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TECHNOLOGIES
TRENDS and
TOPICS
for 2016**

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Letters to the editor may be sent to SWEditor@walkerfirst.com

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Editor's Letter

In preparing for this issue, I dug through a bookcase and located the 10th Edition of Newton's Telecom Dictionary, once considered an essential resource for those of us working in Inside Sales at Walker and Associates. It was published in 1996, the same year the Telecommunications Act of 1996, became law. In many ways it is hard to believe 20 years have gone by since that historic, game-changing piece of legislation was passed. What is most difficult to imagine, however, is just how much our industry has changed in those 20 years.

For example, reviewing the resource mentioned above, it is interesting to note the terms not included. Keep in mind that this book was 1320 pages, but didn't include a single reference to voice over IP. The term IP, in fact, received not much more than a footnote, with no reference of it as a potential vehicle to carry voice. And the definition for "gigabyte" only described how many bytes that includes. It nearly laughs at the idea of that much data, stating "That's enough space to hold 200 copies of this dictionary." How far we've come considering today's movement toward gigabit broadband services, a subscriber base now forecasted to exceed 100 million users by 2020.

With this anniversary in mind, it is particularly fitting that we included an article written by Chip Pickering, CEO of INCOMPAS. While serving as a staff member with Sen. Trent Lott (R-Miss.) he served as a staff member on the Senate Commerce Committee, where he helped shape the Telecommunications Act of 1996. Because of his role in drafting the 1996 Act, he subsequently became well known as a Congressional leader on telecommunications issues. That background gives him a unique perspective on the topic of competition today, which the 1996 Act was in part designed to define and protect.

Along with the technology changes currently underway, the expanding scope of broadband delivery is an ongoing challenge for today's carriers. ICT services are no longer limited to traditional carriers, but now include opportunities in multiple markets. This is especially true for utility carriers, as described in Bobbi Harris's article on page 10.

For this issue, we wanted to cover a wide range of topics, mainly because we know more than one thing keeps our carrier customers up at night. Increasing competition, technology shifts, regulatory changes, rising consumer expectations, evolving definitions of broadband, funding sources and more - it just doesn't seem to stop. With that in mind, we cast a wide net toward our Skinny Wire contributors, asking them to write about what they view as most important topics, trends and technology facing the ICT industry. We expect you'll find this a valued resource as you navigate 2016.

Now, I need to put the Newton Telecom Dictionary back on the shelf. Some relics are worth holding onto.

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Telco Data Centers: Opportunities in Moving Data and Services Closer to the Edge

By Timothy Downs
Founder, CEO
Interwork Media

The telco industry has undergone a major evolution. The switch from copper to fiber has readied networks for speed and scale, and the physical switch has become a software switch, shrinking the footprint needed for equipment. Along the way, the lines have blurred between telcos, network carriers, colo-hosting centers, cloud service carriers and more.

We are now in the age of the Internet of Things (IoT) where Gartner, Inc. predicts there will be 25 billion connected things — mobile devices, smart appliances, sensors, cars, industrial machines — by 2020. The Cisco Visual Networking Index forecasts that “annual global IP traffic will surpass the zettabyte (1000 exabytes) threshold in 2016, and the two zettabyte threshold in 2019.”

The explosion in devices, IP traffic and the accelerating move by enterprises to cloud services is generating a transition in the investment and deployment of infrastructure. “Cloud centers are being built to perform massive computing and store masses of data,” says Russell Senesac, Data Center Business Director at Schneider Electric in a blog post, “but they are going to be too far away for effective data transfer. Data is going to have to live closer to the end user.”

The movement of data and computing power closer to the end-user means greater emphasis on edge-of-the-network computing power. And this may mean new revenue opportunities for telcos who migrate their legacy facilities into next generation data centers and micro centers that leverage Central



“Data is going to have to live closer to the end user.”

Office free space, fiber connectivity and existing business processes.

That’s why we’re seeing the emergence of edge computing platforms, which will distribute computing loads closer to devices (such as smartphones, tablets or sensors), resulting in reduced latency. The architecture of the future will likely have several variations; it could be a gateway or embedded device, or it could be a micro data center.

Edge computing services also allow telcos to rapidly deploy scalable new services, both for consumer and enterprise business segments – helping them differentiate their service portfolio. Furthermore it helps create new revenue streams thanks to its ability to unlock innovative services that can be delivered from

closer to the user, and can improve the bottom line significantly improving end user QoE.

The Central Office as Data Center

It’s not difficult to envision the Central Office of yesterday transitioning to a Data center or Edge Computing hub of tomorrow. They are both mission critical facilities with mission critical infrastructures, prime for adaptation to a new economy of digital capacity and availability. Being close to the user with the foundation in place to support the demand for more connectivity, capacity and speed translates into a tremendous business opportunity.

According to Schneider Electric and other data center solutions specialists, data centers can be used to generate non-



regulated revenue in addition to supporting the telco core strengths of connectivity and business services. In a blog post, Schneider Electric's Mark Hurley writes that telco facilities make perfect data centers because of their location at the edge of the network; the digital technology and connectivity that CO's typically have on site and lastly central offices are mission critical facilities with mission critical infrastructure already in place. According to Hurley, building a data center in the unused space in a CO translates into fairly short-term ROI and creates a diverse revenue stream.

Opportunities exist not only in colocation services but also in managed services from hosted PBX to security and infrastructure-as-a-service. Colocation is a model that makes the data center avail-

able for rent to customers. These types of data center facilities provide space, power, cooling, IT racks and physical security for the IT equipment (but the IT technology is brought in and managed by the tenant.)

A Rack-Based Deployment is a rack-by-rack deployment option leveraging the existing infrastructure. Racks can be deployed on demand in as little as 3-5 days. This deployment model helps preserve capital by providing just in time delivery of data center capacity. A rack supports the IT equipment and includes the rack, rack mount UPS and rack PDU. This deployment option assumes you have excess existing infrastructure capacity to support the IT rack power and cooling requirements.

Hosted Services is another data center model that provides software-as-a-service, smart hands and managed services. If you want to move from a colocation data center to a hosted services model you do not require any additional infrastructure investment.

Hosted services require an additional investment in IT equipment, software and IT staff, but this model can generate up to 20 times the revenue stream of a colocation model.

National Carriers Sending Mixed Signals
Last month, AT&T, Verizon, Deutsche Telekom, British mobile operator EE, South Korea's SK Telecom, and several other companies announced they were joining the Open Compute Project, the Facebook-led open source hardware and data center design community.

Together with data center services giant Equinix and the network technology vendors Nokia and Nexius, they formed a whole new group under OCP focused specifically on data center technology for network operators. The OCP Telco Project will serve as a way for these companies to tap into the innovation ecosystem and supply chain that have saved Facebook billions of dollars in data center costs.

In a major industry shift, last year large telecommunications providers such as Verizon, CenturyLink, AT&T, Windstream began to offload data center space to re-focus on their core competencies rather than trying to compete with the major third-party data center service providers. While analysts maintain there appears to be nothing fundamentally "broken" with the data center businesses, the large telcos seem to believe they can obtain the benefits (services for their enterprise customers) without owning the facilities.

In smaller secondary and tertiary markets, the story may not be the same. Some data center analysts believe that data center providers are looking to subordinate markets for expansion opportunities, as they follow online content providers like Netflix and Comcast who are searching for new customers in new markets. Furthering this push into smaller markets are federal requirements for disaster recovery facilities to be located far from company headquarters. With these two factors it is likely that larger data center providers will start to acquire local data centers in tertiary markets.

TIA Speaks on Top Telecom Trends for Q1 2016

By Limor Schafman
Director of Content Development
TIA

An interview with Franklin Flint, Chief Technology Officer of the Telecommunications Industry Association (TIA) on the trends carrier and supplier CTOs are watching closely in 2016 and beyond.

You have convened a CTO Council of TIA member CTOs recently in which they shared their latest market observations and thought leadership. What were three key trends that were discussed?

1 Demands on Capacity and Flexible Networks

By far the biggest trend is the massive increase in demand on capacity. This is flying out of control. At the Council meeting, CTOs commented on the 50% year-over-year growth rate in bandwidth requirements on networks that carriers have already built. Carriers know that right around the corner their existing networks are going to be maxed out, and they need to keep building to try to get ahead of it.

They are addressing the problem by using technologies like network functions virtualization (NFV). NFV offers better scalability, which enables carriers to build to needed capacity, then scale and add to or reduce existing capacity on the fly as demand fluctuates. Over the next several years, NFV will replace traditional fixed networks. A lot of NFV technologies are not yet matured. Carriers are already deploying some virtualized services, but the goal is full automation in NFV architecture. There are many pilot projects and demos, but full automation is not happening quickly enough. Here at TIA, we are facilitating this need for quick development by opening an NFV Lab this year as a testbed. Other companies and

carriers have their innovation development labs as well. The industry is very excited about the promise of NFV.

2 Advances in Wireless Technology

Another technology trend that everyone is talking about is advances in wireless technology. 4G still has room for technological development. It's not dead yet. Even though we're all talking about 5G already, 4G has growth capabilities built into it, so carriers don't have to redesign everything and come up with new standards in order to meet current demand. But as I mentioned, demand is ever increasing and 4G does have a growth ceiling, so development of 5G standards is getting underway. There are specific needs it will address: capacity, bandwidth and latency. A perfect example of the need for 5G is remote surgery. The sur-

geon will need a high resolution screen without a lot of compression, because even a slight change in the color of a vein could matter. This means high bandwidth and capacity. The surgeon needs instantaneous response time. So latency has to be as low as physically possible. Finding the way to do this affordably in the 5G spectrum is what everyone is working toward. The faster the agreement and adoption of standards, the faster products and services can get to market. 3GPP, ITU and other organizations have begun the standards development process. Once 5G needs are defined, the networks will be built.

3 Internet of Things, from the Carrier Perspective

Internet of Things (IoT) is a huge trend, but to carriers it's just more capacity, more users, more network traffic – more, more, more. One of the issues is that a



“... a single standard does not yet exist for IoT for controlling network traffic. This is an issue ...”



single standard does not yet exist for IoT for controlling network traffic. This is an issue because right now when a company builds an IoT solution, it assumes it will work. But as more IoT platforms and devices go online and traffic grows, carriers will want to categorize that traffic and find a way to prioritize it and move it around, but they don't have a way to commonly do that. The communications community knows this need exists and standards bodies are working to develop that common language.

What role is Open Source playing in the telecommunications industry today?

Carriers are starting to call for open source solutions, particularly with regard to NFV. They will still buy proprietary solutions if they can provide something that open source cannot, but they expect open source to get there, and with strict service level agreement (SLA) adherence. Going forward, it looks as though there will be a combination of open source and proprietary technology. And fortunately,

many companies that have had success in the IT sector are coming in and teaching us how best to take advantage of this new way of developing products and going to market more quickly.

What are the latest views on demand for licensed spectrum?

Spectrum is a challenge. There is a fixed amount of spectrum available. It's like real estate - once you run out, you run out. But there's a lot of spectrum that could potentially still be made accessible. The trick is working with the various regulatory bodies in the U.S. and around the world to provide the right spectrum to the carriers so they can take advantage of it in the most appropriate way. There are multiple uses for wireless networks including public consumer and enterprise, government, military, public safety, broadcasting and private radio networks. Regulators and the industry need to balance current needs with demand coming down the pike, while also aligning frequency and spectrum requirements so that cost-efficient and higher quality products can be produced.

Connected vehicles offer a compelling example, because the automotive industry continues to pursue this market opportunity which requires communication capabilities which on occasion may be mission critical with life and death consequences. How do we best support that mission, while still making spectrum available for other valuable commercial initiatives? This is a huge discussion, and we are advocating on Capitol Hill and with several different regulatory agencies on behalf of our members in the hope of achieving a win-win solution.

What are the trends in unlicensed spectrum technology?

