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In This Issue . . .

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

Editor's Letter

What comes to mind when you think of "disruptive?" Most likely you associate it with something you prefer avoiding - traffic delays on the way to an appointment, the kid who sat next to you in elementary school, a power outage, or lost luggage. Generally, disruptions are what force us to re-engage our brains to figure out how to accomplish items of importance regardless of interruptions, lack of resources, or changes in what we regard as normal. Honestly, we all face them at least on a weekly basis.

In terms of our industry, disruptive technologies are those having potential to push our sense of normal into the category of irrelevant. As technology advances forward, we find ourselves working harder trying to keep up with it all. Perhaps you've thought there should be a moratorium placed on new technologies just so you can catch your breath. Unfortunately, that's just wishful thinking.

But in the middle of all this disruption, customers are increasing their expectations for improved services from your networks. They expect faster speeds, more bandwidth, quicker problem resolution, faster service turn-up, the very best pricing, network security, increased cloud storage, and more. Whatever your role - network operator, C-level executive, engineer, etc. - your job is to sort through the challenges of these disruptive technologies and identify the solutions that add value for your customers and your company's bottom line. No doubt, it's a challenge not for the faint of heart.

This issue of Skinny Wire attempts to sort through some of the disruption and match the technologies with innnovative solutions that matter to you and your customers. As you focus on how new applications are disrupting customer relationships, we recognize that you are turning to industry leaders and manufacturers for innovative solutions that keep you relevant, competitive and profitable.

Examples of Disruptive Applications include: OTT services that are placing pressure on carriers to provide bandwidth that matches customer requirements for more, better, faster Internet connections; Continued growth in IoT that creates greater reliance for "always on" Internet access. This includes everything from connected/smart vehicles to smart medical devices; Security is in the mix of all these conversations as smart homes, smart communities and smart cities exponentially expand the access points for network intrusion. How are these risks and opportunities being managed through innovation among the supplier community?

Obviously, we can't address all these topics in a 48 page magazine. What we attempt to do, however, is offer you a glimpse of thinking that cuts through the clutter and gets to what really matters - how do you use technology to solve customer problems while also satisfying business performance objectives?

We live in a disruptive world, and we work in a disruptive industry. That is unlikely to change. What counts is that we restructure our focus toward taming the disruption in ways that matter. Disruption for the sake of disruption is destructive. As leaders in our businesses, it is important we sort through the chaos and have real conversations about what the real point is. In the end, it has to matter to those who are paying for it. Otherwise, we are merely adding to the disruption.

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The New ILEC Transformation: To Open Access

By Greg Whelan
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The concept of "digital transformation" is a hot topic these days. However, is digitizing and/or virtualizing your current infrastructure and current mode of operations the right thing to do? Perhaps your current business is going so well and all you need is to buy is some "digital transformation" and be set for the next 30 years. The access network is the most challenging part of the network, yet it's the basis your business.

The triple-play economic cycle is past its peak. Cord cutting is becoming more than a nuisance and is expect to continue or accelerate its steady climb. At the same time the cost for video and television content is ballooning and due to cord cutting you must amortize your video infrastructure and content cost over less and less subscribers. Traditional voice maybe okay since the infrastructure is long depreciated, works fine and a large enough segment of the population still wants it. It's the proverbial cash cow. The issue here is millennials have never had a voice "cord to cut".

For now, your environment is okay with manageable competition, if any, minimal threat of a new over-builder, GoogleFiber isn't coming to town, favorable incumbent climate in Washington, D.C., low interest rates, etc. How different would your business environment be if a city government in your footprint announces a municipally funded gigabit FTTH initiative. Or any other entity announces plans to over-build your 'best' areas with FTTH? These are your real threats, not the narrative that 5G will take over the world.

If the biggest risk is a fiber heavy over-builder what can an ILEC do to mitigate

or eliminate the threat? The key question is whether your "transformation" can be achieved by upgrading or overbuilding? Then, what does my business model look like on the other side? For discussion purposes an 'over-build' here implies a "fiber heavy" or "fiber real deep" approach.   Lots of fiber, down lots of roads connecting lots of buildings. One large, multi-year construction project and be done for 25 years. An upgrade would include incremental upgrades such as from GPON or to XGS-PON or from ADSL to VDSL to G.Fast with a 'fiber a little deeper' approach.

