monitor your network or rapidly troubleshoot problems, customer service will suffer. If you cannot pass location for voice-over-IP services to E911 providers or be able to monitor traffic per CALEA or other statutes, you may be entering into liability and risk which your municipality doesn't carry insurance for. Providing common infrastructure services such as DNS, RADIUS, management, and logging are often overlooked portions of running a network. These services are very valuable in reducing operational expenditure by catching problems early, in helping achieve understanding the usage characteristics of your network, and in creating better security for municipal customers.

Strangely, preparing a network for these customers and services is often relatively small dollar expenditure when completed as part of the initial design and implementation stage. Retrofitting such a network after the fact, however, can be costly and service impacting.

We have identified four opportunities easily achievable in the deployment of municipal broadband networks which open entirely new revenue streams:

- Layer 2 VPN - L2VPN offers a business exceptional control over interconnecting different sites and services, allowing businesses to do flexible any-to-any interconnect between multiple sites. It also allows multiple dwelling units (MDUs) to provide inter-facility maintenance and operations services. It is one of the more technically complex items to deploy but its amortized maintenance costs are very small.
- Layer 3 VPN - L3VPN offers individual sites IP connectivity on a semi-private network. This allows your customers to reduce their equipment costs by not requiring a firewall or VPN termination device at each location, and also allows them freedom in network topology by providing services at a central site for all branch offices or providing Internet access for employees at each branch office that is functionally separate from the business communication, to include two examples.
- Wireless backhaul - Mobile carriers have challenges in providing cost-effective, high bandwidth access to cellular towers. It is feasible for municipalities already providing a fiber buildout in high growth areas to extend this fiber to carrier towers owned directly or leased through third parties.
- Managed security services - The advent of SDN technologies allows municipalities to offer end users and businesses a custom firewall. Many businesses have high security demands but do not necessarily have the IT staff to support the infrastructure requirements needed to provide acceptable levels of protection. The municipality can efficiently deliver virtual firewalls to these customers and insert them into the traffic path with very limited up front capital expenditure: 3-4 general purpose servers can easily support tens if not hundreds of virtual network elements.

It is important for municipalities to understand that adoption rates for services often closely match up with the market expectations set by existing service providers.

In summary, building a successful municipal network isn't just about what buildings you serve or how much capacity you can deliver down Main Street - these are essential differentiating factors, but certainly not the only ones. Municipalities that provide well-run networks with active monitoring and network services and service mixes closer to what is extant in the market will see greater success in their take rate, revenue generation, and ROI in their networks.

The Innovation Journey for Rural Broadband Operators

By Prayson Pate
CTO, Ensemble Division
ADVA Optical Networking

There is tremendous innovation taking place in the telco world. Operators are offering new cloud and connectivity services and making use of new technologies such as NFV, SDN, 5G, and IoT. Doing so opens the door to new revenue opportunities. It also powers new partnerships with enterprises, municipalities and utilities.

But the move to these new technologies is not free or easy. It requires major changes in the skills needed by their teams. Smaller operators may not have the wherewithal to take on this innovation by themselves. The situation is even more difficult for their prospective partners.

So how can rural telcos and their partners make the most of new technologies and be part of new collaborative ecosystem, while minimizing the associated work and cost? Here are some best practices.

It starts with fiber

As the car guys say, there's no replacement for displacement. The same applies to bandwidth. That's especially true for telcos, whose customers have an insatiable appetite for data. End users need staggering amounts of bandwidth for videos and multi-cloud applications. According to the latest NPD Group Connected Intelligence Smartphone and Tablet Usage report, "the average U.S. smartphone user consumes a total of 31.4 GB of data on a monthly basis (including Wi-Fi and cellular consumption). This is up 25 percent from one year prior, when the total monthly data consumption averaged 25.2 GB per user."

Investments in fiber give rural telcos an asset that is not available to OTT players. And, the required investment is lower than ever thanks to the availability of a variety of innovative fiber solutions. Combined with valuable right of way, operators have tremendous opportunities to provide high-speed 10G and 100G connections to national fiber backbones.

New fixed wireless technologies (e.g., 5G, NB-IoT, and LTE-M1) can provide interesting and low-cost access to endpoints. They don't remove the need for fiber. In fact, the deployment of these technologies drives even more data into the network, from an ever broader geography. In addition, broadband rural operators can use fiber assets to offer backhaul for new wireless footprint as part of wholesale agreements with major wireless providers.

Acquire technology as a turn-key system covering transport, services, and management

Fiber is necessary, but it's only part of the story. There is also the need to be able to define, deploy, manage and assure services. That means a complete system comprising access, transport, test and management systems.

- Access includes the demarcation point for services. This may be a standard NID, or it could be a universal CPE (uCPE) platform for instantiation of services.
- Transport is fiber, optimized for different applications. This includes local backhaul, metro transport, and data center interconnect (DCI).
- Test includes service activation, service assurance, and service diagnostics. Test must cover multiple layers and access technologies, especially fiber, Ethernet, and IP.

• Management includes both vendor-supplied tools along with home-grown systems as well as standard and open APIs to feed into third-party systems.

How can operators ensure all these pieces work together? Tier 1 operators tend to take on the task of integrating a system of components to create a complete network. Rural broadband operators have limited resources and manpower. They usually need help integrating systems, and suppliers are ready to assist. But there's a catch. Integration is easier if all the components come from a single supplier. However, that approach tends to lock the operator into a relationship where all the power is on the side of the supplier. Fortunately, there is a better approach.

Require an open architecture – and an open supplier

The big push now is for multi-vendor systems. This approach enables competitive awards for each component in the system. It also empowers independent innovation in each technology segment. A variety of new technologies is powering the open approach to innovation:

• An open line system (OLS) disaggregates optical transport into separate components that may introduce more flexibility to the evolution of the optical transmission network.
• Advanced Carrier Ethernet 2.0 services. These include E-Access, which acts as a new T1.
• Network functions virtualization (NFV) replaces network appliances (e.g., routers, firewalls, voice systems) with software network functions running on commercial off-the-shelf (COTS) servers.
• Software-defined networking (SDN) allows software to control network topology, forwarding, and even protocols.
• Software-defined WAN (SD-WAN) offers a way to provide L3 VPNs without the cost and complexity of MPLS.

Who can provide a turnkey solution based on an open architecture? One obvious answer is innovative distributors like Walker and Associates. Walker has been providing integration and installation for years, and those services are now extended to cover the innovations listed above.

Ensure support for today's revenue-generating services

When presenting to a telco audience, I sometimes use a line that helps identify any operators present. I say: "The legacy part of the network is the revenue-generating part of the network." That's sure to get the telco guys nodding their heads in agreement. As a side note, I will be changing that line this year. Legacy sounds so old-fashioned. Going forward, I will be using "heirloom" and "heritage" – they sound so much better!

At any rate, the services are the point of the network. Any changes to enhance and expand the infrastructure must also improve the delivery of services such as DIA, Layer 2 VPN, Layer 3 VPN and even SD-WAN. Suppliers like ADVA and Walker can ensure that technology migration is both straightforward and compatible with improved service delivery – and profitability.

Insist on a path to future cloud-centric technologies

While today's services are critical, they are not the end. Any strategy for improving telco infrastructure must account for the cloud – both as a target of services, as well as a means for delivering those services.

Cloud delivery means providing end users with assured connectivity to data centers. The preferred way is with fiber and a direct connection to the data center. That's not always possible, so approaches such as SD-WAN and software encryption are also needed for a complete delivery solution.

Cloud technologies such as NFV and SDN are essential for tomorrow's telco network. Any update to the infrastructure must include these technologies to provide a path for strategic innovation.

Help is available

Updating and expanding telco infrastructure is never easy, especially when it includes the deployment of new technologies. Fortunately, help is available. With years in partnership, suppliers ADVA and Walker provide operators with innovative solutions tailored for specified deployments. That partnership includes products and technologies that exemplify the recommendations listed above. Together, we can build a reliable infrastructure – one that is equipped to meet your current needs, and innovative enough to satisfy the growing demands of tomorrow's customers.

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.

Free Financial Models for Broadband Builds

Real estate developers and communities don't have to rely solely on costly consultants to get the advanced broadband networks they need

By Steven S. Ross
Broadband Communities

When it comes to financial modeling of broadband deployment investments, particularly fiber-to-the-home builds, the best things in life really are free. Any subscriber to Broadband Communities Magazine can download our models at no charge, along with detailed documentation. Need help using them? We'll provide a free hour or two of live help as well, over the phone or on GoToMeeting. Beyond that, we do charge a fee for help, but it is extremely reasonable. We can work with local bankers, and even travel to prospective deployers to help run public or company meetings. As always, we'll be hosting a free two-hour preconference workshop on the models at our next Summit, in Austin, April 30.

Since 2010, these models have become the world's most widely used. Broadband-starved communities and small private providers and electric co-ops use the models when they first consider a new network or network expansion. The models lower the "barrier to entry" and have resulted in many new networks that otherwise never would have been built. Communities worry, for instance, about hiring a consultant for $50,000 or more only to discover that they cannot possibly afford to build a network. Also, communities have more confidence in a financial model when they fully understand what goes into it.

The Broadband Communities modeling tools run in Excel or Excel clones such as Open Office. The formulas are easily modified, and they are designed so new rows and columns can be added without breaking anything elsewhere on the spreadsheet. By default, they print to a single page -- great for distribution at public meetings and in initial approaches to sources of deployment capital.

One model tests financial feasibility of network deployments in multiple-dwelling-unit buildings (MDUs) or planned unit developments. We've found that many developers themselves use the models to consider whether or not to build fiber and Cat 5 Ethernet cable into their structures. They also use the models when negotiating with third-party broadband providers.

The latest model, released January 2017, allows multiple sheets covering multiple time periods, construction phases, and even different deployment technologies and customer services for different neighborhoods in a build's footprint. It also covers a five-year initial deployment schedule, rather than the four-year default for the other models. All the models can easily expand that period to whatever you wish, of course. Many users choose six or seven years.

The models do not replace consultants and other experts, who generally can offer ways to lower the cost or increase the benefit of a network build. Most users find that the models mainly help get them to the next step -- hiring a consultant. At that point, they find that many consultants are using the Broadband Communities models themselves. We encourage it, and allow them to do so royalty-free. They can even remove our name. That way, we help grow the industry. Everyone benefits.

DETAILS

There is a common-sense philosophy about computer models. They should contain enough detail about key leverage points such as take rate and revenue to come to a rough conclusion. But they cannot be so fine-grained that the forest of detail hides the trees you need to make a decision. And of course, make sure that you are not wildly optimistic or pessimistic. That is, all the uncertainties should not be in the same direction!

The models by default tend to underestimate revenue. A network that adds 1,000 new subscribers a year gets credit for only half the revenue that year, for example, because they don't all sign up on January 1. Users can change the defaults. Revenue per user tends to grow as households and businesses are offered new services or have new needs. Users of the Broadband Communities monthly cash flow models report that they add detail as they gain construction and operational experience. They eventually transition to standard bookkeeping tools, keeping the model to forecast churn and promotional pricing strategies.