There is a big move from some companies to take advantage of unlicensed spectrum for cellular phone use with LTE-U. But other technologies already use unlicensed spectrum including Wi-Fi, Bluetooth, Zigbee, etc., and all of the household phones and microwaves that use that spectrum. The trick is that unlicensed spectrum is free for everyone to use. If everyone chooses it at the same time and same location, some services might have issues. People strongly disagree about whether LTE-U will affect other services. And if there is a problem, maybe that's fine since unlicensed spectrum is open to anyone, or maybe the regulatory bodies will decide to step in, or maybe everyone will find a way to agree. It's a big debate in which our members are involved - and we're following it closely.



ADVANCING GLOBAL COMMUNICATIONS

The Telecommunications Industry Association (TIA) (TIAonline.org) is a non-profit trade association representing the manufacturers, OEMs and vendors who supply products and services to telecommunications carriers. TIA provides standards, policy advocacy, market intelligence and other services to its members. TIA publishes an annual market intelligence report, and technology and market analysis white papers. It holds a number of events including its annual conference TIA 2016 (TIA2016.org), workshops, webinars, seminars, standards meetings and more. Its video news service is TIA NOW (TIANOW.org).

Franklin Flint (@FranklinCFlint), CTO, oversees Standards, Numbering, development of the TIA NFV Lab, and the CTO Council, and speaks on behalf of TIA at conferences around the world. He joined TIA after 20 years at Dell, Inc. where he helped develop the telecommunications vertical strategy. Most recently in that position he managed partner relations for co-developed ICT enterprise product and service solutions. He is considered a strategic thought leader with extensive experience in ICT enterprise, data centers, networking, storage and server technologies.

Limor Schafman (@LimorSchafman) is Director of Content Development at TIA. She brings her extensive knowledge of technology and marketing to TIA in the development of the annual TIA 2016 conference, workshops, webinars and other TIA information resources. She occasionally acts as host for the video news service, TIA NOW. Formerly, Limor was marketing strategist and business development consultant to new technology companies. She began her technology career in the video game and theme park industries in Los Angeles, and was an international corporate attorney in Paris, France.

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Increase Density While Reducing Cost and Installation Time in the Network

By Pat Thompson
Director Global Business Development
CommScope

The increased demand for more bandwidth for an array of applications, particularly in mobile networking, is putting pressure on central offices (COs), head ends and data centers. This demand is driving higher fiber counts, making service providers walk a fine line between greater termination density for their optical distribution frames while maintaining easy accessibility for technicians.

In the past, the outside plant (OSP) to equipment fiber ratio was about two to one, or two OSP fiber terminations in the CO to every one equipment fiber termination. The focus for access and connections was primarily on the front of the optical distribution frame line-up. There was very little electronic equipment with optical interface – usually the last piece of equipment before the signal exited the CO. Increased bandwidth and the use of C/DWDM, ROADM and other technologies has led to more fiber optic connections in the office. The need for more fiber in COs, head ends and data centers today is putting more focus on the ability of the technician to bring cabling to the rear of the optical distribution frame (ODF), as well as provide a flexible solution that can adapt to different network strategies.

Addressing how to cable into the rear of these frames has become equally important as running the crossconnect jumper on the front. But let's talk a bit about why this is important to you.

More fiber requires higher densities

Service providers are deploying ever-increasing amounts of fiber into their networks in general, but one of the largest increases is in the amount of fiber being deployed into the access network, from the OSP toward the subscriber (fiber-to-the-home, business, curb, etc.) Additional fiber is being used for wireless backhaul as mobile use steadily rises and more bandwidth-hungry applications are introduced for wireless devices, such as streaming video.

With more and more optical connections to contend with, the challenge becomes how to add optical density to the fiber frame while still maintaining proper ac-

cessibility, flexibility and manageability at the lowest possible cost.

Ultimately, all of these fiber terminations are destined for the rear of the ODF, presenting significant routing and management challenges for technicians since most fiber management systems were not designed for rear connector access or cable routing. Typically, the focus has been on the front connector access and crossconnect patchcord routing. Technicians are discovering that rear cable routing takes substantial installation time (cleaning and routing of connectors and fibers) and is simply much more difficult to achieve successfully without damaging connections or fibers through improper routing. In other words, it is adding a significant point of failure for problems resulting from damaged connection or fibers. Thus, while service providers are under great pressure to increase densities, they must also consider the significance of having the best possible accessibility while decreasing installation time and risk to the network.

Flexibility, modularity and footprint

Another trend related to more fiber in the COs and data centers is the push for improved modularity and flexibility using fewer parts. Again, the pressure is on to reduce installation time and expense in both new deployments and upgrades. Reducing installation times requires a solution that is engineered and configured for fast deployment, easy connectivity and with as less risk to the network as possible. But it also includes easy product selection, simplified ordering and shortened lead times. Simply put, service providers want one solution that will fit multiple application scenarios. The preference is one generic item that can serve multiple functions within the network.

Many solutions on the market today limit service provider choices according to application. For example, products may only be designed for use with certain connectors, singlemode or multimode, patchcords, IFCs (intra-facility cables), on-frame splicing or optical splitters. Ideally, service providers are seeking one base solution that is flexible enough to accommodate any installation and can be



ordered by one part number – an off-the-shelf solution that makes engineering, configuration and turn-up fast and easy.

Achieving high density in a fiber panel or frame, from a pure physics standpoint, is not inherently difficult. A lot of adapters and connectors can be crammed into a very tight space. The challenge is, in two words, accessibility and identification. Can the technician find the correct port and connector to access, and can he access it without damaging adjacent fibers or without using a special tool?

New developments provide additional improvements

New optical distribution frame (ODF) solutions have emerged in marketplace that address many of the requirements of service providers worldwide. These products incorporate well-designed, easy-to-manage characteristics that have been developed throughout many years of listening to customers, and puts them into a single, modular, flexible product. The building block for these ODF's includes a unique platform of a 12-fiber LC adapter pack. Due to their small size, packing many LC connectors side by side makes it difficult for a technician to access one connector without touching and risking damage to adjacent connectors. These LC adapter packs are also staggered every two connectors from front to back to provide visual separation and identification.

Critical Infrastructure Communication Networks Provide the Lifeblood of Smart Communities

By Bobbi Harris

VP Market Strategy and Development
UTC

Near the end of 2015, the White House announced a new smart cities initiative, [Envision America](#), which will invest over \$160 million in federal research and leverage more than 25 new technology collaborations. The goal of Envision America is to help communities confront key challenges such as reducing traffic congestion, fighting crime, fostering economic growth, managing the effects of a changing climate, and improving the delivery of city services. One key technology will be crucial to the success of the smart cities initiative – real-time, two-way communications networks.

The Information Communications Technology (ICT) marketplace will once again be called upon to deliver the most reliable, scalable and efficient communications technologies to meet these smart city challenges. Electric, water and natural gas utilities are leading the charge in many areas by upgrading their own operations, providing rural broadband to the home, coordinating joint-use and rolling-out data-packet IP communications networks. By casting a stronger communications net, these critical infrastructure providers are quickly becoming the backbone of all things smart.

At UTC, utilities and technology members collaborate to tackle a wide range of challenges, from new regulations and investing in infrastructure to filling open technology jobs and bolstering community advantages while advancing science and technology to accelerate these efforts. Working alongside civic leaders, data scientists and technologists, utilities are joining forces to build these “Smart Communities.” Communications suppliers, whether public carriers or primary-use spectrum providers, are being challenged to add new devices and faster data speeds.

There is great opportunity for the ICT marketplace within the Envision America framework, including new revenue streams, partnership opportunities and advancing new technologies. Utilities and city leaders are in need of credible information about technology solutions. ICT providers should step into the spotlight



“... NIST plans to invest \$5 million in Smart Cities in 2016 ...”

in 2016 to investigate participation in Envision America collaboration and highlight their solutions for smart communities. [Facts about the Envision America](#) investments include:

- More than \$35 million in new grants and over \$10 million in proposed investments to build a research infrastructure for Smart Cities by the National Science Foundation and National Institute of Standards and Technology.
- Nearly \$70 million in new spending and over \$45 million in proposed investments to unlock new solutions in safety, energy, climate preparedness, transportation, health and more, by the Department of Homeland Security, Department of Transportation, Department of

Energy, Department of Commerce, and the Environmental Protection Agency.

- More than 20 cities participating in major new multi-city collaborations that will help city leaders effectively collaborate with universities and industry.
- Ten cities will be chosen based on their goals, collaboration with local organizations and commitment to developing and planning for a smart city. The cities will then participate in a 3-day workshop to begin planning, with private sector partners staying involved throughout the year to support the implementation of their plans.

Like the ARRA funding from 2009, the Envision America funds will not reach

all communities, so those not chosen will need creative financing options. However, also just as with the ARRA funding, this initiative should heighten the focus on proven solutions from ICT providers. UTC has launched a new [community of communities called NetWorks](#),



which provides another collaboration channel for members in addition to its conferences and other educational activities. UTC members can privately discuss Envision America initiatives, as well as federal and state regulatory challenges, technology successes, best practices in operational efficiencies, etc.

Communities across the country are building systems of continuous improvement for the collection, aggregation and use of data to improve the life of their residents by harnessing the growing data revolution, low-cost sensors and research collaborations. These systems require the highest cybersecurity to protect safety and privacy of individuals and organizations. The National Institute of Standards and Technology (NIST) cybersecurity framework created by Executive Order (EO) 13636-issued February 12, 2013- is tasked with developing a voluntary cybersecurity framework. The Framework would apply across the critical infrastructure sectors and provide a “prioritized, repeatable, performance-based, and cost-effective including security measures and controls, to help owners and operators of critical infrastructure identify, assess, and manage cyber risk.” This too is a great opportunity for ICT solution providers – NIST plans to invest \$5 million in Smart Cities in 2016 and is launching a new round of the Global City Teams Challenge. (AT&T announced that it will support Internet of Things and Smart Cities technology adoption by supporting testbeds in cities in the U.S. and globally. AT&T will select 10 U.S. cities to deploy technology for smart metering, lighting, traffic management, parking, and public safety. The company will host a Smart Cities hackathon with NIST participation at the

AT&T Developer Summit in January 2016 with participating cities.)

The ICT market should put plans in place to seize these opportunities and collaborate with organizations such as UTC and with federal agencies included in the Envision America initiative.

For more information on UTC's efforts, or opportunities to participate in any of UTC's programs, please contact us at membership@utc.org.



A smart water and smart city industry expert with more than 15 years of experience, Bobbi Harris is the VP of Market Strategy & Development at UTC. In her years as a global strategic marketing professional, she has focused on environmental issues and sustainability technologies to address water and energy challenges including smart water infrastructure, smart grid, cleantech and green building initiatives. Ms. Harris is also founder and CEO of [Smart Water, Smart City, LLC](#) and a leader in market analysis, strategic intelligence and technology assessments. Her insights are sought by key stakeholders, including the U.S. Conference of Mayors, National Association of Regulated Utility Commissioners, National League of Cities, and electric, water and natural gas utility leaders and technology executives worldwide. Bobbi serves on the advisory boards of the [Research Triangle CleanTech Cluster](#) and [Energy Central's Smart City Community](#). She is an active member of the [Women's Council on Energy and the Environment](#), and [Clean Energy Education and Empowerment](#). Ms. Harris graduated summa cum laude from Campbell University, earned her MBA from the same.

Fiber-to-the-School: New Opportunities for Carriers and Suppliers?

Recent Rules Changes in FCC's E-Rate Program open the door for new fiber connections for schools and libraries using agency funds.

By Timothy Downs
Founder, CEO
Interwork Media

A revolution in learning is underway at schools and libraries across the country. The decreasing cost of technology, especially tablets, netbooks and other devices combined with next generation WiFi solutions featuring increased bandwidth and speed are just part of the digital revolution. Cloud-based software too is playing a role in the transformation to an increasingly interactive and individualized learning environment that expands the learning environment beyond the four walls of the school.

And yet, many US schools and libraries lack the infrastructure necessary to fully utilize today's learning technologies – particularly when it comes to WiFi in the classroom and high-speed 'gigabit' networking speeds to the campus or facility. Local Internet architecture is a lynchpin for the kind of efficient service that can handle cutting edge activities that could involve high-definition video encounters or massive amounts of data flowing between devices.