However, an upgrade strategy doesn't solve the cord cutting and rising video content costs problems. In many areas, at a minimum, you have no choice but to offer voice services and meet the FCC minimum rates for broadband access. Strategically, an upgrade will buy you time, perhaps more than 10 years. Unless, of course, communities convince themselves that it's a 'gigabit or die', which it may be, and do it themselves anyway. The important part of "Community Broadband" is the word "community". A corollary is "broadband is not about bit rates, it's about community survival or vibrancy". Hence, some communities will move forward with their own "community broadband networks" for reasons beyond gigabit speeds. The point to remember is an upgrade strategy may not eliminate the gigabit over-builder threat.
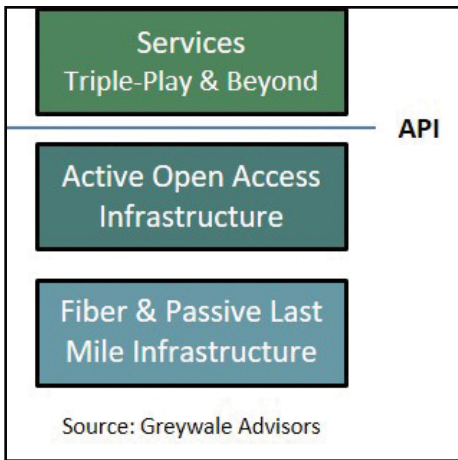
The alternative is to over-build yourself. The biggest challenge to over-build is funding. How does the ILEC fund a multi-year civil construction project based on anticipated future cash flows? Then, what are these future cash flows

and are they sustainable over the life of the financing? The simplest approach would be to overbuild and offer your current "triple play" services with real or "up to" gigabit speed internet access options. This may have the undesired effect of increasing cord cutting forcing you to amortize video costs over fewer and fewer subscribers. Plus, this will not solve the rapidly rising video content costs either.

Given this, should an ILEC consider transitioning to Open Access? The concept itself sounds odd: let other service providers run on my new $Millions network that took me years to build? First, we must ensure we are talking about the same definition of "Open Access".

A big issue around "open access" is the term "open access". I've come across at least five definitions of "open access" some of which have failed and some where the use of the word "open" is purely gratuitous. For example, when an ILEC describes a town with both a Cable and Telco provider as "open access" it's not. It's called "competition". Huntsville, Alabama is not open access either; it's dark fiber leasing or wholesaling. Great for the city, great for GoogleFiber, but still not open access. Then there's an open access narrative that sounds too much like the dreaded unbundling of network elements.   The good news is it isn't.

This "real" open access model is based on a Three Layer Model shown in Figure 1, below.   This model currently serves over two million households in Sweden and many millions more across Europe, Africa and Asia. It's a model that is also appearing in the U.S.A., driven by forward looking municipalities.

Services
Triple-Play & Beyond

API

Active Open Access
Infrastructure

Fiber & Passive Last
Mile Infrastructure

Source: Greywale Advisors

In today's model, the ILEC must own and operate every function in the entire model. This is costly and requires a vast array of capabilities and skills. The Open Access Model identifies three distinct "layers". Each one is optimized based on skill sets and funding options.

Starting with the physical asset, Layer 1 is the fiber owner. They're responsible for the design, construction and maintenance of the passive fiber network. Layer 2 is the entity that "lights" the fiber and provides the open access interfaces and APIs (Application Programming Interfaces). Layer 3 are service providers enabling businesses and consumers to choose from a menu of competing offers. This is not dark fiber leasing. In this real open access model all service providers get access to customer at "Layer 2" of the network protocol stack. To eliminate some confusion, the Layer 2 open access operating entity owns and operates Layers 1 and 2 of the traditional seven layer ISO network protocol stack. So, in concept, Verizon, AT&T and Comcast could each offer services to the same home at the same time over the same strand of fiber. So too could cloud companies such as Amazon, Google, Facebook et al. Then why not the local community college, city govern-

ments, local business and anyone else who wants to be a "layer 3" service provider? Everyone can share "the road" on a fair, equitable and non-discriminatory basis.

With this model, the transformed ILEC can focus on the local engineering aspects of building and maintaining a physical asset that's hanging from poles or buried underground. Then they can decide whether to outsource the Layer 2 operations or do it themselves. They in effect become "access providers" in the truest sense. They provide access to and from consumers, business and service

"In today's model, the ILEC must own and operate every function in the entire model. This is costly and requires a vast array of capabilities and skills."

providers. You would no longer have to manage three separate infrastructures and adapt to evolving regulatory frameworks (voice, video and data). In fact, if you outsource the Layer 2 you don't have to manage anything!