Finding reliable cost and revenue data is always an issue. We suggest talking to equipment venders and distributors, especially full-service firms like Walker. Other sources include other communities, Tier 3 local exchange carriers, and companies that build MDU or PUD networks. Our own database of roughly 1,100 FTTH builds, including about 250 community builds, is at Fiberville.com.

In the database, find a network deployment near you or in somewhat same circumstances (density, deployment size, aerial or trenching, and so forth). They are almost always willing to share their basic revenue and cost data, and advice on third-party vendors of maintenance, installation, network operating centers and so forth.

Several communities have handed our models over to high school and community college classes for completion as class projects.

SIX TOOLS AVAILABLE

1. MSO, ILEC or municipal investor
2. Rural MSO/ILEC/CLEC investor
3. MDU/PCO investor
4. Customer monthly revenue
5. 18-month operational cash flow
6. Multi-neighborhood investor

View and download them at www. FTTHAnalyzer.com

Model creator Steve Ross can be reached at steve@bbcmag.com.

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WHAT IS A "SMART CITY?"

By Robert Worden
Executive Practice Leader, Smart Cities & IoT
Fujitsu Network Communications

You've no doubt heard talk about "smart cities." but what exactly are they, and what do they mean to you?

The short answer is that the smart city concept is the logical and foreseeable outcome of a world in which connectivity has become an integral part of our daily lives. In a smart city, things like utilities, transportation, education, housing, and more are all connected via sensors that provide data in order to improve the quality of life of the city's residents. Civic leaders use this data to make better, "smarter" decisions for the way the city operates and interacts with its citizens. It's a way to make infrastructure more efficient, to make government more transparent, and to make day-to-day interactions with technology smoother.

Imagine a smart communications system, for example, for emergency personnel, able to assess a situation holistically, summon the appropriate personnel, identify and notify the nearest hospital with the appropriate treatment facilities, and even turn traffic lights green as needed for the ambulance en route, thereby decreasing response time significantly. That's Smart.

This isn't simply a concept, but something actually put in place today in smart cities around the world. By making use of data collected from a variety of sources in an intelligently-connected infrastructure, and parsing that data in useful ways, these smart applications can be used to improve the quality, performance and efficiency of everything from major water utilities to individual home appliances. Europe and Asia have been making these steps forward for some time but America is catching up now in cities like New York, Boston, San Francisco, and even Wichita.

From a municipal perspective, smart technology is being used to streamline city-provided services, and to oversee and regulate services provided by outside organizations in order to minimize frustration and dissatisfaction and to maximize economic growth and development. In Amsterdam, for example, the city has installed "smart" garbage bins, so that trash is collected only when the bin is full, thus making garbage collection more efficient and less costly.

Economic development is an important driver for most cities considering an upgrade to "smart" status, with most cities looking to attract new businesses to their community. But how? Many believe that government's most important role is in creating a fertile ground in which innovation can occur. In this sense, the smart, connected, and efficient city is the technological soil in which the seeds of economic growth will be planted, yielding profits and benefits that will in turn enrich both individuals and society at large. Therefore, the cities that are at the forefront of smart cities transformation will reap the largest benefits from this explosive, and in many case much-needed, growth.

Consider a unique and innovative display of economic development using smart technology taking place right now in South Korea. A major grocery retailer wanted to expand business, but without opening additional physical locations. The answer proved to be "virtual shelves" in the city's subway stations. Wall-length billboards display goods for sale, complete with images

" . . . the cities that are at the forefront of smart cities transformation will reap the largest benefits . . . "

and prices, allowing customers to order by scanning QR codes, paying, and arranging for delivery within a day. This optimizes commuter time in the stations, and expands business for the retailer without the expense of a building, rent, utilities, maintenance, staff, and all the other requirements of a physical location. The result is that this retailer has reached the number one position in the online market, and the number two position in terms of brick-and-mortar stores.

Of course, these are only a few of the ways in which smart technology can benefit communities. Every city and county has its own needs, especially in the early planning stages of digital transformation. What's important to remember, however, is that smart cities are here today, and the earliest adopters of this incredible technology will be the ones to reap the greatest benefits from it. Those that delay, or who reject the smart cities model altogether, will quickly find themselves woefully behind the curve, unable to compete with those communities that showed more foresight in these early days. Customers and residents are constantly increasing their demands for bandwidth as the fuel needed to drive their desire for connectivity, and the communities that can provide these services seamlessly and easily win the lion's share of business and revenue. It's never too early to start thinking about smart city transformation, so what are you waiting for?

Better Times for Municipal Broadband

By Ulrich Kohn
Director Technical Marketing
ADVA Optical Networking

Increasing the value of municipal broadband services

Broadband services have created significant positive impact on social and economic development. Fast, affordable, and reliable internet services enhance productivity and competitiveness, and stimulate innovation. Broadband networks improve access to social media and open up a wide range of internet services such as advanced health, governmental, financial and leisure services. What's more, residents can efficiently work from home. Hence, broadband becomes an important factor for choice of location.

Municipalities are well positioned to drive the roll out of regional fiber networks as they can efficiently combine the construction of power, water or gas infrastructure with fiber installations. This economic advantage is especially relevant in suburban or rural communities, which might not provide a promising business case to communication service providers. Municipal broadband networks represent a long-term social and economic investment as they improve standard of living and attract new businesses.

Compared with DSL or cable, fiber networks provide significantly higher bandwidth. Residential users can access internet services at speeds beyond 100Mbit/s, while businesses frequently use much higher capacities up to 10Gbit/s for site interconnection as well as cloud and internet access. The virtually unlimited capacity of fiber allows bandwidth to be scaled to meet future demand.

Those networks can however offer much more than just plain high-speed connectivity. There are a rapidly growing number of IT applications which need precise time synchronization in order to operate in an efficient and reliable way. When designing municipal broadband networks, these upcoming requirements need to be kept in mind, as they are able to distribute highly accurate timing information for synchronization of dispersed systems. This additional capability can significantly improve the value of municipal broadband networks, creating better profitability for the operating organization.

Timing distribution becomes a utility

All computers use an internal clock to synchronize processes and to timestamp data records. The accuracy in most cases in not very demanding. Time information is historically provided over the internet using Network Time Protocol (NTP). With this protocol, a computer can synchronize to a central time server, which distributes datagram with precise time information. NTP time servers are frequently operated by metrological institutes. This time delivery mechanism can provide an accuracy in the range of several tens of milliseconds. It is quite likely that, with increasing compute power, a higher level of precision will be required.

With the emerging IoT, enterprises can optimize industrial processes by leveraging data gathered from countless sensors. Distributed control systems process this data and synchronize with central data centers. Obviously, data captured by a sensor needs to be precisely time-stamped. In the case of power distribution networks, precisely timestamped measurement data is used to accurately locate a failure. A time accuracy of one microsecond is required to locate a fault within 300 meters. Such precision cannot be achieved with NTP technology applied today.

There are various other markets that need broadband services as well as highly accurate timing. Mobile networks rely on precise timing for smoothly handing over customers from one cell to the next. What's more, the latest mobile technologies apply very sophisticated methods for optimizing the utilization of the radio spectrum, resulting in much more stringent timing requirements. Strict timing is also required by financial institutions as they are forced by regulation to precisely timestamp transaction records for transparency reasons. Cloud service providers offering server resources at different sites are another example as distributed computing requires precisely synchronized processes. The same holds for distributed control processes, which cannot work efficiently if they are not tightly synchronized.

In summary, bandwidth customers from many industries already need access to highly accurate timing today. And it won't be long before precise timing is also a mandatory element of residential applications. This trend is creating an interesting upsell opportunity for municipality network operators, as their infrastructure can easily be augmented for the delivery of precise timing.
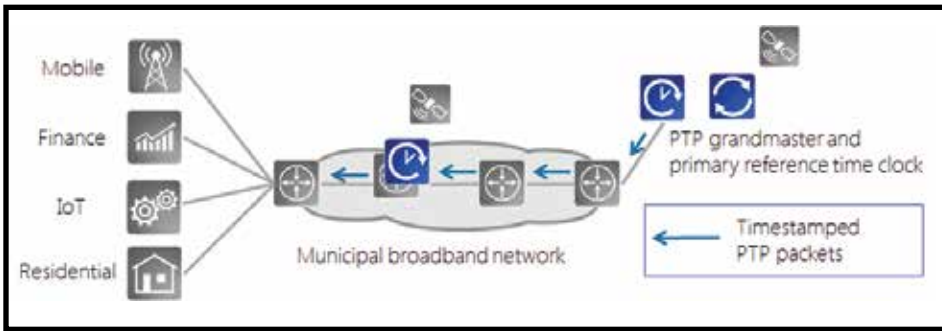
Figure A

Challenges with self-provided timing

Global navigation satellite systems (GNSS) deliver highly precise timing information. A GNSS receiver is used to synchronize a local clock. There are several independent GNSS systems such as GPS, Galileo, Glonass and Beidou.

Even though this is cost-efficient at small scale, it does have some shortcomings. The antenna of the receiver requires clear sight to several satellites and therefore cannot be operated indoor. There is also the issue of jamming, which disturbs GNSS signals locally and makes them unusable for delivering time. As jamming transmitters can easily be procured, this is a significant risk for any application requiring accurate timing.

If timing is mission critical to an enterprise or upcoming residential applications, satellite-based timing should not be the only source. Network-based timing can provide reliable and secure delivery of highly precise synchronization information.

Municipalities can provide better timing

Today's commonly applied time distribution protocol, NTP, does not meet the accuracy requirements of more demanding applications. Precision Time Protocol (PTP) is a more advanced protocol for distribution of time over packet networks. It comes with several improvements such hardware-based processing of timestamps and better manageability. This protocol can meet even the most stringent timing requirements and can be delivered over standard data networks.

If high levels of accuracy are required, the broadband network needs to actively support and contribute to PTP timing delivery. This means not only transporting time over the network but also engaging network nodes in the distribution process. These compensate for delays in a transparent clock mode or even recover time by means of a local oscillator and act as a down-stream clock

source. A device fulfilling this function is known as a boundary clock.

Figure A, above, shows a broadband network delivering precise time synchronization using PTP. At a core site, a PTP grandmaster is receiving highly precise time from a GNSS-disciplined atomic clock. This primary reference time clock (PRTC) can withstand even very long GNSS outages lasting days or even weeks. Routers and switches transport the PTP packets provided by the grandmaster. However, the quality of timing information can be eroded by static and variable delay picked up as it travels the packet-switched network.

Deploying additional grandmaster functionality at the edge of the network can assist timing delivery by sourcing a high-quality timing signal locally and compensating for some of the impairments such as asymmetric delay. It also supports constant monitoring of the synchronization signal quality. With this synchronization architecture, a municipality broadband network can deliver highly accurate timing as a value-added service on top of a traditional connectivity service.

A combination of GNSS-based timing and network-based timing, see Figure B, assures high accuracy and best availability. Applying grandmaster clocks with long holdover times creates synchronization architectures which are extremely resilient against any issues and can secure timing even under catastrophic conditions.

As the service provider is offering timing as a service (TaaS), it is important to consider monitoring the service quality. By comparing the delivered signal with precise, GNSS-based timing, the service provider can assure the quality of the network-provided timing signal. Continuous monitoring will be essential for proofing regulatory compliance if this is also required. In case of network issues, the synchronization signal can be derived from the satellite signal. If different GNSS options are supported, a very high TaaS availability is achieved.