According to a report from the non-profit EducationSuperHighway, an estimated 21.3 million students in the United States remain without the broadband connectivity needed for effective digital learning. "In schools using digital learning, bandwidth demand is growing at a rate of 50% or more per year." While the FCC established a future goal of 1 Mbps per student for Internet access, today, "only 9% of school districts have this level of connectivity. As a result, the vast majority of school districts are going to need to aggressively grow their Internet access, with the typical school district needing to triple its bandwidth over the next three years."

When Congress passed the Telecommunications Act of 1996 authorizing the creation of the E-rate program (more formally known as the schools and libraries universal service support mechanism), only 14 percent of class-

rooms had access to the Internet, and most schools with access (74 percent) used dial-up connections. Today, virtually all schools and libraries have Internet access.

In 2015, the FCC issued two orders, the first of which took initial steps to improve WiFi connectivity in schools and libraries, and streamlined program administration. The Second Order tackled the underlying connectivity challenge; the so-called "connectivity gap." By its own estimates, the FCC believes at least 35% of schools and 85% of libraries lack access to fiber infrastructure today. Beginning in 2016, schools and libraries can close the "connectivity gap" by realizing the potential of the most promising, highest capacity broadband technology available: dedicated, private, fiber optic networks.

In an analysis performed by EducationSuperHighway, fiber was the most cost effective way to deliver high-speed network access. Districts leveraging fiber benefited from approximately nine times more bandwidth and 75% lower cost per Mbps compared to those that did not use fiber. Long-term leases of private fiber networks are an increasingly attractive – and now extremely viable – alternative to the broadband services offered by telecom and cable providers.

In order to successfully deploy 1:1 computing environments, leverage digital textbooks and other digital content, perform online assessments, support distance learning, and fulfill the promise of so many other digital learning opportunities, schools require more network capacity than ever before. Simply catching up with current demand is no guarantee for the future, however. Data from a 2013 bandwidth test showed that 63% of U.S. schools fell short of federal connectivity benchmarks, and 99% of schools will not be meeting 2018 standards for network connectivity. A report in 2014



from EducationSuperHighway states that school bandwidth needs are increasing 30-50% per year.

The E-Rate modernization plan provides new opportunities for schools (and libraries) to be served by regional and national fiber networks, network services companies, and technology solutions providers including WiFi manufacturers, cloud-services firms and more.

Two important components of the FCC Order are: It amends the E-rate program's eligible services list to equalize the treatment of lit and dark fiber. Dark fiber leases permit a customer to purchase capacity on a provider-owned and maintained fiber network without paying for transmission service. Secondly, it permits schools and library applicant to seek E-rate support for self-construction of their own high-speed broadband networks, or portions of such networks,



“Data from a 2013 bandwidth test showed that 63% of U.S. schools fell short of federal connectivity benchmarks, and 99% of schools will not be meeting 2018 standards for network connectivity.”

when self-construction is the most cost-effective solution.

Under the old rules, when a school or library opted to lease lit fiber, the modulating electronics (which are necessary to “light” that fiber) were considered a category one service, making them more likely to receive E-rate funding. By contrast, schools that leased dark fiber — meaning that they purchased capacity on a provider’s network without paying the provider for transmission services — could not get category one support for the modulating electronics, a distinction that created a strong disincentive for schools and libraries to choose dark fiber, even if it was a more financially prudent option. Today, the FCC recognizes that “leveling the playing field between lit and dark fiber will expand options for applicants and will likely reduce costs.”

Another key rule change is the suspen-

sion of the requirement that applicants seek funding for large up front construction costs over several years. As with many government funding activities, schools or libraries must come up with some portion of the funds — known as a match — to access E-Rate funds. Before the December rule changes the match had to be paid in the first year. Now, up-front costs can be spread over four years. The rule changes can incentivize schools and libraries to obtain funding for fiber-optic services besides those lit services that are offered through a traditional incumbent.

In Summary

From Kansas City to Charlotte and nearly a hundred cities in between, the continual increase in demand for bandwidth is driving the need for next generation infrastructure-based telecom services around the country. Policymakers, community leaders and technology advocates

are shifting focus to the next generation of connectivity – “gigabit broadband” – as the transformative general purpose technology that will lead a significant contribution to economic growth and competitiveness.

Community Anchor Institutions – including schools, health facilities and libraries -- represent a unique and important place in our nation. Digital learning opportunities have the power to transform K-12 education in the U.S. and equip today’s students to compete in the global economy. What’s more, libraries, health facilities and educational institutions are vital to the community as a physical gathering place as well as an access point to the Internet and the opportunities available on, and from, the World Wide Web.

The new E-Rate rules, which are in effect in 2016, allow schools and libraries to take advantage of greater flexibility and increased funding to make smart, sustainable investments in their broadband futures.

To learn more contact EducationSuperHighway at www.educationsuperhighway.org, and Schools Health and Library Coalition at www.shlb.org

Moving Toward the Programmable, Disaggregated Network

By Steve Pelosi
VP and Head of the Optical Business Unit
Fujitsu Network Communications, Inc.

Over the past decade or so, the prevailing trend in the network equipment industry has been consolidated, multi-function equipment. The move to WDM in the core, combined with a diverse set of technologies needed for transport, required a high degree of integration.

This approach, however, has disadvantages for network operators. First, these integrated platforms may force operators to purchase functionality they can't use. Second, technology combined into a multifunction platform may need to be "sub-optimized" to fit within the operational and physical constraints of that platform. Third, multifunction platforms are not an ideal fit for every network size. Since multipurpose networking platforms are also costly and energy-inefficient by today's standards, as well as occupying a lot of rack space, network operators have collectively turned to the vendor community for new approaches.

Multiple Forces Propel Change, Open Up New Possibilities

While multiple factors drive change in communications networks, massive bandwidth demand is almost a constant. The forces that propel this continually increasing demand are familiar throughout the industry: Over the Top (OTT) services; widespread adoption of smart mobile devices; the ascent of the Internet of Things, and general escalation in customer expectations as more and more

aspects of daily life require us to be online. The question is no longer whether or not increased bandwidth is needed, but how much will satisfy the demand.

A trend towards an open and programmable architecture has arisen that essentially applies design concepts from the IT world to benefit communications networks. As the lines begin to blur between the worlds of IT and Communications networks, new types of networks become possible along with a range of benefits and opportunities.

Fundamental Design Changes Needed in Network Equipment

Network equipment must change to enable programmable, open, scalable, simple networks. Programmable networks are built for software control. Software-based solutions are more flexible and faster to deploy (and later enhance) than any hardware-based solution, because there is no need to be physically present at the site.

Open networks also eliminate vendor lock-in, offering an environment that invites innovation, and enables multi-sourcing for maximum cost, competition, and supply advantages. Similarly, networks that are easy to scale reduce cost and testing times and allow for pay-as-you-grow capacity, resulting in a shift in capital spending from network equipment to revenue-generating ser-

vices. Finally, simple, open-architecture networks reduce operational complexities, speed service creation and activation, and produce a more agile business through software.

To achieve these programmable, open, scalable, simple networks, the needed change is "disaggregation." Disaggregation means separating networking equipment into functional components and allowing each component to be independently optimized and individually deployed, a less costly and much more flexible approach than traditional multifunction platforms. Ideally, disaggregated equipment is provided in the smallest form-factor capable of delivering a specific function (for the purposes of this article, this means a single rack unit (1RU) in height, which is 1.75 inches). This type of equipment should be self-contained, require no additional common equipment to operate, and incorporate open APIs to enable SDN control. Lastly, it is essential that new, disaggregated platforms be interoperable with legacy equipment, which allows operators to extend the functional life of these investments as long as necessary.

Disaggregated Hardware Benefits Networks of Any Size

It is against this backdrop that the disaggregated hardware platform has entered the arena. These networking platforms are the result of breaking up network equipment into "build it your way" functional components. The compact physical size, comparative simplicity and component-based design of these platforms result in massive physical downsizing, flexibility, open architecture, and ideally, programmability.

Disaggregation was first implemented in IT networks and is now being picked up by communications network operators because of its compelling benefits. These benefits can be realized not only on large communications networks, but across the whole spectrum of network types and sizes:

1. Efficient, and pay-as-you-grow scaling – Network transformation

"The question is no longer whether or not increased bandwidth is needed, but how much will satisfy the demand."



can start with as little as a single piece of equipment, providing low initial cost and as-needed growth in increments of 1RU. You buy only the functions needed and pay for additional capacity only when demand grows enough to justify it. This is in stark contrast to large multipurpose implementations that carry heavy up-front costs, impose additional cost for unused functions, and require additional common equipment to operate.

2. Rack Space Utilization – A small, dense form-factor allows for full utilization of rack space in increments of 1RU. This eliminates rack unit waste for shelves that are not fully utilized and which consequently prevent the installation of other equipment into that rack space.
3. Innovation – When designing multifunction equipment, you are constrained by the form-factor, the system software, and the dependencies among the other functions incorporated into the multifunction shelf environment. Disaggregation breaks apart the shelf and makes each functional component independent. Thus, the physical form factor is neither dictated nor limited by a shelf. Independent functions and software provide freedom of innovation not possible in multifunctional equipment—and result in less testing because there are fewer dependencies to test.
4. Open Architecture – With the arrival of open architecture and

open APIs, you can now choose to build your network with the best-of-breed equipment in each functional area. The network can be virtually converged using software, providing operational consistency across diverse functions and vendors. An open architecture also favors continual operational and software advancement and improvement, reduces costs and cuts time to market for new service deployments.

Disaggregated Hardware: Why Now?

You may be wondering: if disaggregation is so great, why did multifunctional equipment become predominant in the first place? The answer effectively comes down to the timing of technological advancements. The hardware and software technology is only now reaching the maturity to make disaggregation possible. Next-generation hardware technology like CD/CDC ROADM enables programmability of the communication network hardware and inception of SDN/NFV and other software advancements; the hardware technology basis needed to pull the disaggregated network together is just now being realized.

Disaggregation's Sweet Spot Combines Immediate Benefit and a Path Forward

The future of networking equipment is disaggregation. Programmable, open, scalable, and simple networks are needed to meet growing demand and competition. Operators who create custom disaggregated networks can turn their network from an expense into a competitive advantage. But this cannot happen overnight. Existing network assets need

to be utilized and the whole network transformed over time. It is therefore vital that the disaggregated equipment you choose can interoperate with your existing network, adding new functionality and lifespan to your existing assets, delivering immediate and incremental benefits, and preparing the way forward in affordable steps.

As disaggregation matures, an ecosystem of vendors will evolve, new software applications will be developed, and innovation in functional hardware will improve cost, density, and power. But to realize the immediate benefits available, the time to get started with disaggregation is today.



Steve Pelosi, as head of the Optical Business Unit, drives the technical product strategy and direction for the Fujitsu optical networking portfolio. During his career at Fujitsu, Steve has held leadership

positions in network operations, software, optical transmission, and wireless.

Steve began his career at Bell Labs and Bellcore, working in transmission from 1982 to 1987. He then spent five years at Bell Northern Research, working in switching.

Steve received his B.Sc. in biology and psychology from SUNY Buffalo, and his M.Sc. in industrial and operations engineering from the University of Michigan at Ann Arbor.

Customer Benefits Through Automation with SDN and NFV

By the Juniper Networks NFV Team

Helping service providers solve specific challenges they are facing today while improving life cycle

Introduction

Software-Defined Networking (SDN) and Network Functions Virtualization (NFV) are transformational technologies that enable service providers to create highly programmable networks with automated workflows. Automation solves the specific challenges that service providers are facing today with respect to managing complexity, reducing operational costs, and improving the overall customer service life cycle.

Functions to Automate in a Service Delivery Network

Juniper Networks believes that certain key functions in a service delivery network will benefit immediately from automation. With SDN and NFV, service providers can create an automated framework that supports every step of the service life cycle. To date, many of the steps involved in the service life cycle are complex and labor-intensive.