The Open Access Transformation will enable the ILEC's management team to focus on two things: providing access between every building in the area and everyone who wants to be service provider and satisfying the financing. With this approach, you're not just digitally transforming your network, your transforming your business for the next 30 years.

Greg Whelan, Principal at Greywale Advisors, is a leading expert on Open Access Broadband in the U.S. His unpublished research "Overcoming the 12 Challenges of Open Access Broadband in the United States" provides a playbook for a range of Open Access deployment and funding strategies for both public and private entities. His research focus is in virtual access networks, Real Open Access Broadband, Gigabit Broadband, fixed-wireless broadband and Community Broadband. He's a pioneer in broadband telecommunications and drove the first global DSL standards and was a co-founder, and Vice President, of the Broadband Forum.

Greg has worked in technical marketing roles for large technology firms including Cisco Systems (San Jose, CA) where he led award winning global marketing campaigns in telecommunications and cable markets and Analog Devices (Norwood, MA) where he created and lead their successful entrance into the broadband telecommunication market. He's also spearheaded marketing and products for a number of early stage SP Focused venture-backed start-ups in the Boston area, three of which were acquired by larger tech companies.

He has a BS in Electrical Engineering from Cornell University and an MBA in Innovation from Northeastern University. He has also studied Digital Video over Broadband at the MIT MediaLab.

The Road to Autonomous Networks - Taking A New Path

By Joe Marsella
CTO, Ciena EMEA
Ciena

Ciena's Joe Marsella details the journey of Our Hero as he struggles to make the dream of an intelligent, self-optimizing network a reality.

Our hero is hopelessly stuck in an enormous tangle of network complexity.

As he struggles, he realizes that for most network operators the concept of a self-driving or self-optimizing network seems far out of reach.

Still, his most fervent desire is to break free from current network complexities to accelerate the pace of service delivery, and eliminate lock-in.

As he struggles, he determines that service delivery optimization should be his most coveted goal.

Trouble is, how can he turn this dream into a reality?

Turning static, costly and slow moving network assets into a dynamic, agile, intelligent operational infrastructure is no small undertaking. For many network operators, the changes required and obstacles they face may seem overwhelming, and costly. However, they increasingly understand that delivering even a single new service leveraging their current infrastructure is also an arduous, expensive series of tasks. And the entire process involved in completing just one proposed service change also comes with an exorbitant 'tax' to be paid in the form of internal OPEX, but also potentially to external vendors and/or integrators who support the current network infrastructure.

At the same time, this often crippling 'tax' increases with each service change request. Despite a strong and growing desire for change, our hero's network has become stuck in perpetual inertia, unable to unlock innovation, and requiring constant manual tinkering using arcane processes to overcome barriers to achieving his desired new service objectives.

In some cases, the cost of operationalizing a single new service may grow so complex and cost prohibitive, the risks simply outweigh the benefits.

Without the ability to quickly make service changes, there is also little chance our hero will be able to keep up with the pace set by more nimble and agile providers – those not saddled with the burden of dragging legacy networks and operational environments along with them. These competitors have the freedom to swiftly adjust and focus on new ways to improve customer experiences and increase satisfaction. In the race to woo and keep his customers happy, our hero fully recognizes that his organization is lagging behind. He must find a way to sprint forward, despite the shackles of network complexity that have made progress so difficult.

And that's when he sees a fork in the road – a new path ahead, perhaps? This new route holds not only the promise of accelerating service delivery but also enables an entirely new degree of service innovation that wasn't possible before.

But the start of the route looks rough, with steep hills, twists and turns ahead. Envisioning Intelligent Ops – Turning the Dream into a Reality

To overcome the shackles of network complexity, and avoid being 'locked-in,' our hero has opted to take a new path forward—one that focuses on the optimization of the service life cycle. This route can help him to drive the business forward, improve customer satisfaction, and boost bottom line results.

He now believes that optimizing the service lifecycle is the way to break free from legacy network complexities and gain some much-needed agility and scalability. And he sees this is his only hope to keep pace with relatively younger competitors who are sprinting ahead, working hard to chip away at his customer base. But he faces a steep learning curve ahead—how best should he start?

With persistence and dedication, our hero makes progress, as he chooses to start with network automation and adopt a data-driven WAN automation architecture, which is relatively easy to adapt. And he also learns to leverage DevOps processes and techniques to help him drastically increase agility, while simultaneously increasing his ability to execute on the adaptations.