New revenue streams to municipal broadband networks

So, as more municipalities build broadband networks to stimulate economic growth and empower communities, the extra demands of enterprise IT and mobile networks present valuable opportunities. Synchronization of distributed applications and regulatory requirements mandate access to highly precise time information.

Municipal broadband needs to respond to this new requirement. By offering time as a service as an optional service, broadband customers can benefit from highly precise, robust and assured time delivery, while additional revenue streams strengthen the profitability of the broadband network investment.
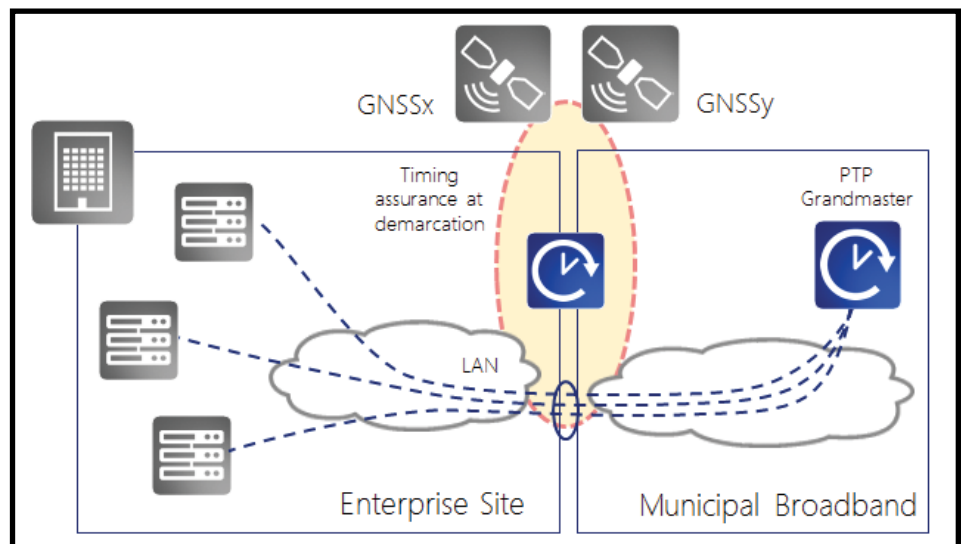

Figure B

CO-OPS ARE GOING BROADBAND

Join NRECA and partner with America's Electric Cooperatives.

electric.coop

The Fight for Competition: New Year, New Networks

By Chip Pickering
CEO
INCOMPAS, and a former Republican Member of Congress from Mississippi

At INCOMPAS, our members build new networks. Networks that are faster, stronger and more affordable than the bigger guys. With competition as the cornerstone of our policy, both wired and wireless networks have expanded rapidly.

As someone who worked to pass the Telecommunications Act of 1996, I am always heartened to see companies that didn't even exist 20 years ago now dragging older industry incumbents into the future.

But we still have a long way to go. Today, 51 percent of Americans only have ONE choice of high-speed internet provider at home, and 38 percent have no more than two choices. That's a whopping 89 percent of Americans stuck with little to no choice.

This is a problem the Trump Administration and Members of Congress from both parties will need to address in 2018 and beyond. But the path to the future isn't a straight line. Those who believe competition is the North Star must be prepared to defend against a monopoly resurgence.

Open Internet
The biggest tech battle of 2017 is poised to make a comeback. The fight to save net neutrality has just begun.

For almost two decades, Republicans and Democrats defended open internet principles. These included no blocking, no throttling and no paid prioritization. That ended when the FCC voted to scrap net neutrality in December. It was a move that pleased a handful of big cable companies, but angered over 80 percent of Americans, including Trump voters and conservatives.

It's clear that strong open internet policies brought more innovation, investment, and lower prices. Twenty-two million people cut the video cord in 2017 and streaming companies invested a staggering $15 billion into new original content.

Net Neutrality isn't just a tech issue.

Main street businesses, like the National Association of Realtors, came out in force to support net neutrality. And last year's 38 percent increase in cloud growth saved start-ups and small businesses millions.

The incredible backlash around the nation to the FCC's ill-fated vote has Washington taking notice. Court challenges have already been filed, there is a bipartisan effort in both houses of Congress to address the problem, and states are taking action to fill the gap. This is clearly an issue Americans are passionate about – look for net neutrality to be a campaign issue in races across the country.

One is Not Competition
The FCC's decision to tip the scales against competition in the business data services (BDS) market will also have its day in Court in 2018.

Last April, the FCC ignored their own data and warnings from the Small Business Administration and lowered the benchmark for the number of providers serving a market. Under their new BDS regime, only one provider counts as a sufficient level of competition.

This laughable definition stands in stark contrast to President Trump's and Congressional leaders' calls for more competition in areas like healthcare, insurance and rural broadband. In addition to kicking small businesses where it hurts (the wallet), a broken BDS market has cost the economy over $150 billion in the past five years alone.

Deployment: One-Touch, Make-Ready, NOW
Ultimately, the deployment agenda is the future. We agree with the current FCC that deployment is a shared goal that has the power to lift all boats. The Commission has acknowledged that building new networks is difficult. It takes time, money and getting around a myriad of state and local monopoly roadblocks.

Many of the barriers to network upgrades take place around physical infrastructure, like access to poles and towers.

New, competitive providers are seeking to upgrade their networks, but can spend more time and money on regulatory approvals than it takes to deploy the new infrastructure.

Representatives Anna Eshoo (D-CA) and David McKinley (R-WV) recently introduced the CLIMB ONCE Act which clarifies that Section 224 of the Communications Act does not preempt states from passing One Touch, Make Ready policies. This efficient approach to broadband infrastructure drastically cuts down the time it takes to deploy new networks in addition to being safer for workers and more convenient to the public. The FCC should follow suit and implement One Touch, Make Ready standards.

Equally important, the FCC should end building and condo monopolies that lock-up customers and lock-out broadband competition. Over 30 percent of Americans live in multi-dwelling units, and they deserve more choices and lower prices.

As we endeavor to remove regulatory barriers to deployment, it is important that the government encourages investment and innovation from new companies seeking to get into the game. You can't speed deployment before you've leveled the playing field. All you would be doing is making it easier for incumbent providers to maintain their stranglehold on the market to the detriment of consumers and small businesses.

There is plenty on Washington's agenda in 2018 that could help promote competition. It's up to all of us to remain diligent and hold policymakers accountable as we work to speed deployment without sacrificing competition. This is the only way to ensure long-term investment in the networks of the future. So, let's start today, and make 2018 the year of competition.
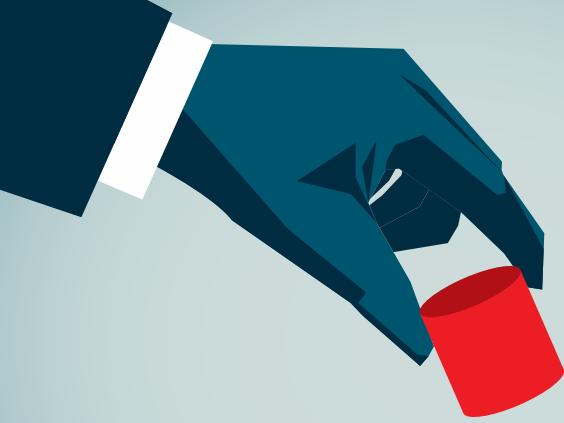
Common Ethernet Install Mistakes: How Municipalities & Utilities Can Avoid Them

By Tomas Yanaz
Solutions Marketing Manager, Metro and Transport
VIAVI Solutions

Subscription cable services are tied with ISPs as the lowest-ranked of 43 industries in a recent poll from the American Customer Satisfaction Index. Some people in rural areas have no high-speed access at all. As a result, numerous local government organizations and utility companies see an opportunity to fill those coverage and service gaps by investing in their own Internet infrastructure to address the unmet need. Although these municipalities and utilities are fortunate to have troves of residents willing to defect from incumbent service providers, becoming a network or Internet service provider is a new ballgame - not just the laying the fiber, but providing the customer services on top of it.

For example, when a local test unit is connected to a service provider's network, the test unit and network equipment must negotiate to the proper full-duplex link speed or the interface will default to half-duplex. In a half-duplex state, a bit error rate test will falsely report a very low throughput for a given Committed Information Rate (CIR). As an example, a CIR of 100 Mbps may only achieve 10 Mbps (or less) if the link is set for half-duplex. Even though the link may be fine, the incorrect test will cause a tech to go into troubleshooting mode, waste time, and throw off the day's schedule.

The following list very briefly outlines the most common installation problems on both the physical and transmission layers, and the tests that can help prevent them;

Physical Layer Tests:
- Fiber inspection: bad or contaminated fiber connections are the #1 cause of troubleshooting and optical network downtime, using a scope to inspect fiber connectors will mitigate that risk

- Fiber characterization: Optical Return Loss, OTDR, Power Meter and Light Source, Polarization Mode Dispersion, and Chromatic Dispersion tests can be used to find errors or report that the fiber pulled meets predefined parameters and SLAs

Transmission Layer Errors:
- Misconfigured VLAN: a ten-second scan of the VLANs with a remote test device can bring significant time-savings because VLAN misconfigurations are one of the most common configuration errors
- Auto-negotiation Issues: a quick check can determine bit rate inaccuracies and mitigate the duplex setting problems described above
- Poor transmission quality: several Ethernet service activation tests (RFC 2544, Y.1564, RFC 6349, etc.) can determine the cause of poor transmission rates including a misconfigured network switch, rate-shaping issues, incorrect buffer settings, or non-network elements negatively impacting performance, e.g. a slow responding DNS or authentication server

Whether a local government organization or a traditional utility provider, providing Ethernet and Internet services are a wonderful opportunity, but one that must be embraced with great caution so as not to repeat the missteps of the incumbent providers. Flawless execution begins with network testing, and modern test sets have made testing much easier and faster than before. There's no excuse not to implement a thorough test plan for every install. After all, the time you invest in activation tests will save time, costs, and improve your community's confidence in your ability to deliver.

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- Instant extra capacity via reverse feed, which essentially doubles bandwidth between distribution hubs

GETTING BROADBAND OFF THE GROUND
Co-op fiber projects bring new life to rural communities

BY CATHY CASH
Senior Writer/Editor
NRECA
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from RE Magazine

Matt Kincaide knows what it's like to live thousands of feet below the surface of the Earth, sometimes for days. The veteran miner worked Colorado's Western Slope for 13 years until April 2016, when the mine was closed, and he was laid off. He figured his only option was to pick up his family and move where there was work.

"In this area, it's hard to find jobs that pay comparable to what I was making at the mine, especially for someone who just has a high school diploma," Kincaide says.

But his plan to move away took a turn for the better thanks to the work of a local electric cooperative. The 34-year-old Delta, Colo., native found work with a "different view of the world"—running fiber-optic cable as a subcontractor for Elevate Fiber, the broadband subsidiary of Delta-Montrose Electric Association (DMEA).

"I feel pretty fortunate and blessed," he says.