Automation enables service providers to efficiently plan, build, and operate innovative services while adding responsiveness throughout the entire life cycle. The resulting gain in efficiency and responsiveness ultimately improves the overall customer experience.

The following section highlights how automation improves each element of the service life cycle.

- **Order and Fulfillment:** A self-care portal provisions services based on existing repeatable templates to deliver services in minutes.
- **Control:** Customers have substantial visibility into and control over their services, giving them the ability and flexibility required to activate, modify, remove, and relocate services. Requested changes are automatically configured in the network, with fewer errors.
- **Security:** Automated security detects

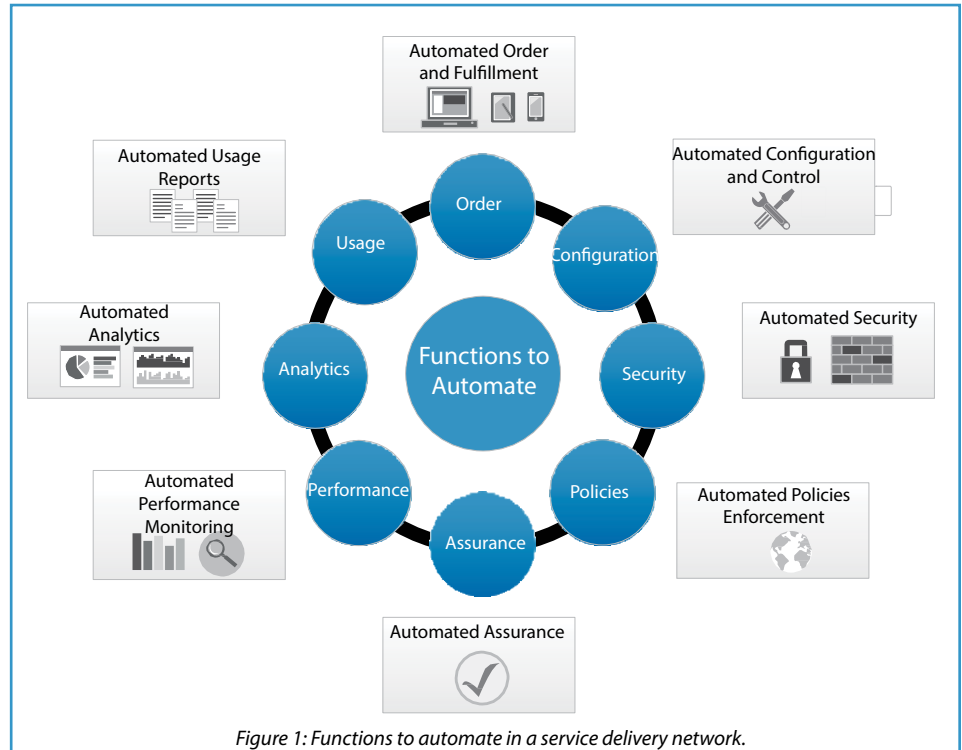


Figure 1: Functions to automate in a service delivery network.

malicious traffic and enforces policies designed to safeguard network access.

- **Policies:** Policy-based service management adjusts network resources, including bandwidth and traffic priority, allowing the network to dynamically provide differentiated services and role-based access.
- **Assurance:** Proactive error detection and fault reporting provide insights that enable network operations to reroute traffic and limit service disruptions.
- **Performance:** Automation provides active traffic management while maintaining service performance objectives.
- **Analytics:** Analytics capabilities enable service data to be collected and analyzed from across the network domain for network optimization purposes.
- **Usage and Reporting:** Reporting fea-

tures record and measure usage patterns, traffic volume, and any specific usage of network resources for network planning purposes.

Benefits of Automation for the Enterprise Customer

Speed and Agility

Automation expedites the service fulfillment process. The order process is intuitive; customers, using a simple self-guided user interface, can select and manage a variety of virtual network functions (VNFs) from a service catalog.

Flexibility

Automation enables highly flexible and scalable service deployments. Customers can quickly roll out new services with a small and affordable initial deployment that can be swiftly expanded and provisioned for high availability and performance.

Control

Customers have the ability to activate, modify, remove, and relocate service resources. Policy-based controls automatically manage bandwidth and service levels, allowing customers to customize differentiated services and access privileges based on departments, geographical locations, and role-based access.

Simplicity

Automation simplifies evolution over the life of a service. Under today's systems, any service update is a complicated process that requires technical support visits from the service provider. Automation eliminates manual processes and Performance Automation provides a complete real-time operational picture. Assurance proactively measures usage patterns, traffic volumes, error detection, and fault reporting to establish a service provisioning feedback loop that optimizes and sustains service Key Performance Indicators (KPIs) irrespective of deployment size.

Security

Automated security provides encryption, key management, authentication, and role-based access to the service. Automation proactively uses real-time feeds on emerging threats so that security enforcement points within the network

can automatically filter malicious traffic without requiring any human interaction.

Visibility

Automation gives customers visibility into their services. Network usage and quality across services are constantly monitored, analyzed, and benchmarked. Customers can design service policies that automatically manage network resources.

The Juniper Networks NFV Solution

Juniper Networks market-leading NFV solution consists of a Management and Orchestration (MANO) platform, Network Functions Virtualization Infrastructure (NFVI), and VNFs.

At the heart of Juniper's end-to-end NFV solution is the Juniper Networks® Contrail Cloud Platform, an intelligent, policy-driven, automated service delivery, resource allocation, infrastructure configuration, assurance, and security solution.

Juniper's automation framework and Contrail Cloud Platform combine to deliver business agility, predictable KPIs, and lower TCO.

NFVI serves as the network foundation to deliver services and an open platform for third-party applications and multiven-

dor integration. Juniper's NFVI includes: Juniper Networks MX Series 3D Universal Edge Routers, which provide the routing foundation for NFVI; SDN gateways, which perform traffic analysis and policy enforcement; and the MetaFabric™ architecture, which creates high-performance data center and cloud networks.

Juniper is one of the first vendors to introduce VNFs, which include the carrier-grade vMX virtual routing platform, IP VPN, and the expansive virtual security services platform, vSRX. Juniper's NFV solution also facilitates an open ecosystem for Juniper partners and third-party developers to create new and innovative VNF services. Additional information about Juniper's NFV solution can be found here.

Conclusion

The Juniper Networks vision for network automation revolves around its automation framework, which leverages SDN and NFV to automate many steps of the service life cycle. Juniper's innovation in NFV delivers automation that effectively streamlines services provisioning, minimizes complexity, reduces time to market, and drives business results while meeting customer expectations.

In a series of predictions for 2016 Mikko Disini, director Product Marketing at Citrix, examines the pace of change in network functions virtualization (NFV)

This year will mark the beginning of a multi-year roll out of NFV, as the early adopters move beyond proof of concept and into full wide-scale deployment.

- In 2015, there has been much discussion around the transition to NFV, and how operators can deploy it in existing networks. We've seen product launches, proof of concepts (POCs) and industry partnerships as the market matures.
- In 2016 we'll see some operators at the bleeding edge that have completed several POCs move into the detailed planning stage and start issuing RFPs for multi-year deployments.
- Other operators are postponing the move to NFV as they have a lot of existing capacity for growth in their networks, so will continue to build out physical appliances. These operators will be watching the early movers to NFV with interest, but will be looking three or so years ahead before they make the move.
- In between, there are operators with older technologies for which NFV is the natural upgrade, and which will start looking at trials next year. Likewise, the more greenfield operators that are leapfrogging previous technologies will move straight to NFV.
- In 2016, challenges will remain but the industry will move to address them - for example, openness in the variety of interfaces needed to make technologies compatible; and balancing the ROI that can be gained through operational cost savings and speed to market of services versus the upfront investment of time, resource and cost to deploy NFV.
- We're seeing the blurring of development operations teams and the need for them to work hand in hand to build out apps quickly and an agile way, so that operators can iterate quickly for applications, in a matter of weeks - this is known as devops. A major challenge that we'll see continue to play out in 2016 is telcos competing with the OTT players that use the devops cycle, and being able to innovate fast enough. Operator organisations, typically siloed, do not lend themselves naturally to the devops methodology.
- Furthermore, in 2016 operators will continue to build out the skill sets needed for NFV, hiring from web-scale companies and cloud providers.
- NFV is not a solution in and of itself - operators need to adjust the mindset, skillset and structure of organisation to be able to take advantage of the agility and flexibility that NFV will bring.
- In 2016 operators will look to vendors that have experience in and capabilities for devops environments to support them to leverage the power of cloud, and to rapidly and continuously integrate code to deliver new services.

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Deploying 10 Gigabit Access Networks: Using the Emerging NG-PON2 and XGS-PON Standards

By Robert Conger
 AVP, Carrier Strategy
 ADTRAN

Understanding NG-PON2 Architecture

The primary value of Next Generation PON (NG-PON2) is the ability to serve a mix of residential, business and backhaul services over a common optical Distribution Network (ODN) using a mix of point-to-point and point-to-multipoint technologies. The biggest challenge facing NG-PON2 is coming up with a single system that meets the scale and flexibility needs of premium business and backhaul services while also delivering on the price points needed for mass market residential applications. XGS-PON is a fast developing standard supported by leading service providers and ven-

ONTs nearing the price level of today's mainstream GPON ONTs.

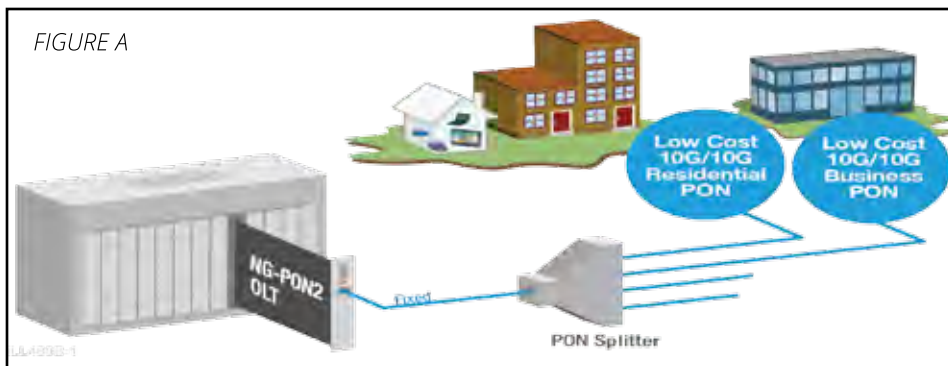
This flexible optics approach allows for mass market 10/10G NG-PON2/XGS-PON adoption for all broadband applications (Figure A) while maintaining flexibility for the future overlay of an additional fixed optics 10/10G business PON and/or multiple TDWM PONs using higher capability tunable optics (Figure B).

The ADTRAN NG-PON2 system elegance offers the ability to benefit from mass market price points without having to wait for large volumes to be reached

available through the disruptive ADTRAN NG-PON2 solution set, service providers can extract an additional five to ten years of revenue from this year's residential PON deployments, maximizing future service flexibility and minimizing risk of subscriber churn.

Solution Programmability and a Commitment to Open Interfaces Simplifies Converged Operations

Additionally, the operational cost and complexity to connect a FTTH subscriber can be further reduced to accelerate the expansion of Gigabit broadband services. ADTRAN's solution supports provisioning through modern, open APIs, facilitating the deployment in next-generation SDN-based management systems. Both the ADTRAN OLT and ONTs support open, standard-based, physical interfaces allowing for the support of best-in-breed network design and the delivery of universal CPE across a multi-vendor network. This in concert with accelerated mass market electronics and optics pricing ensures that cost-sensitive residential broadband will be viable using NG-PON2/XGS-PON technology.



dors around the world for 10 Gbps (XG) Symmetric fixed wavelength PON over the already established GPON/NG-PON2 infrastructure.