Bringing together teams of personnel from various product, networking, engineering and IT disciplines, he helps them collaborate, building new WAN services through the use of service templates and bringing in new domains by creating 'adapters' to abstract away from underlying complexities. By leveraging DevOps tools and techniques, this newly established team of superheroes finds a way to introduce and bring together different sets of underlying controllers, management systems and even network elements ranging from IP/MPLS to Ethernet to optical, melding together previously

independent worlds.

As part of the effort to simplify network operations, our hero also learns to fully embrace virtualization. He recognizes in his B2B market arena that enterprise connectivity has become intensely competitive and essentially commoditized, while the ability to offer valued-added services not only increases market opportunities, but also provides further differentiation for his firm.

At the same time, however, he understands that managing physical platforms and networks across every enterprise branch location will make his service simplification goal unachievable. Our hero quickly determines that virtualization is the answer, enabling him to break through previously cost-prohibitive operational barriers to offer a wide range of virtualized business appliances that add a new level of value on top of the business's basic connectivity offerings.

From his new vantage point, it's now possible to see further ahead. Turns out he was right! There are new and emerging market opportunities ahead. And he fully understands how utilizing automation and virtualization will efficiently help him enable a range of new services. But while he now has automated the WAN and added the ability to offer virtualized functions, he still has more work ahead on his network automation journey.

As he gains momentum, our hero sees that he now needs to focus on the true end-to-end service regardless of whether it is traversing a physical or virtual infrastructure. He now understands that to 'abstract' away network technologies and provide true end-to-end service lifecycle provisioning with performance-driven SLAs, he must look beyond simply WAN automation and virtualization, and focus most on each customer service — this customer oriented perspective now leads him down a path toward Multi-Domain Service Orchestration (MDSO).

Our hero now realizes that the move into multi-domain service orchestration is simply an extension of the WAN automation he has already implemented. In fact, to add new virtual, mobile or data center domains to his automation platform becomes as simple as creating new 'adapters' to interface to these new domains and new templates, which can even utilize previously built WAN templates in a hierarchical manner. By building upon his existing architecture, he can now further abstract away the details of the network and apply a true end-to-end

service-oriented view, northbound to end users and network administrators. Through all of their efforts, the team of superheroes is now driving a new services-oriented or Service Level Agreement (SLA) centered view of the network, to replace their prior technology-driven view. On this journey from technology-driven to services-based operations, our hero has also learned that simplifying the service lifecycle can help him to dramatically speed the process involved in service turn ups and/or turndowns, effectively creating an on-demand service capability that gives his business a unique market advantage. His service simplification ideology also helps bring a new end-to-end service-centric view of the network, which in turn improves service assurance and overall customer satisfaction.

By choosing the path toward MDSO, our hero now has freed himself from lock-in and created a true end-to-end service automation platform, which has also streamlined business operations. But automated does not necessarily equal autonomous. What else can be done to bring an element of intelligence to the network?

As the story concludes, our hero has learned to conquer the dreaded lock-in beast, and streamlined outdated processes and technologies to deliver new services, quickly and efficiently.

How much more quickly, you ask? In terms of building and delivering new services, processes that once took months to complete, are now accomplished in minutes.

Because our hero has created an abstracted network model that is able to retrieve an amazingly rich set of information and data from across the entire network infrastructure, he decides that it's time to utilize this information to draw insights from the network. He decides to deposit and store this 'big data' in what is called a data lake, which can store data from both within and outside the network in an efficient, unstructured manner.

Because analytical insights and intelligence may be garnered from this data lake, our hero adds an analytical engine that can provide a more structured and normalized view of the data, complete with a set of rich APIs that support higher level applications. These APIs are designed to be open, to enable a wide range of future ideas, from multiple, varying sources, as and when they are created.

Our hero can now utilize this engine and its secure access to structured data models to drive immediate value through the use of sophisticated machine learning and predictive analytics. He can now 'mine' for golden 'nuggets' of data, from the treasure chest that is his data lake, deducing key analytical insights that add value to business operations. With this new capability, our hero decides to focus in the short term on three primary applications:

1. **Improved customer satisfaction**
   Using performance-related data combined with machine learning algorithms, it now becomes possible to actually predict failures before they happen. By focusing on risk assessments, a network operator can stay ahead of potential outages. But just pointing to a problem won't necessarily ensure the network availability customers demand, so evolving to a fully autonomous network requires that network intelligence evolves to automatically steer services away from potential, predicted problem areas.
2. **Improved demand planning**
   Predicting capacity requirements and traffic growth was once a challenging, offline guessing game. By leveraging predictive analytics, it's now possible to predict the specific areas that may require capacity augmentation, and to automatically trigger those changes in the network, as the operator's network policy allows. Today, this process requires some human interaction and creative thinking, but in the future, this type of predictive planning will ultimately become the norm
3. **Network optimization**
   As the rate of change accelerates in network operations, and more organizations enable both machine-driven and even external customer-driven inputs, the need for networks to self-optimize, in near real-time will ensure the network architecture remains ideally suited for the traffic types and services carried.