DMEA began ramping up its broadband project in early 2016, polling members on their interest in high-speed internet service. The response was emphatic. "Member support has been a constant for this project, from the research phase to the launch, to where we are today," says DMEA CEO Jasen Bronec. "None of this would have been possible without that grassroots momentum that defines the cooperative spirit."

The smallest of the co-op's communities were the first to reach the sign-up minimums set by Elevate Fiber. In Paonia, with a population of 1,650, 346 customers—313 residential, 33 commercial—were up and running as of February 10. Commitments by members in Orchard City, where the population is 3,000, are over 139 percent of the minimum, and construction is underway.

"By reaching their sign-up goals first, these small communities show a need and excitement for economic development and their belief that broadband will help," says Virginia Harman, DMEA vice president of member relations and human resources.

Nationwide, the story for rural regions isn't so bright, with large populations still lacking an easy on-ramp to the information highway.

According to a 2016 Federal Communications Commission (FCC) report, "1 in 10 Americans lacks access to 25 Mbps/3 Mbps broadband." The federal government defines high-speed internet access as at least 25 megabits per second (Mbps) for downloading information and 3 Mbps for uploading. In rural regions, it's exponentially worse, with 40 percent of residents—about 23.4 million people—lacking access to 25/3 internet, compared to 4 percent of those living in urban areas, according to the FCC.

This rural/urban disconnect "disproportionately impacts the ability of small businesses operating in rural areas to successfully compete in the 21st century economy," the FCC states. In Oklahoma, attracting and serving businesses was a primary goal of one rural co-op's broadband push.

FIBER AND FIGHTER JETS
In the far northwest corner of Oklahoma, where acres of prairieland sway with Indian grass, sits an unlikely international hub: the IT control center for multinational aviation systems developer Ferra Aerospace Inc.

Based in Brisbane, Australia, and with offices in the metropolises of Los Angeles, London, and Bangalore, India, Ferra supplies some of the biggest names in the commercial and defense aerospace business with critical software and hardware systems. Their projects include the F-35 Joint Strike Fighter, the MH-60 Black Hawk helicopter, the F-18 Hornet, and the CH-47 Chinook.

So why would a thriving aerospace engineering firm with contracts all over the world set up shop in the tiny windswept Oklahoma town of Grove—population 6,623—hours from the nearest major city?

Plant manager Mike Tackkett says the answer is simple: a burgeoning regional aerospace community, U.S. contracts, and cooperative broadband.

BOLT Fiber Optic Services, a subsidiary of Vinita-based Northeast Oklahoma Electric Cooperative, has provided gigabit broadband to the region since June 2015. "Because of BOLT, global IT can be handled out of Oklahoma," Tackkett says. "It's a lot more reliable and lot faster than what is available for that cost anywhere else."

Ferra first opened its Oklahoma operation in 2013. It later bought 10 acres of land and built a state-of-the-art, 35,000-square-foot facility in September 2016. Among other benefits, the massive expansion allows for assembly of F-35s, Tackkett says. Design evaluations, changes, and peer reviews "can take place across the world, no problem," thanks to Bolt's reliable, high-speed service, he continues.

"What we primarily do at our location here is project management and final assembly," Tackkett says. "A lot of data is shared, so speed of download is pretty important."

Beyond the quality of the broadband, he says, the personal touch of working with a co-op is a major benefit.

"Most of the people actually working there are local," he says. "They helped us plan ahead to make sure everything was set up for our future expansion."

He recalls a recent project where the city of Grove was widening the highway in front of Ferra's facility. To avoid any service interruption or damage to the power lines or fiber, BOLT buried the lines underground.

"BOLT is good to us," Tackett says.

Since its creation, BOLT has installed more than 2,000 miles of fiber and has plans to complete its 3,200-mile network in August. Officials say the project has helped bring noticeable streams of employment to the community.

"We have seen hundreds of jobs come to our rural areas strictly due to the fiber network," says BOLT Manager Sheila Allgood. "We're seeing businesses set up shop here because of the access to fiber. But the expansions of current businesses have been where we have seen the largest impact to our communities, through adding jobs and all the economic impact that new construction brings with it."

Tackett says Ferra plans to further expand its Grove operations by the end of 2017 and increase its homegrown 15-member staff to 100 by 2020.

Other broadband benefits are behind the scenes but just as real, Allgood says. "We hear from medical offices who can see more patients in a day because they're not waiting on the electronic medical records to slowly download," she says. "Convenience stores, marinas, downtown shops, they're no longer waiting minutes on the credit card machine to process."

Allgood says for her, one family's story puts an exclamation point on the value of broadband.

"Their child had to move in with a relative who lived in town because they didn't have access to internet at their rural home, and the child could not do homework and keep up the grades at school," she recalls. "When BOLT delivered fiber to their home, their child moved back in and now can get homework done and study as needed. This shouldn't be the situation for any American family." Unfortunately, it's not unique.

TENNESSEE BROADBAND BILL
Gibson Electric Membership Corp. (EMC), headquartered in Trenton, Tenn., powers nearly 39,000 meters in western Tennessee and Kentucky. But when it comes to high-speed internet access, most of their members are in the dark.

Over platters of barbecue sandwiches at an annual round of district meetings hosted by Gibson EMC, farmers and residential members beseeched the co-op to bring broadband to their area. One member told how his son had to travel nearly an hour from his home outside Clinton to Paducah, Ky., to apply online to colleges. Another member studying for a master's degree described driving 20 miles from Gadsden to Jackson, Tenn., to find a spot with enough broadband to download her college coursework.

"We feel our students are falling behind their urban peers," said a frustrated Dan Rodamaker, Gibson EMC's president and CEO.

Rodamaker and several other Tennessee co-op CEOs are anxious to get their members onto the right side of the digital divide. State numbers show that 34 percent of rural Tennesseans—more than 800,000 people— either lack any internet access or sufficient access to meet the minimal FCC standards.

Tennessee state law has prohibited electric cooperatives from providing retail internet service. But that is changing. Tennessee Gov. Bill Haslam this year crafted legislation to lift the broadband restrictions on co-ops and recognize co-ops "as uniquely situated to assist in bridging the broadband accessibility gap." The General Assembly passed the bill on April 10.

Haslam promoted his broadband plan at a Nashville legislative rally held January 31 by the Tennessee Electric Cooperative Association (TECA; statewide) and asked co-op leaders to support the bill as it made its way through the state's General Assembly.

In his State of the State address the day before the rally, Haslam said co-op broadband would "help spur deployment in rural unserved areas, opening them up to economic investment and job growth." TECA Executive Vice President and General Manager David Callis applauded the efforts of the statewide's 23 member co-ops to promote the broadband bill, saying "access to high-speed internet has the potential to shape the future of rural Tennessee."

DUE DILIGENCE
BY JESSICA HEALY
NRECA MEMBER COUNSEL

Broadband for rural America is a topic that's getting a lot of attention nationally. While this is an exciting frontier for electric cooperatives—particularly those considering getting involved directly in bridging the digital divide—there are important legal issues to weigh before heading in the direction of broadband.

Some key questions to ask are:
• Is engaging in the broadband business or owning an entity engaged in the broadband business a permitted "purpose" or "power" under your state's electric cooperative act?
• Do your electric cooperative's easements permit leasing or selling excess fiber-optic line capacity (in addition to using the line for internal communications)? And, if they do not, what would the applicable damages be, if any?
• If your electric cooperative engages in the broadband business, or owns an entity engaged in the broadband business, must the cooperative provide access to its poles and lines to broadband competitors under the anti-trust essential facility doctrine?
• Is leasing or selling excess fiber-optic line capacity a "qualified pole rental" and excluded from the 85 percent member income test? Is it unrelated business income?
• If your electric cooperative engages in the broadband business, or owns an entity engaged in the broadband business, is the cooperative taking appropriate steps to avoid cross-subsidization between the electric, broadband, and other business lines?

This list is not exhaustive. Legal considerations will vary by state and by the business structure used to provide broadband. Cooperatives are encouraged to consult with their attorneys and tax professionals on these issues.

For more on broadband due diligence, visit Cooperative.com: Cooperative.com/public/Documents/broadband-duediligence. pdf.

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MAKING CONNECTIONS

For some electric co-ops, partnering with rural telephone providers is the way to get broadband done

BY DERRILL HOLLY
RE Magazine, NRECA
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The talk of getting broadband into rural communities isn't just about fun, games, and home entertainment. Today, it's about better health care, more jobs, and sustainable growth in a changing economy.

For electric co-ops who see unmet needs in these areas and are looking to bring modern connectivity to their territories, it's not always necessary to go it alone. There may be a willing partner with similar community goals just down the street. "Partnerships involving telephone and electric cooperatives are actually well-positioned to succeed where others have faced difficulties in reaching rural America," says Shirley Bloomfield, CEO of NTCA–The Rural Broadband Association. "People need to get excited about the power of two leading community associations working together."

In Kentucky, a partnership between a telephone cooperative (telco) and an electric co-op is bringing tele-health care services to the underserved population of McKee.

Peoples Rural Telephone Cooperative (PRTC) and Jackson Energy electric co-op, both headquartered in McKee, are collaborating on a program with the Veterans Affairs Hospital in Lexington, Ky., that allows veterans to teleconference with healthcare providers from a secure private room in McKee's public library.

"Electric cooperatives and telephone cooperatives are both committed to their communities," says PRTC CEO Keith Gabbard. "Reliable, affordable high-speed internet service makes rural communities stronger by connecting them to distant cities, services, and the rest of the world."

Since 2015, the two co-ops have also collaborated on a telework program that has trained more than 350 home-based customer service and support representatives and placed them in jobs that previously did not exist in their service territories.

"These projects have provided jobs, hope, and pride to the communities served," says Carol Wright, Jackson Energy's CEO. "We invested $30,000 in the Booneville telework project, and the economic impact has been estimated at $1 million." Tim Bryan, CEO of NRTC, which serves both electric and telephone members, says when building a challenging business model like extending broadband into unserved areas, "partnerships make sense."

"In our experience, electrics and telcos working together is particularly powerful because each entity offers something unique that can benefit the success of the endeavor," he adds.

In Arkansas, Ouachita Electric Cooperative found a similar partnership with an investor-owned rural telephone company.

For more than a decade, Ouachita Electric has offered satellite internet service. But it proved insufficient for most businesses, and many members still relied on dial-up at home.

"Businesses could not locate in our service territory without reliable broadband internet service," says Ouachita Electric General Manager Mark T. Cayce. "If schools have broadband and students do not have broadband at home, they can't get their work done."

To turn things around, the Camden, Ark.-based distribution co-op worked with investor-owned South Arkansas Telephone Company to create Arkansas Rural Internet Service, a fiber-to-the-home company, in July 2016. In February, their first customers began receiving service.

"East Camden, here in our service territory, is the first city in Arkansas with the capability of providing every home in the city limits with 1-gigabyte internet service," Cayce says. "We intend to have high-speed internet service available to all of our members within three years." Cayce says rural telephone providers have technical expertise that complements the infrastructure owned by electric co-ops.

"Between the co-op and the phone company, we have 180 years of serving our communities," Cayce says. "By bringing fiber into our system, we're leaping from the Stone Age to having some of the best internet service in the country."