Flexible Optics Balance Cost and Scale

Realizing that the major cost component of any NG-PON2 system is the cost of the optical transceivers (both at the OLT and ONT), ADTRAN has developed a flexible optics approach to NG-PON2 that allows for a single NG-PON2 OLT system to utilize multiple types of optical transceivers, allowing the service provider to better align the cost with the target application. The flexible optics range from low cost fixed optics for residential, business and small cell broadband applications to fully-tunable optics for premium enterprise, datacenter, fronthaul and backhaul services. Through further innovation in the ONT optics design, ADTRAN has developed a fixed optics 10/10G ONT solution compliant to NG-PON2, XGS-PON, and GPON standards that allows for the immediate support of NG-PON2 ONTs for business and backhaul services as well as being able to seed the residential market with less complex NG-PON2

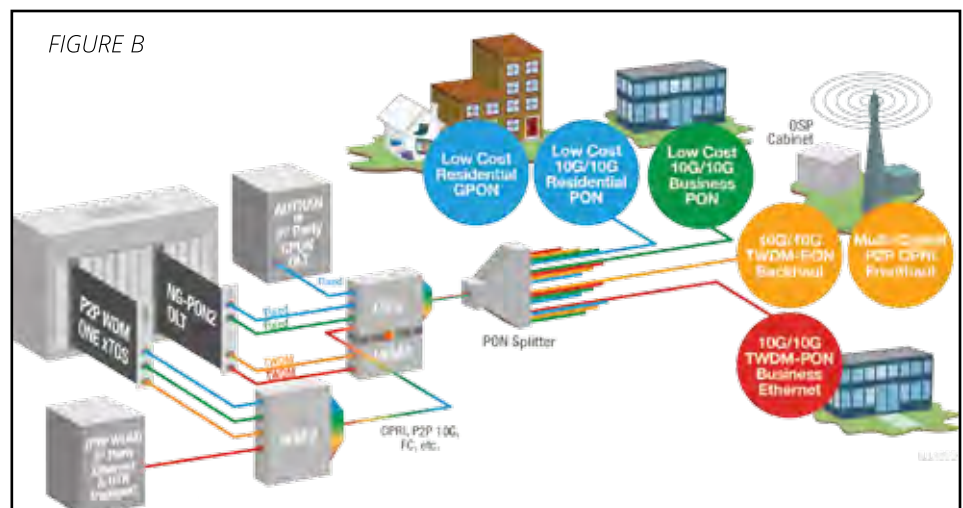
in the 10G PON market. This approach gives service providers confidence that they can move forward with a 10G PON strategy today, without the risk of depending on a future worldwide volume ramp of 10G and tunable optics to make it cost-effective. On the OLT side, any mix of optics can be used on a single OLT, allowing for maximum flexibility without compromising on future capabilities. Leveraging the additional capacity

[See attached diagram]

Figure A: Deploy mass market Gigabit or multi-Gigabit converged broadband services using low cost fixed 10/10G optics (XGS-PON)

[See attached diagram]

Figure B: Overlay premium optical services with the deployment of higher capability Nx10/10G tunable optics





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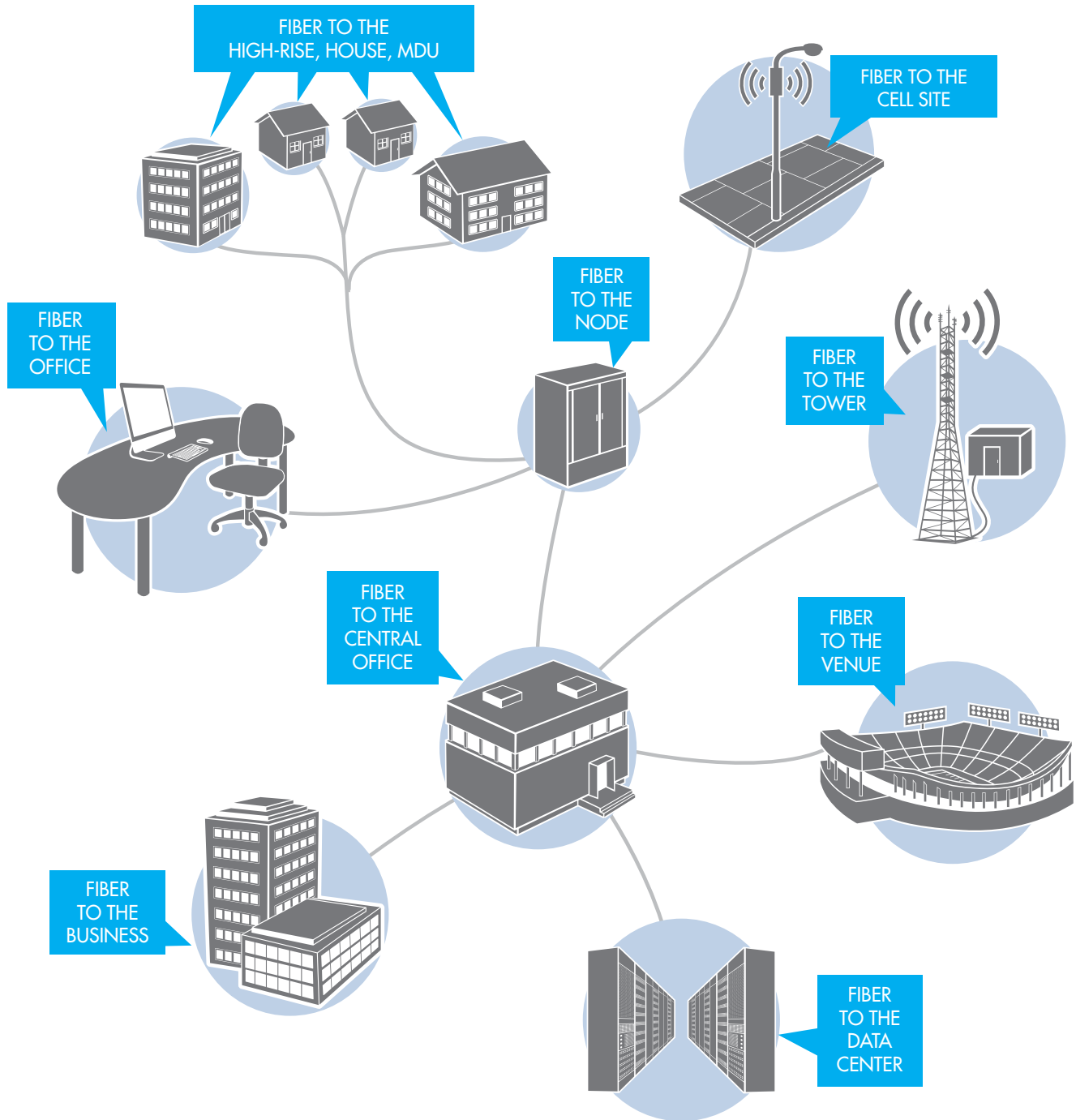
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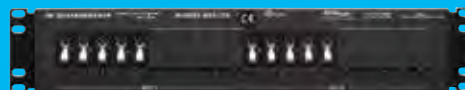
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Site Power Monitoring

Happy Anniversary, '96 Telecom Act

By Walter McCormick
President, CEO
US Telecom Association

This year, Americans should take a break from our daily digital immersion to celebrate the enactment of Telecommunications Act of 1996. With its twin pillars of competition and deregulation, this groundbreaking law set the stage for the thriving broadband Internet economy we take for granted today. The Act accelerated massive investment and innovation in communications and information technology propelling widespread adoption of powerful and connected technologies leading to unforeseen economic prosperity and consumer choice. We've come a long way in a very short time.

Twenty years ago, nearly every home in America had landline voice service from a local telephone monopoly and paid third-party long distance providers by the minute. Most viewed television from the local cable monopoly or over the air. Wireless communications, satellite television, and the Internet were in the very early stages of their development. Fax machines, Palm Pilots, and clunky desktop computers with dial-up Internet were cutting edge. Practically no one had broadband Internet, certainly not of the speed and quality available today.

The Telecom Act transformed the communications industry from a group of isolated monopolies to a highly competitive, diverse, and innovative marketplace. It broke up local voice and cable monopolies and allowed competition across traditional industry boundaries, which set in motion the race to build the broadband Internet. New wireless and Internet markets became competitive from the outset. As a result of policies encouraging broadband network competition in a minimally regulated environment, the investment spigot opened up. Since 1996, broadband providers have invested \$1.5 trillion building competitive landline and wireless networks across the nation and continue to invest more than \$70 billion annually.

The benefits of broadband competition and investment unleashed by the Telecom Act have been astounding. In 20 years, Internet traffic has grown by a factor of more than 135,000; we invest more per capita than other industrialized nations; and we generate more traffic than all counties except South Korea.



With access to broadband, mobile, and WiFi networks, U.S. consumers, businesses, and governments are well along the transition to modern, more efficient Internet and mobile networks. Today our industry continues to invest in better and faster networks while we build the cloud computing and content distribution infrastructure so essential to the evolving broadband and mobile Internet. And we are laying the foundation for emerging applications, such as data analytics, the industrial Internet, and the Internet of things.

Consumers are the greatest beneficiaries of these evolutionary changes. Almost all Americans can get either wired or wireless Internet access. Approximately 90 percent of Americans have a choice among two or more landline providers and four or more wireless broadband providers. Public and home WiFi networks are widely available. Nearly 300 million Americans in 90 percent of American households have a wireless phone, with a majority using a broadband-enabled smartphone. Only half of households have a landline phone at all. Long-distance charges are a thing of the past as consumers purchase all distance voice service, usually in a bundle with broadband Internet access. Subscription video services are available from telecom broadband providers, satellite companies, and cable. Meanwhile tens of millions of American households are getting video through new online Internet video services.

Consider the difference twenty years has made in consumer services, convenience, and choice in industries such as music, photography, books, print and broadcast media, voice communication, video entertainment, advertising, retail, real estate, travel, hospitality, and consumer finance. Other industries are also being transformed, such as energy, manufacturing, and even agriculture. Meanwhile, we have thriving industries that either did not exist or barely existed 20 years ago, such as search, social media, location services, online markets, and the sharing economy; and there is a transformation taking place in health, education, and public services.

While the Telecom Act was ahead of its time in the 1990s, 20 years later it is time for a refresh. Having achieved its core market-opening goals and achieved a fast-paced, dynamic broadband economy, much of the Act is now obsolete. In a world where competition is occurring across traditional industry boundaries, where computing and communications have converged, the Telecom Act's categories make no sense. At the same time, new challenges are arising around privacy, intellectual property, cybersecurity, and completing the deployment of broadband to all parts of the United States. Congress, as the elected representatives of the American people, must ensure that telecom policy addresses today's challenges, not last century's, and ensures that we retain our international leadership.

Competition Policy Marches Forward in 2016



By Chip Pickering
CEO
INCOMPAS

Last year, we witnessed some of the biggest victories for competitive policy in over a decade at the FCC: the Tech Transitions Order to preserve and promote competition; the acceleration of FCC review of the business broadband marketplace and lock up provisions; the rejection of the Comcast-Time Warner Cable merger; and the adoption of an Order to ensure all consumers have access to an open Internet.

INCOMPAS, representing communications and technology companies large and small, advocates for laws and policies that promote competition, innovation, and economic development across all platforms—wired, wireless, Internet, streaming, edge providers and start-ups. We are an association of new network builders.

Last year's tech transitions win was a catalyst for new networks and competition. The collective effort to build a better technology future helps consumers, business customers, and non-profits alike. New networks' technology enhances the ability to simplify networks; transport critical business data securely and reliably among multiple office, branch, store, or campus locations; support high-bandwidth applications at a lower cost; and scale bandwidth as businesses grow.

Here's a closer look at some of the biggest issues facing INCOMPAS in 2016:

Broadband Competition and Special Access

Special access services are a linchpin to competition in the business broadband and wireless markets. These are dedicated lines that are vital to business operations and wireless backhaul. INCOMPAS has, and will continue, to urge the Commission to act expeditiously to adopt comprehensive policy reforms to stop the exercise of market power in this critical market. Pro-competitive policies for special access services will stimulate investment and innovation, the positive impact of which will reverberate across various industries.

Let's face it: Every American who relies on a wireless connection for an UBER



ride or connecting with friends on Twitter and Snapchat has a dog in the fight for promoting wired and wireless competition and innovation via special access.