Each new application developed further increases the level of 'intelligence' in the network and provides much needed insights that our hero and other network operators can use to drive changes back into their now automated networking environments. Our hero's new autonomous architecture continues to grow increasingly intelligent and autonomous,

# ACCELERATING THE PATH TO SD-ACCESS

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How IOT Will Bring Change to Service Providers

By Timothy Brown
Director, Security and Virtualization
Network Utility Force
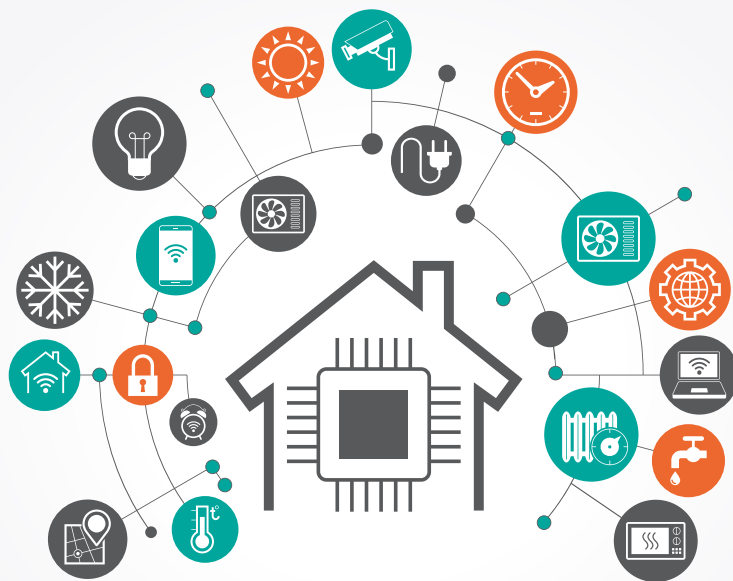
One of the many fantastic innovations technology brings is low-cost, low-power networked industrial control and home automation equipment.

I recently added a new set of sensors at my home for home automation. For under $200, I was able to automate every light in the home, added new motion sensors and window sensors, and can even tell the intensity of ultraviolet light in my living room. My television automatically turns on in the morning based on what time my first meeting is and a few lines of code have my streaming television services throwing up the right channels. A news summary is read during morning coffee, and the commute time to my first meeting is part of that briefing. It sounds amazing, doesn't it? It sure is. There are other effects, though, that are not apparent at first glance.

Municipalities are rolling out IP-connected elements at a rate never seen before, and homes are buying up automation devices such as connected thermostats and cameras at a record pace. While the bandwidth for some of these sensors may be low, they still take up space on the network: an entry in a CAM or MAC address table, an IPv4 or IPv6 address, and depending on the rate of the sensor's involvement with the rest of the network, a lot of packets.

We often determine what OEMs are good candidates in our networks using a variety of models: the more common speeds and feeds, features, investment protection, etc. Any axis can be deceptive; "wire rate" often means wire rate for a given packet size and packets per second count. OEMs often do their own assessments and design work around what's called IMIX, which is a typical picture of what equipment is likely to see in the real world. There are a variety of different mechanisms for evaluating IMIX traffic, but usually, they are very biased towards larger packet sizes.

OEMs have deployed many capabilities in the later generations of switching chipsets both commodity and custom-fabricated. One of these capabilities allows a service provider to change the dimension of the tables used to store what addresses are reachable off of what ports. For example, a Juniper EX4300 has a default table of 5120 addresses per VLAN; a very respectable number in any case. In some large scale sensor networks, though, 5000 addresses is not uncommon to reach on a city block, and provisioning a VLAN for a city block's sensor devices is not all that sound of an engineering judgment on its face.

So what does this mean for service providers? It means the traditional metrics we've used in the past to dimension our networks and devices will need to be added to and augmented. It means a host of additional devices placed on our networks will force us to consider alternative models for connectivity such as traditional wireless (802.11 or mesh), or bespoke low power wireless networks. The face of security and management changes as well. With so many more devices to secure and manage, providers have both an opportunity and a challenge ahead of them. The opportunity is in providing security at the interconnection point of these sensor trees to the network.