Recognizing Excellence

Walker's 2017 Sales and Marketing Performance Recognized by Manufacturer Community

By Randy Turner
Director, Marketing Communications
Walker and Associates

Following another year of growth and new business opportunities, members of the industry's manufacturer community gathered in Sarasota, FL during the Walker and Associates Commercial Sales & Marketing Kick-off Meeting to recognize Walker's commercial sales and marketing leaders. Presenters included some of the most recognized company names in the industry, underscoring the wealth of manufacturer relationships Walker offers its customers. An often repeated sentiment was an appreciation for the hard work, commitment, and determination demonstrated by Walker and its sales and marketing teams in solving customer problems, presenting value at each opportunity, and exceeding expectations among equipment manufacturers.

In addition to individual awards, Walker was recognized by ADTRAN as their Top Service Provider Distributor in 2017

Mark Ogden, Director of Sales, North American Service Providers, presents the Top Service Provider Distributor Award to Jennifer Beck, OEM Development Manager for Walker and Associates.

marking the company's 15th consecutive year achieving this status. The partnership between ADTRAN and Walker spans two decades, representing solid commitments to carriers throughout the US market. Walker's status as ADTRAN's largest service provider distributor provides customers enormous value, including selection, availability, pricing, service and customer support.

Walker also presented its annual Hank Ford Award to Becky Hill, ADTRAN's Sales Operations Specialist for the Walker account. The Hank Ford Memorial Award is presented each year to recognize an individual who rises to the highest level of performance in support of product and event marketing, as well as their focus on best of breed channel marketing strategies. Becky has supported Walker many years, responsible for providing timely information to Walker in support of customer projects. Her role is vital in creating successful outcomes in delivery of product and quote responses. Her commitment to excellence, always with a smile, is a true example of the partnership Walker enjoys with ADTRAN and other manufacturer partners. Congratulations Becky!

ADVA Optical Networking recognized Walker as their Top Distributor in North American Markets. Walker has enjoyed a long-standing partnership with ADVA. Their level of support for Walker continues to increase, and their product innovations are paving the way for new opportunities.

The awards event was sponsored collectively by ADTRAN, ADVA Optical Networking, Ciena, CommScope, Corning, Fujitsu, Juniper Networks, and SmartRG.

In addition to awards presented by manufacturer partners, Walker recognized associates in sales and marketing for their performance during 2017. The President's Citation Award was presented to OEM Development Managers who reached 100% of their annual plan, and sales associates were recognized for their leadership in sales and profit goals attainment. These awards included Inside Salesperson of the Year, Field Salesperson of the Year, and recognition of salespeople achieving 100% of their 2017 sales plan.

The evening included comments from Chrystie Walker-Brown, company CEO,

ADTRAN's Becky Hill receives the Hank Ford Memorial Award from Trey Hall, honoring her for exemplary work in her channel management responsibilities with Walker and Associates.

and Mark Walker, company president. They expressed appreciation for strong partnerships with manufacturers, commitment by associates, and acknowledgement of a strong team of collaboration and innovation between Walker and its healthy list of manufacturer partners. A challenge was issued to rise to challenges and opportunities ahead in 2018, always keeping an eye on presenting value to shared customers.

CommScope's Home-field Advantage Delivers a Home Run for North Carolina Research and Education Network

From February 2010 to August 2013, North Carolina's public broadband infrastructure underwent an amazing transformation, increasing in size by more than 800 percent!

The growth was fueled by an all-fiber diet, supplied by CommScope. Today, individuals, businesses and public facilities in the most remote parts of the state have high-speed access to a future that is brighter than ever.

" . . . affordable high-speed broadband to more than 1,500 community anchor institutions and 180,000 businesses, and reach more than 300,000 underserved families . . . "

The North Carolina Research and Education Network (NCREN) is North Carolina's broadband infrastructure for education, research and economic development. The network is built, owned and operated by the private nonprofit MCNC. In 2007, it consisted of 72 endpoints and about 200 miles of fiber. Of the state's 115 public school districts, fewer than 10 had access to NCREN and the educational resources on it.

In February 2010, MCNC embarked on a massive statewide expansion of the network. Known as the Golden LEAF Rural Broadband Initiative (GLRBI), the $144 million project aimed to deliver affordable high-speed broadband to more than 1,500 community anchor institutions and 180,000 businesses, and reach more than 300,000 underserved families in North Carolina.

Bring high-speed access to a significant number of technologically-underserved areas

The GLRBI was funded through grants from the U.S. Department of Commerce's National Telecommunications and Information Administration's (NTIA) Broadband Technology Opportunities Program (BTOP). Significant matching funds were provided from private donations and investments, including a $24 million investment from the Golden LEAF Foundation and $10 million from the MCNC Endowment. No state funds were utilized as matching funds for the MCNC awards. This project remains one of the largest single investments in middle-mile broadband infrastructure in North Carolina history. MCNC needed an infrastructure provider who was up to the task. In selecting North Carolina-based CommScope, MCNC got the strength of a global player and the passionate commitment of a native son.

Phase one tests distribution capabilities

The GLRBI project consisted of two phases. Phase one involved running 442 miles of fiber from strategically-located areas within the state's interior to rural nodes closer to the periphery. Phase two consisted of connecting the outer nodes with a 1,300-mile fiber loop.

The first phase, lasting 20 months from September 2010 to April 2012, called for 442 miles of fiber and conduit, 600 hand holds, 10,000 couplers, 100 splice cases, 750 marking posts, and 100 grounding rods. While some of the companies vying for the project could supply the demand, CommScope offered a unique advantage.

A key criterion for selection was the ability to distribute materials to multiple job sites across the state. Here, CommScope was able to leverage its Cable Transport division (one of the only in-house trucking fleets in the industry) and its centrally-located distribution hub in Statesville, N.C. With most of the trailers equipped

with on-board cranes, materials could to be off-loaded directly at the job site instead of having to be broken down at the loading dock. This translated into significant savings in construction time and money.

The large distribution hub in Statesville also served as a major staging area during phase one construction. By involving its purchasing department, CommScope was able to purchase and stock all needed third-party materials at the Statesville location for distribution to each site. "Once we got the order from the job site, we were usually able to deliver product within 48 hours," said Eric Edwards, who helped coordinate the massive project for CommScope.

Phase two showcases CommScope's design expertise

Phase two called for 1,300 miles of new broadband infrastructure that would bring much-needed high-speed access to a significant number of technologically-

underserved areas. A critical requirement was the ability to maximize bandwidth capacity within a relatively small conduit. MCNC's plans dictated the use of a single, 2" diameter conduit to serve the current and future bandwidth needs of thousands of schools, research facilities and other state-owned institutions.

Within eight weeks, the CommScope design team had engineered and tested an innovative tri-duct solution. It consisted of three, 3/4", high-density polyethylene (HDPE) conduits under one common jacket. Each 3/4" conduit could accommodate CommScope's TeraSPEED® 144-count, singlemode nonarmored fiber—each strand capable of delivering more than 100 Gigabits of data per second. By utilizing just one of the 3/4" conduits, MCNC was able to satisfy their current capacity needs, leaving two conduits for future growth and expansion.

Not only did CommScope provide the preferred engineering solution, it had the capacity needed to produce the 1,300 miles of conduit and fiber for phase two. All conduit and cabling for the project was manufactured in North Carolina at CommScope's Statesville and Claremont facilities. Over the 30-month course of phase two, these two facilities produced an average of 150,000 feet of finished product per month.

Combined, both phases of the GLRBI involved multiple departments working together. "It was a highly-coordinated effort involving representatives from customer service, sales, enterprise, supply chain, operations and purchasing," said Edwards.

Laying the foundation for a high-speed future

Today, NCREN serves more than 450 connectors, including all K-12 public education in North Carolina; many private education institutions and charter schools; most of the state's leading research institutions; other government, judicial and public safety customers; and more than 100 health care providers—including nonprofit hospitals and public health clinics. Due to the GLRBI, North Carolina is one of just a handful of states with an open-access, middle-mile fiber network available to economic developers, businesses and broadband service providers. According to MCNC Chief Operating Officer Tommy Jacobson, the work of connecting the state is ongoing.

"There are still major areas of the state, particularly rural areas, where citizens do not have access to basic broadband. Through our work with partners like CommScope, we're able to deliver broadband to those parts of North Carolina who really need it," Jacobson said.

As for CommScope, a company accustomed to performing on the global stage, being able to use its deep and broad capabilities to improve the quality of life in its own backyard has been a gratifying experience.

"We were honored to be chosen by MCNC to assist with this important project," said Ric Johnsen, senior vice president of broadband solutions at CommScope. "Our selection is a validation of CommScope's capabilities and willingness to support MCNC's efforts to bring an advanced network to the State of North Carolina."

RECORD GROWTH FOR U.S. FIBER DEPLOYMENT IN 2017

22-DEC-17
Posted by: BBC Wires @ 9:03 am
WASHINGTON — U.S. fiber deployments experienced record growth in 2017, according to new numbers released by the Fiber Broadband Association and market research provider RVA. Annual deployments hit a new record passing 35 million homes, a whopping 4.4 million increase in homes marketed — the most-ever in a single year — and a 15 percent growth over the 2016. 15.4 million American households now take all fiber. The research also shows that Canada is the leader with 45 percent growth in homes marketed in 2017.

Increased Participation of Smaller FTTH Providers
The rapid growth of fiber networks in North America is due in large part to the increased participation of smaller FTTH providers as well as increased consumer demand, reflected in FTTH's continued progress despite a general lack of specific government funding. Deployment growth from the largest providers grew at a rate of 14.1 percent, while the smaller providers had 16.5 percent deployment growth.

The research also delved into new consumer data regarding broadband use, priorities and satisfaction along several metrics. These consumer insights cast a spotlight on how exactly fiber broadband is perceived and needed, as an individual technology and in comparison to other technologies.

"Across the board, fiber is meeting consumer and business needs and connecting people to a uniquely satisfying broadband experience, said Heather Burnett Gold, president and CEO of the Fiber Broadband Association. "Commissioning such key research is one of the many ways that the Fiber Broadband Association serves the fiber industry, keeping us all informed about where this exciting technology is and where it is going."

Changing Attitudes Towards Utility Broadband

By Brett Killbourne
General Counsel
UTC

The Problem
There are more than 20 states that restrict municipalities, including municipal utilities, from offering broadband services, and these restrictions take different forms in different states. One thing all of these states have in common – they all have some of the nation's lowest ranking for broadband access according to BroadbandNow. States such as Alabama (ranked 40th), Colorado (ranked 23d), Louisiana (ranked 36th), Minnesota (ranked 27th), North Carolina (ranked 15th) and Utah (ranked 11th) require a referendum in order for a municipality to offer broadband service. Alabama, North Carolina and Tennessee (ranked 24th) also restrict municipal entities to offering broadband in their jurisdictional limits, and they prohibit municipalities from offering broadband in surrounding areas. In addition, some states like Florida (ranked 10th), Louisiana and Utah require a feasibility study or proof of profitability. There are four states that prohibit municipal entities from offering retail broadband: Nebraska (ranked 39th), Nevada (ranked 19th), Texas (ranked 30th) and Washington (ranked 14th). A fifth state, Missouri (ranked 42d), prohibits municipal telecommunications, but provides exceptions from the prohibitions, including for "Internet-type services" (i.e. broadband), which enables some municipalities such as Springfield, Missouri to offer broadband services. Finally, there are several states -- Iowa (ranked 38th) and Wyoming (46th) – which restrict funding for municipal broadband and/or require municipalities to provide a right-of-first-refusal for a private company to provide broadband in their jurisdiction.