On a broader scale, wireline broadband competition has a tremendous impact on how businesses large and small, schools, hospitals, and nonprofit organizations operate and grow through secured managed services, cloud computing, and connection to the Internet.

Chairman Tom Wheeler and the FCC deserve praise for their work moving the data collection effort and policy reform process forward. They are responding to the hundreds of business customers who have asked the FCC to protect and promote competition. Competition brings

them better service and lower prices.

Last year, INCOMPAS organized businesses and trade associations representing 150 thousand gas stations and convenience stores to rally behind competition policy. Expect that effort to increase in 2016.

Ending the Bell Lock-Up

The FCC has also launched an investigation into terms and conditions within broadband plans that lock up customers and lock out competition for broadband services. The FCC is looking into damaging terms and conditions that are preventing customers from moving to a competitive provider, and delaying the deployment of new advanced networks.



New Networks Initiative

The House Energy and Commerce Subcommittee on Communications and Technology has been addressing broadband deployment issues in a series of hearings. In December 2015, the Subcommittee voted a combined package of previously released legislative proposals designed to reduce barriers to deployment.

Included in this package is the bi-partisan-supported "Dig Once" legislation, which proposes to lay broadband cables while doing road repairs to minimize traffic congestion.

INCOMPAS has supported the legislation, in addition to developing a coalition to protect the pole attachment language in

the House broadband deployment bill and to encourage Senate consideration of similar provisions so that network builders face as few barriers as possible to bring competitive options to market.

Set Top Box Reform

In January, Chairman Wheeler announced his intention to begin a process at the FCC that could finally bring an end to the cable monopoly of the set top box marketplace. Unlike the cable set top box, new competitive devices allow consumers the freedom to move seamlessly between traditional television channels and new over-the-top based content and apps. Forced leasing of the old cable box is costing consumers \$231 each year. That's collectively about \$20 billion a year for the cable companies which also control 99 percent of the set top box device market.

INCOMPAS supports the "Competitive Navigation" solution that will promote consumer choice and competition in the access of Multichannel Video Programming Distributors (MVPD) and Over-the-Top (OTT) video.

The long and the short of it is this: No consumer wants their streaming content blocked or barricaded by the cable company; people shouldn't have to switch remotes to watch their favorite over-the-top shows.

By ending monopoly control and breaking open the set top box market, Chairman Wheeler and the FCC have the power to present a free market solution for video devices that will bring both competition and innovation and more video choice to consumers.

Video Reform

Competitors offering broadband Internet access service must also offer video service in order to effectively compete in the residential marketplace. However, a NTCA/INCOMPAS video survey of our respective members demonstrates the difficulty with obtaining reasonably priced programming. The survey results state that 95% of small providers and new entrants into the video/broadband market struggle to obtain reasonably-

priced programming, and 40% report retransmission consent fee price increases of more than 100% during the current contract cycle. The Commission has the opportunity to address the pricing disparities new entrant and small providers face in its pending retransmission consent proceeding. By doing so, competitors can put more resources into their network upgrades and deployments to better serve consumers.

Final Thoughts

The fight for more competition is a battle on many fronts. But with a unified coalition we can unleash new waves of innovation and consumer benefits. The end result will be greater choice, innovation, and economic development – and ultimately a brighter future for consumers and business customers.

About the Author

Chip Pickering became CEO of INCOMPAS in January 2014. Pickering was a six-term Congressman, representing Mississippi's Third District. During this time, he served on the House Energy & Commerce Committee, where he was vice chairman from 2002 to 2006 and a member of the Telecommunications Subcommittee. He also was co-chairman and founder of the Congressional Wireless Caucus and an assistant minority whip of the House. Previously, Chip worked for Sen. Trent Lott (R-Miss.) and served as a staff member on the Senate Commerce Committee, where he helped shape the Telecommunications Act of 1996. Because of his role in drafting the 1996 Act, he became well known as a Congressional leader on telecommunications issues. Most recently, Chip was a partner with Capitol Resources LLC, a public affairs and government relations firm, where he represented an array of telecom clients, including wireless, cable and competitive broadband providers, as well as non-profits and companies specializing in education, energy, technology and defense. There, he also played a vital role as one of the principal negotiators in developing a wireless industry agreement for interoperability in the 700 block.

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Getting More Out Of the Hosted Telephony Explosion

By: Patrick T. Sheehan
Director, Open Solutions Sales
Mitel

There's no question in anyone's mind that the cloud is booming, including Hosted IP Telephony and Unified Communications. Such rapid market expansion provides so much opportunity, thousands of companies in the US have joined the market as a VoIP Service provider of some sort. From local carriers to Tier 1 national carriers, small Managed Services outfits to large recognizable names in hosted internet telephony, there is literally a sea of service providers out there, vying for every customer's Monthly Recurring Charges as they move to the cloud.

While every service provider is keenly aware of the value of that monthly charge for the service, there are many providers who have yet to embrace the revenue opportunity of the associated devices – the desk phones. Now, I know mobile devices have their place for some users as the exclusive device, and while that number is small today it is growing. But for the next several years, the fact is that the desk phone will still be the primary choice for over 2/3's of users. The SIP Phone market will continue its rapid double-digit growth rate through 2020, driven primarily by hosted telephony, and this presents opportunity for Service Providers to capture additional revenue. Service Providers that sell the phones are able to recognize 30-45% more revenue, and even more by bundling those phones into the monthly service fee. In order to take on this responsibility, it is critical to have highly reliable products that are easy to deploy and maintain, and solid technical support from the phone manufacturer to ensure happy, loyal customers and reduce operating costs. This is something Mitel delivers, and our resellers frankly rave about it.

We've talked about getting more revenue from customers already acquired. One of the challenges associated with this market growth, and the abundant choices customers have in selecting a provider, is brand awareness. Customer referral is the most powerful lead generation tool critical to new customer acquisition – if the customers know WHO provides the service. How many end users actually know who their provider is – 5% at most? The people that manage the relationship

“The SIP Phone market will continue its rapid double-digit growth rate through 2020 . . . ”

and the people that pay the bills are the only ones that would know this 6 months after the install (unless the install went poorly, then unfortunately most users remember.) What about the other 95% of users? Imagine how many times a day someone calls or texts a friend and asks “Who do you use for your phone service, my company is looking, and yours seems great.” You know what that person being asked does as a proud brand advocate – they look down at their phone and respond with the name of the phone manufacturer.

That phone represents a branding opportunity for Service Providers, and it is an opportunity to ensure their brand is in front of nearly every end user. Sure, you can put a sticker on the phone, which isn't the most professional image. Mitel (who acquired Aastra) took a different approach than other SIP phone makers, and manufactures the new 6800 series phones with Service Provider branding in mind. The phones have a replaceable logo plate, making rebranding the phones literally a “snap”. (See what I did there?) The color phone displays can also easily be rebranded during provisioning to create an OEM-like product without the complexity and stocking requirements. This makes it very cost-effective for our distributors and service providers to rebrand the phones on-demand as part of provisioning. We even leveraged this capability ourselves to offer our resellers a choice in phone brand – Aastra or Mitel.

This is one of those 1+1=3 scenarios where opportunity is knocking to: 1- maximize revenues from every customer and, 2- rapidly increase lead generation so you can repeat #1 over and over again.



Attention Network Operations: Your Dark Fiber Should Not Be Dark To You!

The lack of a fiber management system is costing you money.

By Jim Theodoras
Senior Director Business Development
North America
ADVA Optical Networking

If oil is black gold, then fiber has become glass gold. The rapid growth in mobile and cloud services have led to increased demand for dark fiber leases. And owners of dark fiber have awakened to the reality that they own a long-term asset that can be monetized. But this rapid expansion in access services offered over dark fiber has created a dangerous situation: There has been no way for the dark fiber provider and/or lessee to monitor and guarantee his service... at least until now.

Access Technologies and Networks Grow

Mobile and cloud services are both mega trends that have led to the development and proliferation of fiber access technologies such as edgeless unmanaged CPE and CPRI fronthaul, all leveraging dark fiber to transport increasing amounts of bandwidth. Dark fiber owners now have a wide variety of customers to lease their dark fiber services, but these customers want the service to remain dark. If they wanted a lit-service, they would have leased a wavelength or switched port. Furthermore, the access ecosystem is very diverse, and today's customer may be tomorrow's competitor. If a dark fiber provider were to light up his fiber, then his customers may worry about the provider offering the same services they are offering. Customers who want to con-



sume dark fiber want it kept dark, which is why even today these services tend to be "blind" services.

Blind Services are Dangerous

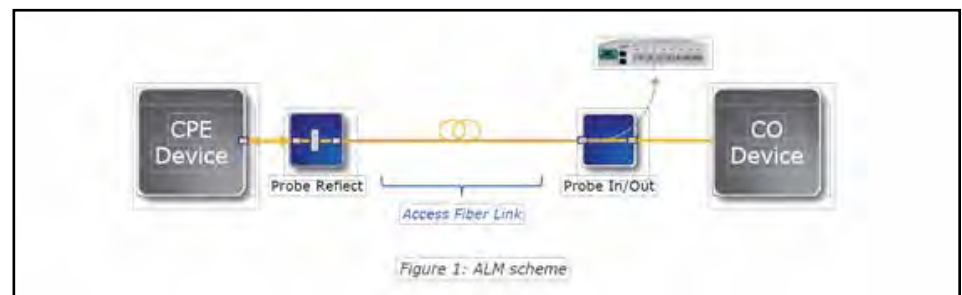
This situation puts everyone in a tough position. The dark fiber owner wants to monetize his asset by leasing it to access service providers, and the access service provider wants to make money by piecing together fiber links to carry their end customers' traffic end-to-end, and the end customer is working under the assumption the connection will simply always be up. None of this can hap-

pen without Service Level Agreements (SLAs), but there is no way to guarantee or ensure the service without active in-service monitoring.

must roll a truck anyway to investigate and – if confirmed – locate the source of the problem. Meanwhile, the dark fiber owner has no idea what is happening, and no way to know if the issue is in their fiber. In summary, three unhappy companies, all guessing at what may be wrong and losing money until someone figures out the problem and resolves it. Fortunately, there is another way that solves this conundrum while keeping everyone happy.

Shining a Light in the Dark

There is no reason access links must be



blind, nor remain dark. By re-thinking the situation entirely and taking a different approach, everyone in the access ecosystem cannot merely be kept happy, but also greatly exceed each other's expectations. The key is passive in-service monitoring of the physical fiber. An optical signal can be added into the fiber and extracted later. This independent optical signal allows the fiber's health to be characterized along its length. The fiber owner is able to monitor his physical asset, without encroaching upon his cus-

tomers who want to con-

tomers' business. The customer (and the customer's customer) can breathe easier knowing that the health of the fiber is being monitored in real-time and while in-service. SLAs can be written against verifiable availability metrics, rather than best intentions. Degradation in fiber quality can be caught well before service degrades, and before alarm bells ring at customer sites. A win-win for everyone.

Access Link Monitoring

ADVA Optical Networking has developed the FSP3000 ALM, an Access Link Monitoring solution which is able to proactively manage fiber infrastructure across any fiber services, any protocols and any customer equipment - all at a low cost point. The implementation consists of a central unit that monitors multiple fiber services in parallel and small inline reflectors placed at access end nodes. The reflectors may be pre-installed during build-outs, or later as upgrades, as they do not interfere with normal service. The ALM works by injecting a small optical signal at one end of the fiber which travels down the fiber and is reflected back up the fiber to the point of injection. A signal processor in the main unit compares changes in the optical return loss to a recorded mask. If a difference is identified, the distance to

the outage is calculated by time of flight of the signal to reach the disturbance. Fault localization is precise and fast, and since a reflector is located at the CPE end of the fiber, only one person is needed to troubleshoot link problems rather than the typical two. Suddenly, dark fiber ser-

vices are not an unknown quantity, but rather a precisely monitored asset that can monetized to the fullest extent.