The Practical Effect
Clearly there is a correlation between restrictions on municipal broadband and the extent of broadband access in states across the country. And this correlation follows from the fact that many municipal broadband deployments were originally started because there was no broadband access available at all or the cost of broadband services in these areas was high and the quality of existing broadband services were poor. In short, municipal entities stepped in to remedy the gap that is commonly called the digital divide.

> " . . . many municipal broadband deployments were originally started because there was no broadband access available at all or the cost of broadband services in these areas was high and the quality of existing broadband services were poor."

According to the latest Broadband Progress report from the FCC, this digital divide is widening in rural and tribal areas. The FCC found that 39 percent of rural Americans lack access to broadband services that provide speeds of 25 megabits per second (download) and 3 megabits per second (upload)(i.e. 25/3 mbps) – which is the FCC's current working definition of broadband services. Worse, the FCC found that 41 percent of Americans living on Tribal lands (1.6 million people) lack access to 25/3 Mbps broadband. Worst of all, the FCC found that 66 percent of Americans living in U.S. territories (2.6 million people) lack access to 25/3 Mbps broadband. These findings are not anomalous; each of the last five Broadband Progress reports by the FCC have concluded that broadband is not being deployed on a reasonable and timely basis.

How We Got Here
As the FCC considers ways to promote broadband it should reassess its position on state restrictions on municipal broadband, which has had a somewhat tortured and circuitous history. Many of the state restrictions on municipal broadband that exist today were, according to a former FCC Chairman, enacted at the behest of the incumbent telecommunications carriers and cable television companies. Initially, the FCC's position on such restrictions was that it lacked the authority to preempt state and local restrictions on municipal entities that provided telecommunications services, including political subdivisions such as municipal utilities. The issue was appealed all the way to the Supreme Court, which ultimately sided with the FCC that it could not intervene to invalidate state restrictions on municipal telecommunications services. That was in 2004. Fast forward to 2015 and the FCC decided that it could intervene on restrictions on municipal broadband, and it preempted laws in Tennessee and North Carolina that prevented Chattanooga and the City of Wilson, NC from providing broadband beyond the city limits. That FCC decision was appealed to the US Court of Appeals for the Sixth Circuit, which reversed the FCC's decision. The FCC did not challenge that decision; and as such, things have now come full circle and state restrictions are once again protected from being preempted.

Changing Views About Utilities and Broadband
So, where do we go from here? It seems that there is a shift that is taking place between the FCC and utilities when it comes to broadband. Instead of being viewed as barriers to broadband, utilities are being described by the FCC as partners for broadband. To be sure, the FCC was referring to electric cooperatives when it expressed its hope that utilities will become "a bigger part of closing the digital divide," but the same could be said for other types of utilities, including municipal utilities.

There is an increasing number of utilities that are deploying broadband networks or are interested in doing so. And, as noted above, utilities are getting into broadband in large part to fill the digital divide. They see broadband as a way of driving economic growth into the communities that they serve, while also improving the quality of life in terms of better education and health care. That is why utilities are deploying future-proof
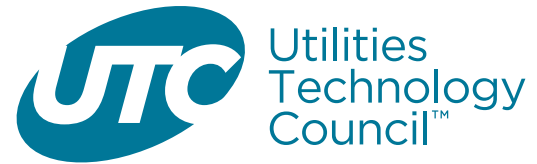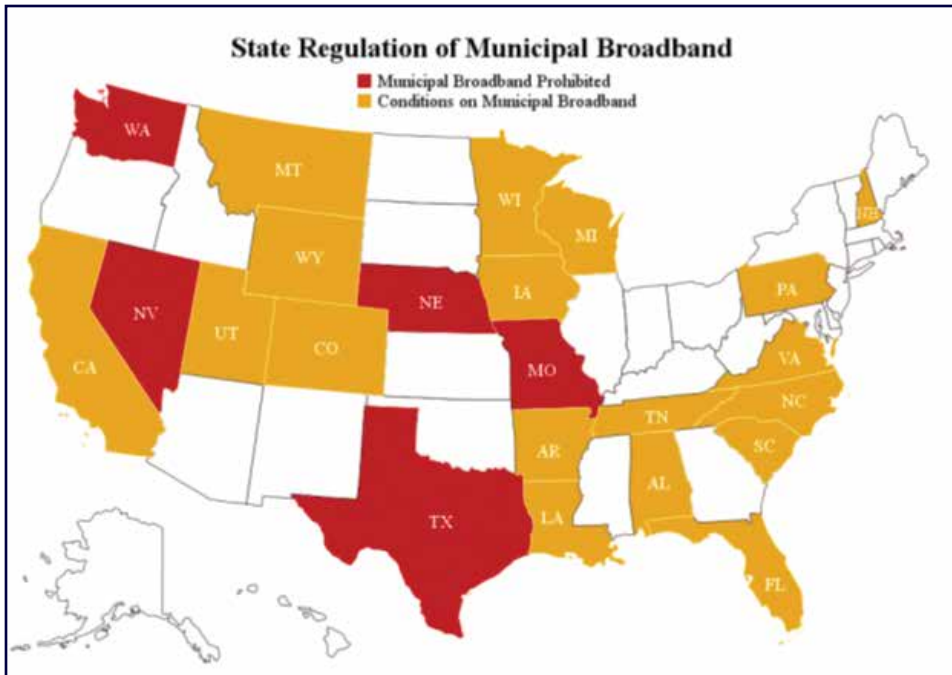
State Regulation of Municipal Broadband

■ Municipal Broadband Prohibited
■ Conditions on Municipal Broadband

broadband networks and offering gigabit services at rates that are affordable.

The response to these utility broadband deployments has been remarkable. It is not unusual for utilities to see take rates of over 70 percent, and the most popular service packages that customers purchase are in the 50-100 megabit speed tiers. This shows that customers in these previously unserved areas will buy broadband when it is robust, affordable and reliable, dispelling the myth that consumers in unserved areas don't want broadband. Utilities literally get fan mail from their own customers, thanking them for providing broadband to their homes and businesses.

Sometimes they get requests from nearby towns that want broadband but are outside of their service territory. Some utilities have agreed to provide broadband to those nearby towns, but others like Chattanooga and Wilson have been prevented by state law from doing so. Moreover, in their own service territories, utilities are deploying their broadband networks to everyone – there is no cherry picking.

Most importantly for the FCC, utilities are proving that it is possible to deploy fiber-based services in unserved areas economically and sustainably. Some utilities are reporting that they have been able to go cash-flow positive in less than three years, deploying to 100 percent of their customers, without any government subsidies.

Outlook for Utility Broadband

So, it's no wonder that utilities are changing views at the FCC, and hopefully this change will lead to fewer restrictions at the state level. There are encouraging signs that things may be changing at the state level as well. There have been several bills introduced at the state level over the past two years that would either expand or eliminate state restrictions. Most of these bills were not passed; only New Hampshire and Utah were successful, and those bills that would make it easier for municipalities in those states to offer broadband. Meanwhile, UTC joined coalitions that successfully opposed bills to expand restrictions on municipal broadband in Missouri (H.B. 2078 and S.B. 946) and Colorado (S.B. 136) last year. Most recently, Tennessee passed legislation that eliminates restrictions that previously prevented electric cooperatives from providing retail broadband services. Although Tennessee did not lift restrictions on municipal utilities, there are ongoing efforts to introduce legislation that would lift the restrictions on municipal broadband.

UTC has formed a Utilities Broadband Council (UBC) to help utilities with regulatory, business and technical issues associated with providing broadband services. Its members include all kinds of utilities, including electric cooperatives and municipal utilities that are providing retail broadband, as well as investor-owned utilities and large public power providers and federal power authorities that are providing wholesale services over lit and dark fiber to third party broadband providers. UTC and the UBC have focused their advocacy efforts on enabling utilities to be able to apply for federal funding from the FCC through its Connect America Fund – and the FCC just announced that it plans to conduct a reverse auction in July 2018 that would allow utilities to compete for access to $2 billion in funding over 10 years to provide broadband in unserved areas. To help utilities prepare for the upcoming reverse auction, UTC is holding a Utilities Broadband Workshop in New Orleans on February 20-21, 2018. Utilities and technology companies that provide equipment and services are encouraged to participate in this important event, because the deadline for applying to participate in the reverse auction is the end of March 2018. More detailed information about UTC and the UBC as well as the Utilities Broadband Workshop can be found at www.utc.org.

Mr. Kilbourne is currently Vice President of Policy and General Counsel at the Utilities Technology Council ("UTC") where he provides legal guidance to utilities on telecommunications issues both pending before federal and state agencies and being considered in Congress.

Brett received his Juris Doctor degree in 1998 from Catholic University and his Bachelor of Arts degree in 1987 from the University of the South. He is licensed to practice law in the state of Maryland, and is a member of the American Bar Association and the Federal Communications Bar Association.

An Insider's Guide to *Accelerating* Community Broadband Initiatives

By Mark Ogden
Director of Sales, North American Service Providers
ADTRAN

In recent years, a substantial number of communities and operators have announced rollouts of Gigabit services, and as a result close to 20 percent of the U.S. population now has access to this level of high-speed broadband. On the flip side, this means more than 80 percent of the U.S. remains lacking. This presents a huge opportunity for growth in Gigabit service availability and the expansion of its many benefits to even more communities.

As local governments, service providers and other community stakeholders increasingly consider launching fiber initiatives, they're no doubt weighing a plethora of questions, but instead of becoming overwhelmed by the process, it's important they learn how to work with the right technology partners who have the requisite experience to help them succeed.

Major Considerations for Broadband Initiatives

Broadband can dramatically transform the way we live, work, and play by stimulating economic development, advancing education and digital learning, improving access to healthcare and telemedicine, digitizing agricultural management, increasing workforce mobility, and underpinning smarter more connected homes.

Creating these life-changing and lasting effects on communities begins with a diligent decision-making process, one that is no small step for any municipality or service provider. Along the way, one encounters everything from sorting out the business case for a new broadband build and evaluating different technical approaches to the investment, to wading through many structural decisions that govern areas such as project financing, infrastructure ownership, or service offerings.

Unfortunately, there isn't enough time to cover all the issues involved with a community broadband build, but it's critical to consider some of the hurdles that are likely to arise. Aside from the cost to acquire access equipment, the additional costs of installing, testing and commissioning network access could pose challenges, along with the on-going operational costs of managing the network. Not to mention, all of these demands may need to be addressed with limited in-house technical resources and personnel. Lastly, and perhaps most importantly, service providers often face difficulties knowing if or when they can expect a timely return on their considerable investment. Those going down the path of a community broadband initiative need an effective toolkit to address these technological, operational and business model challenges in rolling out Gigabit services.

> *" . . . service providers often face difficulties knowing if or when they can expect a timely return on their considerable investment."*

Accelerating the Availability and Adoption of Broadband

In business speak, "accelerators" are intensely focused assistance programs that apply various support mechanisms—mentoring, education, or financing—to accelerate growth-driven enterprises toward successful outcomes. Based on our unmatched experience working with service providers and municipalities to enable hundreds of Gigabit communities across the nation, we believe there is undeniable value in launching Gigabit services through such accelerator programs.

A Gigabit Accelerator Program typically includes a comprehensive toolkit of the right technological solutions, but also the services, training, and marketing support needed to accelerate Gigabit community partners down a path to success. It leverages an ecosystem of partners, innovative access products, and network services to support roll-out, activation, and monetization of broadband services, all while promoting the value of Gigabit to the broader community.

First and foremost, broadband initiatives demand having the right professionals involved from the start. Partnership in a Gigabit Accelerator Program means having access to a single-source community for all things Gigabit. This includes trusted consultant engineering, public policy expertise, and distribution suppliers for fiber equipment and other requisite technologies, just to name a few.

As noted previously, cost is a prevailing concern for those evaluating a broadband deployment, and there is no one-size-fits-all approach to buying technology infrastructure. That said, service providers can be confident that with the right guidance on today's newest access technologies and techniques, a network architecture supporting Gigabit speeds is achievable in a cost-effective manner. Moreover, through a Gigabit Accelerator Program that provides comprehensive training and network care, subscriber management solutions, and other network services, one ensures improved efficiencies and lower costs for network

operations as well as better return on investment over the long haul.

It is vital to accelerate Gigabit service take rates across the community as early as possible. Mentoring and marketing initiatives, to help service providers convey the power of Gigabit to stakeholders within the community, are critical. We recommend educational events and other outreach to evangelize the value of Gigabit within community neighborhoods, anchor institutions, and economic development organizations. Service providers also need to market their Gigabit and educate consumers directly about the benefits of this new service. The goal of these efforts is to increase service adoption and open the door to other services users might want.

ADTRAN understands the transformative effects of Gigabit broadband. We envision every city, regardless of size, realizing the new world of opportunities Gigabit brings. A Gigabit Accelerator Program offers a unique a path forward for communities and their broadband initiatives, one that bridges where they are today with where they want to be tomorrow. We look forward to enabling their success every step of the way.

Mark Ogden is the director of ADTRAN's Service Provider Sales. A seasoned telecom veteran, Ogden has over 30 years of experience in the industry and has served in a variety of sales and marketing roles for ADTRAN. In his current role, he has responsibilities for each of ADTRAN's distribution partners servicing the North American Service Provider market. Ogden is also an instrumental figure in ADTRAN's advocacy for a range of broadband-enabling programs and initiatives. Ogden is a graduate of Harding University and holds a Bachelor's degree in Business.

Lawmakers Push to Improve Broadband Access

BY HARPER NEIDIG AND ALI BRELAND
Reprinted from The Hill

A House panel will look into ways to build out the nation's broadband infrastructure in the coming week.

The issue is getting added attention as President Trump is set to discuss his long-promised $1.7 trillion infrastructure proposal during Tuesday's State of the Union address.

Hours before he shares details on his plans, the House Energy and Commerce Committee's subcommittee on technology will be holding a hearing to discuss a slate of bills aimed at bringing internet access to more Americans.

The panel will hear from representatives from the cable, internet and wireless industries and take up 22 bills from both sides of the aisle.

Members have been ramping up their efforts to emphasize the importance of expanding broadband networks as the White House teases its infrastructure plan, which could be released in full by the end of the month.

Both parties largely share a goal of delivering high-speed internet to rural areas, but there are different philosophies between Democrats and Republicans on how to do that.

House Democrats released their own infrastructure bill last year that would inject $40 billion into programs for expanding access for unserved and underserved communities. A Federal Communications Commission (FCC) report last year estimated that figure is how much it would cost to deliver internet access to 98 percent of Americans. Getting internet access to the remaining harder-to-reach 2 percent, though, would require an additional $40 billion.

The Democrats' infrastructure bill, called the LIFT America Act, will be considered at Tuesday's hearing.

Republicans, meanwhile, have not said how much money they are willing to spend on broadband infrastructure, but the White House has endorsed a combination of private and public investment to boost efforts.

Still, bipartisan groups in the House and Senate have rallied around pushing the administration for direct funding for rural broadband expansion.

The bipartisan Senate Broadband Caucus, led by Sen. Shelley Moore Capito (R-W.Va.) sent a letter to the president earlier this month pleading for stand-alone funding.

"Our rural communities have connectivity needs that are not being met, limiting economic opportunity and growth," the letter reads. "Prioritizing direct funding support for broadband deployment in an infrastructure package will help close the digital divide and ensure our country maintains its global competitiveness."

20 YEARS OF CONNECTING SCHOOLS AND LIBRARIES: POLICY SUMMIT

REMARKS OF
COMMISSIONER JESSICA ROSENWORCEL
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, DC
JANUARY 24, 2018

Good afternoon. Thank you to the National Coalition for Technology in Education and Training for bringing us together. It's a privilege to join you and a fantastic honor to share the stage with Senator Jay Rockefeller and Senator Ed Markey. As you know, more than two decades ago they joined with Senator Olympia Snowe to create the E-Rate program.

Thanks to their bold, bipartisan vision schools and libraries in communities in every state across the country are now connected to the internet. They built—from the ground up—the nation's largest educational technology program. That is an extraordinary legacy—and one we righteously celebrate here today.

From the start, the idea behind E-Rate was simple: Let's get all of our schools and libraries connected to modern communications and the internet. In the rear-view mirror that seems easy—and spot on. But remember that when the Telecommunications Act became law, a device meant a Nintendo 64. Few Americans had regular access to the "information superhighway" and if they did, they spent no more than 30 minutes online a month. Moreover, at the time teaching tools meant a blackboard and a bulky textbook. If you wanted a platform to share, you needed a mimeograph machine with its blotchy, smelly, purple ink or if you were lucky, a noisy new Xerox copier. And research in school meant a trip to the card catalog, where the universe of available knowledge was itemized on uninspired stacks of off-white index cards.

So in retrospect, E-Rate was ahead of its time. But in time, as the benefits of connectivity became clear, institutions in every state signed up.

In fact, when I arrived at the FCC five years ago, 95 percent of our nation's schools were connected to the internet. It sounded a lot like the job was done. But nothing could have been further from the truth. Because the challenge is no longer connection—it's capacity.

In fact, at the time nearly half of E-Rate schools were accessing the internet at 3 Megabits or less. That's too slow for streaming high-definition video and not fast enough for the most innovative teaching tools. Moreover, with these bandwidth limitations, only 5 percent of high schools were offering computer science courses. As a policymaker—and a parent—this struck me as just wrong.

At the same time, other countries were forging ahead and building plans for big bandwidth to reach all their students. South Korea, Estonia, and Uruguay had already made enormous inroads connecting their schools. China, India, and Thailand were exploring the large scale purchase of connected devices for next generation education. Of course, the policies and cultures of these nations are different from the United States. But they have students, like ours who will compete in a global economy—and there is simply no reason to let other nations outspend us, outeducate us, and outachieve us.

So we did something about it. And by we, I mean so many of the people in this room today. You did it. You clamored for change. You decided that E-Rate needed an upgrade—because it was not acceptable for the nation's largest educational technology program to stay stuck in the dial-up era. You made a difference—because you made a ruckus.

As a result, the FCC put in place E-Rate 2.0. It rebooted, reinvigorated, and recharged E-Rate for the digital age. That means it now has clear capacity goals—and Gigabit speeds are in sight. Moreover, it put a new premium on Wi-Fi to facilitate one-to-one learning environments. It also has an updated budget—built for the future of education.

These changes have produced results. More than 39 million students now have the broadband they need in their classrooms and libraries. More than 2.6 million teachers have connections that now meet our capacity targets. The benefits have been especially dramatic in rural areas, which have seen increases of over

" . . . preparing the next generation for digital success now requires connections not just at school—but at home."

65 percent in funding levels for Wi-Fi. Libraries, too, have been big beneficiaries of these reforms, with one survey showing a 50 percent increase in support since reforms were put in place. These numbers add up—to real progress.

But numbers don't tell the whole story. So let me illustrate. After returning to the FCC last year, I had the privilege of visiting schools to see in person the promise of E-Rate 2.0. In North Carolina I saw math classes rolling mechanical spheres at different angles in order to calculate speed and velocity. In rural New Hampshire I joined Senator Maggie Hassan to see high school students using digital programs to compose melodies for string instruments. The arts teacher described how instruction had changed because instead of relying on a few slim folders of sheet music he now had infinite libraries of compositions exponentially multiplying what his students could play and learn. I also headed to Maine to visit the Waterville Public Library with Senator Angus King, which earned a national award for its effort to connect

the community to career opportunities by offering support for digital literacy and entrepreneurship. E-Rate makes this all possible.

That doesn't mean the job is done. Let's acknowledge systems at the Universal Service Administrative Company need work. Great programs like E-Rate do not thrive without continuous attention and care. We need to fight for the gains we've made and ensure that they stay in place—so twenty years from now we can gather again to celebrate E-Rate's success and progress.

But we also need to recognize that connecting our schools and libraries is not enough. Because preparing the next generation for digital success now requires connections not just at school—but at home.

Seven in ten teachers now assign homework that requires access to broadband. But FCC data suggest that as many as one in three households do not subscribe to broadband service. Where these numbers overlap is what I call the Homework Gap.

According to the Senate Joint Economic Committee, the Homework Gap is real. By their estimate, it affects 12 million children across the country. They are everywhere. In my time at the FCC, I have spoken with students in Texas who do homework at fast food restaurants with fries—just to get a free Wi-Fi signal. In have heard from students in Pennsylvania who make elaborate plans every day to head to the homes of friends and relatives just to be able to get online. I have heard from high school football players in rural New Mexico who linger in the school parking lot after games with devices in the pitch-black dark because it is the only place they can get a reliable connection. These kids have grit. But it shouldn't be this hard. Because today no child can be left offline—developing digital skills is flat-out essential for education and participation in the modern economy.

More can be done to address the Homework Gap. Carriers across the country are pitching in by making available low-cost broadband service. Libraries everywhere from Maine to Missouri are loaning out wireless hotspots—and letting students borrow connectivity for schoolwork. Rural school districts are putting Wi-Fi on buses and turning ride time into connected time for homework. Communities are mapping out where free online access is available for student use. These efforts deserve applause. More importantly, they deserve expansion. We need to get creative about the Homework Gap if we want to solve it. If we do we can turn more of our students from digital consumers into digital creators. And that's worth the effort.

I'll end here and thank you again for having me join you to mark this important anniversary. Thank you to everyone in this room for what you have done to make E-Rate the powerful program it is today. Thank you for what you will do to fight for it in the future. And thank you for your deep commitment to ensuring that every student has the opportunity they need to develop the digital skills they need for a fair shot—no matter who they are, where they live, or where they go to school.

Reprinted from https://www.fcc.gov/document/rosenworcel-remarks-connecting-schools-and-libraries-policy-summit

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Raising the
Bar

By Randy Turner
Director, Marketing Communications
Walker and Associates

As with any business interested in its longevity, the task of re-invention is ongoing. Since its 1970 origins, Walker and Associates has strategically redefined itself, now recognized in the industry as a steady leader. That process involves carefully orchestrated change at times, while applying calm to chaos in others. Investment, re-allocation of resources, and careful research eventually pay off. Recent years have proved that true for Walker.