Monitoring Dark Fiber Saves Money

Without service monitoring, at the first sign of an outage, trucks roll! The average cost of a truck roll is ~ \$300 (\$150+\$50/hr@3hrs). For networks with thousands of sites, this means millions spent - not counting lost revenue, or damages due to bad press. Now re-imagine a world where dispatch is used only to fix rather than identify problems. And since the location of faults is exactly known, repairs are completed quicker, helping to meet the 4hr MTTR typical in most SLA's.



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Staffing Your Organization for Telco Innovation

By Prayson Pate
Chief Technology Officer for Ensemble Software
ADVA Optical Networking



As the telecom industry knocks at the door of the telco cloud, operators are expressing concerns about finding the staff skill sets needed to support innovation. These service providers need to significantly enhance their capability for software development and integration. They also need to move from operational silos and waterfall development to agile and DevOps for development and delivery. They are clearly anxious about this shift.

Value Domain Knowledge

Telco service providers have a wealth of domain knowledge that is relevant and supports this innovation. During my recent "Real CTOs of NFV" interview with Tim Naramore of Masergy, Tim noted that Masergy's new Virtual f(n) service, based on NFV at the customer premise, is supported by existing Masergy staff and operational systems.

"One of the reasons we like our virtual network function partners is that we already use Brocade in our network. We already use Fortinet in our network. When we rolled this service out I didn't have to go to the NOC and teach them how to use a different firewall from another company. I was able to say, 'This is the same thing. It's just a different IP address.'

How you get it set up is different, but that's

a one-time thing. How you maintain it going forward and how you interact with it on a daily basis, that's the same. I wanted to deliver it to those brand names for one, but also I wanted to leverage the operational knowledge that I already have in my group," Tim said.

Smart Dogs Can Learn New Tricks

We at Overture (now part of ADVA Optical Networking) made our own shift. We had many years of experience with traditional Carrier Ethernet appliances and a large installed base of major service providers worldwide.

We began re-inventing our product line in 2012 to focus on network virtualization and we had to also re-invent our organization. Principal Engineer David Griswold enjoyed a long career in embedded development before learning a new set of development processes, languages and programming models.

"With an appliance like our traditional products, the environment is very controlled. In a cloud-based model, you have a lot more variability: processor type, speed and core count, cache and memory size, core affinities, NIC flavors, kernel versions, etc. Making the packet performance deterministic is much more difficult than in the appliance model. The

sheer volume of information can be overwhelming. To work effectively in this environment you have to get over the need to know how everything works. In addition, you wind up putting a lot of trust in open source, and that can be scary," David said.

Did his previous embedded experience help?

"Absolutely. We have always created software that moves and manipulates packets, and we are very familiar with the operators' services and networks. That domain knowledge gave me the background to succeed in the new virtualized environment," he says.

Retraining is a Start

Carol Wilson, Editor at Large at Light Reading sees operators trying different strategies, including retraining existing staff.

"AT&T is probably the best example of mass retraining. They're working to re-train thousands of people," she observes. "Rather than saying, 'Are you trained to do this specific program or get that specific certification,' they are asking, 'What's your skill set and how can we take that skill set and fit in to what we need in a different way?'"

Go to the Talent

"We did an event on carrier white box strategies in November in Santa Clara. There was a lot of discussion around the fact that telcos don't have core IT skills in great abundance, particularly when you start looking at the ability to do things that some folks in Silicon Valley take for granted, such as Chef, Puppet and Docker," she notes.

She says service providers are opening offices in Silicon Valley to be close to the new talent. However, with stiff competition from high-profile startups and glamour players Silicon Valley is a competitive environment.

Creating A Fast-Paced Culture

Carol also points to AT&T's Brooks McCorcle. Three years ago McCorcle pulled together a small group of top AT&T performers and gave them 90 days to develop a business for the SMB market.

That effort jumpstarted the AT&T Partner Exchange, giving VARs, integrators and managed services providers the ability to add AT&T services via network-based APIs. McCorcle operates the AT&T Partner Solutions Group using Agile and DevOps working models.

Focus on Automation

Travis Ewert, SVP of global software development at Level 3, says his company is aiming to increase operational scale and customer control by expanding the use of automation, as opposed to focusing specifically on SDN and/or NFV.

"Whether the resource is physical or virtual, for us the heavy investment is on what orchestrates and controls all those elements. We didn't have a focus on architecture, engineering or operations by themselves. Instead we worked across the groups. We found folks who came out of those backgrounds to be our innovation leaders," Travis says.

These leaders have one characteristic in particular: knowledge of the customer experience.

"We rely on those folks who are closer to the customer. That could be someone in operations who understands the nature of network and services in addition to

the experience of the customer. They understand both the tooling of the network and the services layered on top, as well as what it means to turn up and assure that service," Travis says.

In addition, Level(3) is hiring financial services industry experts. "They have been supporting stock trading, where you have millions of data series and you are looking for a correlation or anomaly to trigger an event. We are relying on them to build similar types of capabilities for more network-centric data. We are also going beyond simple algorithms to machine learning or even artificial intelligence," he notes.

How does Level(3) get these new hires up to speed on telco services and operations?

"We put our developers on rotations to watch over the shoulder of our operational teams and perhaps even do their jobs for a period. Doing so gives the developers a completely different appreciation for the operator's role and what it means to the customer. We also have curriculum and training focusing on operations and services. These efforts help the more traditional IT developers get network-savvy," Travis notes.

Has Level(3) totally solved the skill set problem?

"Those are strong words so I am not sure I would go that far. We do know what kind of staff expertise we want: networking experience, software aptitude and business processes. It's not easy to find all three, so you take people with two of the three and train them, and that's not easy," he says.

Just a Start

This is not an exhaustive discussion of strategies to address the skill set and cultural transition operators must make. I hope it provides ideas operators can implement to get to innovation more quickly. You can find my original posts on this topic at www.linkedin.com/in/praysonpate.



Prayson Pate is chief technology officer for Ensemble Software at ADVA Optical Networking. Prior to joining ADVA, Prayson was CTO and co-founder of Overture Networks, which was acquired by ADVA in January 2016.



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A photograph of two young children sitting on a light-colored shag rug, viewed from behind. They are looking towards a large television screen in the background. The screen displays a cityscape with a prominent building. The scene is lit with warm, indoor lighting.

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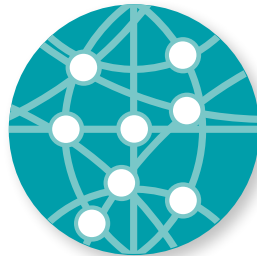
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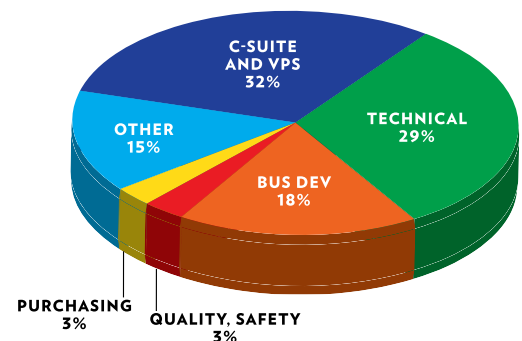
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In the Spotlight

By Randy Turner
Director, Marketing Communications
Walker and Associates



David Cotten joined Walker and Associates during the fourth quarter of 2015. David lives in Rockwall, TX which is a suburb of Dallas. His career started over 35 years ago with Nortel

Networks where he held various positions including engineer and account executive for their entire carrier based line of products and services. Upon leaving Nortel following 15 years of service, David went to Wave 7 and OSI promoting the first FTTH solutions into the IOC and CLEC markets. In the early 2000's, he joined Coppercom as their regional sales manager selling soft switches into the IOC, carrier and CLEC space. As the soft switch market tightened, David continued with Taqua in the same markets.

David has a great track record and enjoys a wonderful reputation within the carrier markets. Recently, David owned his own consulting business and also worked for United Power in the local markets. David has been covering the states of TX, NM, AZ, OK, LA for his entire career and knows just about everyone in Walker's target carrier accounts in his new sales territory. He is excited to be at Walker and will be a great asset to customers and supplier partners in OK, TX, AZ and NM. Please welcome David to the team and introduce yourself when you get a chance. His email is david.cotten@walkerfirst.com, or he can be reached by phone at 336.731.5431.



Bob Sawyer recently joined Walker and Associates as the Regional Account Manager for the states of VA, PA, NJ, WV, MD and DE, in addition to NYC, NY and the DC area. Bob has many years of

sales, engineering and solutions architect experience with a variety of networking companies. Bob's career includes time at service providers including AT&T and XO, in addition to his experience with telecom startups. Bob is an outstanding technical sales resource and has demonstrated the ability to drive growth and meet complex networking needs. Bob loves to collabo-

rate and tackle new project opportunities.

Regarding his new opportunity, Sawyer states "Spearheading consultative and solution sales processes, strengthening business relationships, and optimizing profitability characterize my career focus and success. Additionally, I've used my superior interpersonal and communication skills to articulate corporate vision, facilitate decision-making, and encourage excellence. Throughout my career I have dealt with customers in a variety of circumstances. I have always been able to establish an excellent rapport with clients, resolve problems to maintain satisfaction and loyalty, and effectively address any other customer needs. I'm excited to be a part of the Walker team and look forward to bringing this skill set to my clients in the Colonial territory to help them realize their organization's vision."

Walker is very excited to have someone with his background and skills to service customers in this region of the country. Bob can be reached by email at bob.sawyer@walkerfirst.com, or by phone at 336.731.5367.



Kevin Beck (not pictured) has joined Walker and Associates as the Regional Account Manager for the company's "Heartland" territory, covering the states of KS, MO, LA, and AR. He joins the Walker team with over 20 years of experience in the telecommunications industry, having spent most of his career at Tellabs and Alcatel-Lucent, focused primarily on sales and business development. His background and areas of expertise include data, access, optical and security solutions in both wireless and wireline networks.

"I am excited to be a part of the Walker team and look forward to meeting you in the upcoming weeks and months. I will provide you with the expert support and the exceptional service you have come to expect from us. By working together, we can help your company achieve even greater results for your bottom line and for the customers you serve."

Kevin most recently worked for Coriant (Tellabs) where he covered Sprint for them based while based in Kansas City. Prior to working at Coriant, Kevin held sales

and management positions at Ekinops, Lucent, Starent and a variety of startups in the networking industry. He brings a wealth of networking and industry knowledge as well as strategic account management experience.

Kevin can be reached by email at kevin.beck@walkerfirst.com, or by phone at 336.731.5433.



Evan Kline recently joined Walker and Associates as an Inside Sales Executive. He currently lives in Winston Salem near the company's headquarters. Evan's background includes strong selling and customer relationship skills that will transition well to his new role at Walker. Most recently, he managed a Starbucks store, overseeing employee training and performance, as well as meeting company standards for customer service and satisfaction, monitoring customer count/average ticket and meeting sales goals set by the district manager. Evan has completed extensive training at Walker that quickly set him up for familiarity with the industry, technology and company resources designed to facilitate successful customer interactions.

Evan can be reached by phone at 336.731.5240, or by email at evan.kline@walkerfirst.com.



Brian Johnson has joined Walker and Associates as Juniper Field Systems Engineer. Brian will work with Walker's national sales team, and others throughout the organization, in support of business development efforts. Brian has many years of experience in engineering and other technical roles working with Hard Drive Central, Northern Valley Communications and most recently Dickey Rural Networks. As an Engineer at DRN, Brian worked with existing members of Walker's sales and engineering teams, as well as Walker's Juniper partners network modernization initiatives. Brian played a key role in decisions leading to transitioning Juniper as the core network technology, displacing an aging Cisco environment. Brian earned his BS in MIS at Northern State University. He also holds several Cisco technical certifications.

Brian lives in Aberdeen, SD with his wife and three children. He can be reached by email at brian.johnson@walkerfirst.com,

or by phone at 336.731.5411.



Diane Garcia has joined Walker and Associates, as an Inside Sales Executive. With an extensive background in all areas of Telecommunications, Diane Garcia has been involved in various stages of telecommunications sales, service and support for over 21 years. Much of that time has been spent in the Washington and Oregon areas, where she worked as a Major Accounts Manager for Smart-RG in Eugene, Oregon.

Diane has achieved several high-level Cisco network certifications and brings to the table a superior skillset for voice and data services, call center applications and telecom hardware. Her industry experience includes Network Planning, Network Engineering, Project Management, New Business Development and more. Diane's positive attitude and attention to detail have made her extremely successful in working with customers and prospects. Her ability to effectively utilize her needs analysis skills to determine and propose the best communications paths her clients should be heading toward, have gained her very high level of customer trust and loyalty. She is viewed as a telecommunications subject matter expert by her clients as well as her peers.

Diane's work ethics, dependability, dedication to customer satisfaction and strong technical acumen have made her a proven asset to the telecommunications industry, her employers and the customers she serves. She is truly a dedicated, positive team player with a solid, proven background of experience, skills and capabilities.

Diane may be reached at diane.garcia@walkerfirst.com, or by phone at 336.731.5251.



Adam Blackley, a seasoned associate at Walker, has rejoined the inside sales department as an Inside Sales Executive. His most recent experience with the Government Inside Sales team afforded him a wide range of customer interaction, additional technology training, and extensive knowledge of customer support tools.

His new responsibilities will keep him in contact with customers in Upstate NY, TN and IA, calling on them with product

offers, managing customer orders, resolving customer issues, and consulting with them on new solutions for their networks.

Adam can be reached at 336.731.5383, or by email at adam.blackley@walkerfirst.com.



Cindy Sheets recently joined Walker and Associates as the Inside Sales Executive handling the states of CT, MA, ME, NH, NY, RI, and VT. She comments "I am very excited to join the team of experienced professionals at Walker and look forward to working with customers throughout the New England territory."

Cindy joins the Walker team with over 30 years of experience in sales and customer service. Already she has demonstrated a strong commitment to providing customers with the expert support and exceptional service they have come to expect from Walker.

She can be contacted at cindy.sheets@walkerfirst.com, or 336.731.5390.



Pam Smith joined Walker's Government Inside Sales Team. She will be handling DOD accounts and Prime Contractors to help handle the growth experienced in quotes from these customers.

Pam sold to the DoD with a focus on the Air Force for the last 6 years while at PC Mall-Gov. Prior to that Pam was an account manager dealing with contract officers, end users, purchase card holders, program managers, and OEM relations. She studied at the DeVry Institute in programming. She began selling refurbished PC equipment in 1985 and has been in the enterprise business since then. She has previously owned her own company.

She enjoys attending her church, is a movie buff, loves animals, family and friends. She also loves volunteering at a juvenile prison ministry.

Please join Walker and Associates in welcoming Pam's entrepreneurial experience and enthusiasm to the team. She can be contacted at pam.smith@walkerfirst.com, or by phone at 336.731.5448.

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Five Summits

- IT/OT Partnerships Summit
- Security, Risk and Compliance Summit
- Rural Broadband Summit
- UtiliSite Colocation and Joint Use Summit
- Smart Water Summit

Four Workshops

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WEDNESDAY, MAY 4

TRACKS	Convergence of IT and OT for Utility Modernization <small>Sponsored by Black & Veatch</small>	Securing Critical Infrastructure	Creating The Digital Utility of the Future <small>Sponsored by NERC</small>	Optimizing Utility Telecommunications <small>Sponsored by TC Communications</small>	Connectivity and Data in the 21st Century <small>Sponsored by Access Spectrum and Light Speed</small>	Rural Broadband Powered By Utilities	Collocation, Joint Use and Fiber Leasing – Create Lasting Benefits for Your Utility
8:00am-9:00am	Advanced Smart Grid Communications & Applications	Practical NERC CIP Implementations and Beyond	Staging Big Data Down to Earth	Managing Your Utility Telecom Network like a Service Provider	Common Concerns in Modern SCADA Communications	Rural Broadband Investment and Profitability	How can we make or break utility communications fiber lease, or collocation?
9:15am-10:15am	IT/OT Convergence: Here to Stay and Why	Situational Awareness in a Converged IT/OT Environment	Interest of Things Insights	Case Study: The San Diego Gas & Electric Smart Grid Communications System	Utility Wireless Communications: Current State and Future Ahead	Case Studies on Getting Started with Rural Broadband	Current Issues in Power Attachments and how they affect
10:30am-11:30am	IP Transition Panel	TUD	Cybersecurity When IT and OT Converge	How Utilities Can Do More with Less to Embrace Wireless Technology for Smart Grid Applications	New-Form Solutions for Meeting Increasing Capacity Requirements & Managing Bandwidth Resources for Wireless Communications	Rural Broadband Business Case	Fiber Leasing Challenges and Opportunities
11:45pm-2:00pm	Opening General Session with Larch & Kynote Frank Abagnale, Howard Forgy and Security Expert & Acclaimed Subject of Movie "Catch Me if You Can"						
2:00pm-6:30pm	Exhibit Hall Open						
7:00pm-9:30pm	Meet Me At the Iron Pub Crawl Sponsored by Megazys and Walker and Associates						
8:30pm-11:00pm	After Crawl Crawl's Under the Stars Sponsored by Zhong Technologies, Inc.						

THURSDAY, MAY 5

7:45am-9:00am: Breakfast and General Session: Telecom to Technology: The Path Forward to the Next Generation							
TRACKS	The Convergence of IT and OT for Utility Modernization	Securing Critical Infrastructure	Creating The Digital Utility of the Future	Optimizing Utility Telecommunications	Connectivity and Data in the 21st Century	Rural Broadband Powered By Utilities	Collocation, Joint Use and Fiber Leasing – Create Lasting Benefits for Your Utility
9:30am-10:30am	Facing the Challenge of Utility Modernization with Converged Packet Optical Switching	Compliance: Box has been Checked, Now What?	The Workforce of the Future	Network Virtualization and Benefits to Utilities Telecom	Case Studies and New Opportunities for Scaling Spectrum with Public Safety	Fiber in the Home Deployments	Maximizing Utility Infrastructure Revenue While Meeting FCC Enforcement Action
10:45am-11:45pm	Modernization Beyond AMI	IT/OT Convergence and Cybersecurity	Field Data Collection with Modern Tools	Utility Network Migration through Factory Built Networks: Knowledge Transfer & Risk Mitigation	Spectrum Sharing and Small Cells: Opportunities and Challenges in the 9.5 GHz Band	Funding Options for Rural Broadband Deployments	Financial Benefits of Utility Asset Optimization
12:00pm-3:30pm	Exhibit Hall Open with Lunch						
3:45pm-4:45pm	IT/OT Partnership Factors of SCADA and Integrating in a Telecom Cloud/Software System	Cyber and Physical Security Convergence	Will Your Thing Think: Games	Using Communications to Roll Out Broadband	Spectrum and Equipment Performance Testing	Legal and Regulatory Issues of Becoming a Rural Broadband Provider	Get Things like Drivers and Homeowners
5:00pm-6:00pm	Interest of Things Driving Forces in IT/OT Convergence	Building Your Network Securely from the Ground Up	Device and Risk Management Success Stories	Key Performance Indicators for Utility Telecom	A Strategic Approach to Utility Spectrum Access	UTC's Rural Broadband Council - Leading the Way for Utility Deployment of Broadband Services	A New Way Forward: Overcoming Programs
6:45pm-9:15pm	Awards Reception & Dinner Sponsored by Fujitsu						
9:45pm-11:00pm	After Awards Party Reception Sponsored by GE						

FRIDAY, MAY 6

8:00am-10:00am	Utility Only Breakfast & Roundtables
10:00am-12:00pm	Annual Meeting of Members

Recognizing Excellence

Walker's 2015 Sales and Marketing Outstanding Performance Recognized by Manufacturer Community

By Randy Turner
Director, Marketing Communications
Walker and Associates

Following a year of growth and new business opportunities, members of the industry's manufacturer community came together during the Walker and Associates Annual Meeting to recognize 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 2015,



Jennifer Beck, Walker OEM Development Manager of ADTRAN, receives Top Service Provider Distributor Award from Mark Ogden, Director of Distribution Sales, Service Provider Team for ADTRAN



Trey Hall, Walker's VP of Marketing, welcomes attendees to the awards presentation.

marking the company's 13th consecutive year achieving this status. The partnership between ADTRAN and Walker spans nearly 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.

Later in the evening, Walker presented awards to manufacturers in recognition of their partnerships with the company. Taking time to pay tribute to the innovation, support and loyalty among manufacturer partners, Trey Hall, VP of Marketing commented, "Tonight as we reflect on our success in 2015 and look ahead to 2016 with excitement, we are proud to share our celebration with each of our manufacturer partners. As a value-added distributor, Walker and Associates is fueled by the innovation, collaboration, and support of our suppliers. As we wrap Walker services, support, and solutions around our manufacturers' offerings the value that we collectively deliver to our customers is something we should all take great pride in."

Juniper Networks was recognized with the greatest year-over-year dollar growth award for 2015. CommScope came in a close second place for the same. Ciena received an award for the greatest %

increase in sales year over year. These partners are congratulated for the people and processes they put in place to support Walker and its customer base. Their attention on training, shared resources and solid leadership contribute to their successful work with Walker's sales and marketing teams.

Walker also presented an award to Manuela Voss, who works for CommScope, in recognition of her years of service to Walker's marketing department. 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. Manuela's extensive experience has spanned her years at ADC, TE Connectivity, and now at CommScope. Richard Dempster, OEM Development Manager for CommScope has worked with Manuel since 2005 and states "Manuela Voss has been consistently instrumental and pivotal in the success of Walker, devoting her dedication and commitment to serve the partner community."

The awards event was sponsored collectively by ADTRAN, ADVA Optical Networking, Brocade, Ciena, CommScope, Corning, Fujitsu, Juniper Networks, and Microsemi. Also attending were Emerson Network Power and Telect.

In addition to awards presented by manufacturer partners, Walker recognized associates in sales and marketing for their performance during 2015. 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 goal attainment.

The evening concluded with comments from Chrystie Walker-Brown, company CEO, 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 2016, always keeping an eye on presenting value to shared customers.



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!

Proud Member of:



February	
* Utility Telecom Forum 2016	Reno, NV
LTA Annual Convention	New Orleans, LA
GTA Vendor Showcase 2016	Macon, GA
* UTC Region 7 2016 Spring Meeting	Austin, TX
* CalCom Showcase and Tech Expo 2016	Sacramento, CA
Telecom Training & Safety Conf 2016	Bismarck, ND
March	
* UTC Region 3 2016 Spring Meeting	St. Pete Beach, FL
ITA Showcase Northwest 2016	Portland, OR
SDTA Spring Workshop	Oacoma, SD
* ICA Annual Meeting & Expo 2016	Des Moines, IA
MTA Annual Convention & Trade Show	Minneapolis, MN
MTIA Show-Me Expo	Columbia, MO
* SCTBA Spring Convention	Charleston, SC
April	
* INCOMPAS Show Spring 2016	Washington, DC
* NC Telecom Conference	Pinehurst, NC
Texas Communications Expo, Inc.	Belton, TX
TANE Spring Symposium	South Portland, ME
OTA Outside Plant Seminar	Newport, OR
UTC Region 6	Overland Park, KS
May	
* UTC Telecom 2016	Denver, CO
FNA Conference 2016	Buford, GA
NDTA TOC Conference & Showcase	Fargo, ND
Fiber Network Alliance	Buford, GA
OTA-WITA Joint Annual Meeting	Seattle, WA
ANMTA Spring Conference	Santa Fe, NM
KTA Annual Meeting	Lexington, KY
OTA 121st Annual Convention	Columbus, OH
June	
NYSTA Annual Conference	Lake Placid, NY
TTA Annual Meeting	Franklin, TN
IBTA Annual Con vention	French Lick, IN
ITA Annual Convention	Springfield, IL
Tri-State Technology Conference	Williamsburg, VA
FTTH Expo	Nashville, TN
TIA Network of the Future 2016	Dallas, TX

* - Indicates Walker and Associates is an event sponsor

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