In early 2017 Walker announced construction completion of an outdoor fiber cable yard in order to better support new fiber cable stocking initiatives. Located in Winston-Salem, NC, this new resource is dedicated to stocking large fiber reels, enabling Walker to support fiber cable demands from its customers. In addition to stocking the cable, Walker's investment in fiber cable cutting equipment provides expanded opportunities to meet the growing demand for customized fiber cable orders.

In its first year of operation the cable facility shipped 8 million feet of fiber cable to customers, much of it requiring custom cuts. This added benefit provides customers greater flexibility, helps them avoid storage of extra cable, reduces shipping costs associated with full reels, and helps maximize project budgets. Customer response so far has been overwhelmingly positive.

Walker maintains an inventory of bulk cable in excess of $6M from industry leading fiber manufacturers. In addition to the fiber, connectivity equipment necessary for FTTx projects, central office redesigns and more are available to com-plete a bill of material for small and large projects.

Fiber cutting, re-spooling and maintaining and inventory of bulk fiber cable is positioning Walker to support customer needs in even greater capacities. While fiber availability continues to challenge US carriers, Walker is uniquely poised to provide not only the fiber cable, but also the associated equipment and services that matter to anyone involved in designing, building and maintaining growing networks.

In other responses to trends of change, Walker announced in late 2016 development of its Virtual Networking Lab. As a value added distributor, Walker has a rare combination of supplier partner breadth and technical depth which has presented the opportunity to solve a significant problem facing our customers: interoperability. Walker has always had a consultative approach to supporting our customers with complex multi-branded solutions in areas such as core routing, optical transport, access networks, and CPE. To support its customers Walker created a software networking lab environment that tests, integrates, deploys and maintains virtualized and automated versions of the same hardware versions of networks Walker sells and supports.

In expanding the capabilities of this lab, Walker works with strategic OEM partners to test and package turn-key solutions for specific use cases. But the really exciting aspect of the lab, however, is working alongside customers to design, test, and deploy solutions that are custom-tailored for each customer's network. The hardware integration function is not new to Walker, nor are the many valued partners that trust Walker to represent their solutions.

The goal of the Walker Lab is to offer clients the opportunity to introduce these technologies, explore how to exploit these technologies to position your company's network for the next generation Virtualized Automated Network. Walker's staff has experience in uCPE/vCPE NFV, Operating Systems on top of VMware and OpenStack, Automation tools such as Ansible, Puppet and Chef, VNF Managers and Orchestration. The Walker Lab offers Integration, Interoperability and Performance testing to help you validate your specific virtualized network architecture. Contact Walker to evaluating these technologies and implementation projects with your team

As expected, these expansions move Walker closer in its quest of emerging as a single source for customer requirements. Through their engineering services, Walker assists customers with network design. An expansive range of logistics services provides customers with worry-free supply chain management. Additional services include managed services such as monitoring, remote support, Network Operations Center (NOC) services, Security Operations Center (SOC) services, and more, Together, all these services and resources are moving the company further along its evolution to a Value Added Distributor (VAD).

Learn more about Walker's extensive network services at
http://walkerfirst.com/managed-servic-es/

In the Spotlight

By Randy Turner
Director, Marketing Communications
Walker and Associates

Shane McCullough joins Walker and Associates as an OEM Development Manager, focused on the CommScope account. Shane began his career in telecommunications more than 20 years ago in Inside Sales at Walker. He later worked as a Senior Product Manager for the Power Transfer Switches & Cross Connects at Emerson Network Power. He brings to Walker extensive experience and expertise as he focuses on product management, marketing, and customer service. He is an accomplished sales and marketing professional. Welcome back to Walker, Shane!

Shane can be reached by email at shane.mccullough@walkerfirst.com, or by phone at 336-731-5255.

Dave Armentrout recently joined Walker and Associates as Director of Services Development. He returns to Walker to fill this critical position vacated by Rick Walker who announced his retirement in 2017. Dave brings a wealth of experience into this role as a corporate leader within multiple service provider organizations as well as his prior time served within Walker.

Walker and Associates has made tremendous strides in recent years not only growing its business, but evolving into its new identity as a Value Added Distributor. With expanded technical expertise and diversified technologies, Walker is rebuilding the tools, processes, and people needed for this new identity. Dave will play a critical role in achieving next milestones. Please join Walker in welcoming him as he rejoins the Walker family.

Dave can be reached by email at dave.armentrout@walkerfirst.com or by phone at 336-731-5316.

Patricia Buelin was promoted to the position of Inside Sales Executive in Walker's Federal Sales Department. She has nearly 10 years of experience as an Inside Sales Executive and Customer Service Representative. Patricia now covers DOD-West, DOE, contactors-west and other Strategic Accounts.

Patricia can be reached by email at patricia.buelin@walkerfirst.com, or by phone at 336.731.5280.

Joe DeFranco joined Walker last fall 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.

Joe can be reached at joe.defranco@walkerfirst.com, or by phone at 336.731.5266.

Mike Lawson recently joined Walker's Federal Sales team, covering the Navy, Marines and SPAWAR-East. Michael worked as the Senior Account Manager for Juniper Federal the past 9 years covering the US Navy and Marines. Prior to that he covered the same space for Nortel and Timplex Systems. He is a graduate of Shippensburg State College.

Mike can be reached by email at mike.lawson@walkerfirst.com, or by phone at 336-731-5269

Michael Smith joins Walker as Project Manager of Installation/Services. Michael works closely with installation staff in managing the delivery of Walker's larger based installation projects. One of his first first major projects with Walker was a multi-node network upgrade that included installation provided by Walker resources. He has also assumed leadership in managing ongoing support services and addition network builds for a municipal broadband project.

Michael spent 22 years with Windstream Communications (formerly Lexcom Telephone Company). His roles as Project Engineer, Plant Management, Engineering & Planning Manager, Supervisor – Outside Plant Engineering, and Manager – Outside Plant Engineering provided Michael with great experience in the project management aspects that add to Walker's service capabilities. In these roles, Michael managed the design, deployment and construction aspects of copper telephone networks, hybrid fiber coax cable television networks, and fiber to the home networks. His experience enables Walker to focus on project management aspects for network upgrade builds in the pipeline

Michael resides in Lexington, NC, and works in the Welcome office. He can be reached by email at michael.smith@walkerfirst.com, or by phone at 336.731.5223.

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Patti Brammer retired from Walker and Associates following 20 years with the company. Her career at Walker included sales support, contracts and proposals, and years as an Inside Sales Executive for both commercial and federal sales. She was recognized by her peers, customers and manufacturer contacts for outstanding sales and customer service.

She looks forward to spending more time with her family and friends. Congratulations Patti!

Rodamaker says once signed, the new law will allow co-ops to "improve the quality of life for our members, to help them meet the need not served by anyone."

Haslam was expected to sign the bill by late April.

'NO ONE ELSE OFFERED'

Back in Colorado, Terry Salisbury knows Orchard City better than most. His great-great-grandparents were among the first homesteaders in the area. Now, thanks to DMEA and Elevate Fiber, he sees his two-by-three-block, no-stoplight hamlet on the verge of a new frontier.

"People want to work from home, but they can't get hired because their internet is too slow," Salisbury says. "Having a good quality connection would really enhance our lives."

That's what got him to meet with neighbors, hand out fliers and yard signs and, by any means necessary, "beat the bushes" for Elevate Fiber sign-ups. Orchard City needed 312 subscribers committed to at least one year of service to get the co-op to come in. Sign-ups have topped 400.

"I went out and pounded on doors. I talked to people everywhere I went," Salisbury says. "We got our people signed up pretty quick."

Salisbury is retired from his business as an alcohol and drug abuse counselor. He looks forward to instantly downloading photos from his son in New Mexico.

Without broadband to access the internet, "we are pretty much limited to our telephones," he says. "No one else offered to put in broadband beside Elevate."

DMEA made the move to bring broadband access to homes and businesses after completing a recent fiber-based system communications upgrade.

Launched in June 2016, Elevate Fiber can deliver up to 1 gigabit service to Montrose-based DMEA's more than 27,000 members across Montrose, Delta, and Gunnison counties. When the project is completed in five to six years, the co-op will have laid about 4,000 miles of fiber.

"At less than a year old, Elevate is already a catalyst for economic development," says Becky Mashburn, marketing and public relations administrator for the co-op. "Since we're building our fiber network from the ground up, we're seeing boosts from the start with construction. Now that we have live customers, our members and businesses can improve their daily operations too."

Elevate Fiber has eight staff and has contracted with Outback Power to run fiber to the home. Outback works with Lightworks Fiber & Consulting, a local fiber splicing company that has 65 employees, including former miner Kincaide.

Without the Elevate Fiber contract, "I wouldn't have hired this many people," says Lightworks co-owner Teresa Neal. "I would have continued working out of my house and stayed at under 20 employees."

She says the big job from Elevate Fiber is "trickling down" into the local economy through her company's leasing of 20 trucks, renting equipment, and buying fuel and lumber, among other things.

On a recent morning before starting his fiber work in Hotchkiss, just a dozen miles or so from the mine where he used to work, Kincaide reflects on what's in store for his quiet Colorado county.

"I think broadband will definitely be good for the community," he says. "A lot of positive things will come out of it we don't even know yet. Mining has been a big part of Delta County for a long time, but, at the same time, you've got to be flexible. Life is always changing."

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, exhibiting at conferences and expos, and directory advertising.

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

We look forward to seeing you at these events!

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NRECA TechAdvantage	Nashville, TN
NTA Technology Day	Grand Island, NE
MARCH 2018	
ICA Annual Meeting & Expo	Des Moines, IA
* UTC Region 3 Spring Meeting	Jacksonville, FL
ITA Showcase Northwest	Portland, OR
MTA Annual Convention	Minneapolis, MN
SCTBA Annual Convention	Charleston, SC
APRIL 2018	
TCEI Expo	Belton, TX
TANE Spring Symposium	Portland, ME
NC Telecom Expo	Pinehurst, NC
CalCom Showcase & Tech Expo	Sacramento, CA
* TechNet Fort Bragg	Fayetteville, NC
OTA Outside Plant Seminar	Newport, OR
MAY 2018	
Broadband Communities Summit	Austin, TX
* UTC Telecom & Technology	Palm Springs, CA
ANMTA Spring Conference	Tucson, AZ
NDTA TOC Conference & Showcase	Fargo, ND
* ACE/RUS School & Symposium	Atlanta, GA
AFCEA Defensive Cyber Operations Symp	Baltimore, MD
NTA Spring Conference	Lincoln, NE
KTA Annual Meeting	Lexington, KY
OTA-WITA Joint Annual Meeting	Sunriver, OR
June 2018	
TTA Spring Meeting	Franklin, TN
OTA/ATA Summer Conference	Branson, MO
* INDATEL	Indianapolis, IN
Fiber Connect 2018	Nashville, TN
IBTA Annual Convention	French Lick, IN
NYSTA Annual Conference	Lake Placid, NY
FNA Conference Summit	Buford, GA
ITA Annual Convention	St. Louis, MO
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