The challenge is that many of the sensors are not built with security in mind. A recent attack against a popular security researcher's website saw more than 620Gbps of denial of service traffic, brought about by cameras made by a Chinese vendor that were often open to the Internet and not well secured. Municipalities rarely have the security operations staff or architecture experience capable of mitigating these challenges, so an unwary service provider might find their network crippled by sensors they have no control or dominion over. A French web host had a similar attack driven by the same vector that was over 1.1 Tbps of traffic - a truly staggering number to many of Walker's customers in the service provider realm. Software defined networks, security virtualization with virtual firewalls from many vendors such as Juniper and Fortinet, and new techniques for micro-segmentation can offer some relief on the security front.

What can service providers do today to prepare for the onslaught of the Internet of things? Walker can help. With our laboratory and integration services and our new SDN/NFV Integration Lab, we can test equipment and validate its performance. We can also help service providers prepare and offer new services such as virtual firewalling, DDoS detection and response mechanisms, and application and wireless gateways.

Walker offers professional services in-house or through our partner, NUF, and can help you understand how the new rush of devices might affect your existing network.

Why Service Providers Need Universal CPE

By Prayson Pate
CTO, Ensemble Division
ADVA Optical Networking

Universal customer premises equipment (uCPE) is getting a lot of attention from service providers. Can uCPE live up to the hype? Yes! Here's why.

What Is uCPE?

In general, service providers want to simplify customer site deployments by replacing a panoply of dedicated appliances with software virtual network functions (VNFs) running on a single, universal platform. Preferably, the uCPE platform is a pure commercial off-the-shelf (COTS) server hosting a mix of open source and proprietary software from a variety of vendors. uCPE provides the means of achieving this vision by using network functions virtualization (NFV) to extend cloud-centric technologies all the way to the access part of the telco network.

A universal CPE deployment would typically include most or all of these attributes:
- White box or COTS server for hosting
- Standard and open software architecture built on standard components such as Linux, KVM, open source containers, and OpenStack
- Multi-vendor solutions combining a mix of open source and proprietary software components as well as flexibility to swap out software components in an automated and efficient manner
- Zero touch deployment provides the ability to perform service turn-up without pre-configuration or manual intervention

- Scalable solutions that can be deployed over a broad range of host platforms
- Able to fit into today's networks – and tomorrow's. uCPE solutions can take advantage of network interface cards to support non-Ethernet network interfaces such as TDM or DSL, as well as the inevitable evolution to faster and cheaper processors

The Real Value of uCPE – On-Demand Services

The ability to leverage open software and a multi-vendor approach to services sounds good. It aligns with the service provider vision of leveraging the cloud, but how does it help today?

If you step back and think about that cloudy goal of a programmable network, you can start to understand the real value of uCPE: dynamic services turned up on demand. With the proper uCPE architecture, service providers can offer net-new services that are not possible today.

Here are some examples of what uCPE can enable:
- Instant turn-up of locations. With local sourcing of COTS servers, service providers have the ability to respond immediately to service requests, so delays for import and onsite support go away.
- Wireless access. Today's COTS servers support optional wireless interfaces, enabling service turn-up

even when wireline connectivity is not yet available. Once wired access is provided, the wireless interface can be used for backup or true bandwidth on demand.
- Service on demand. Today's services are coupled with an appliance. Adding or changing a service means adding or changing an appliance. Changing hardware is slow and costly, especially if done over hundreds or thousands of sites. Moving to a software-centric solution means the customer can get the service they want when they want it (which is usually now), and that multiple services can be hosted on a single platform.
- Shared resources. A proper choice of uCPE architecture (including orchestration and control) can enable the hosting server to be used by multiple service providers. Doing so enables new opportunities for wholesale revenue as well as for cost-effective access to off-net locations.

Yes, But Does It Catch Fish?

Those of us of a certain age may remember television commercials for the Popeil Pocket Fisherman. The Pocket Fisherman was clearly compact and portable but seemed like a toy. The manufacturer recognized this objection and addressed it by showing it in action and catching fish.

I have heard similar objections from service providers regarding uCPE. They acknowledge the benefits above but are skeptical of how to achieve them. "It

costs too much," or "the performance is too low," or "I have to give up features." Service providers are justified in worrying about these areas. We at ADVA Optical Networking have worked with our COTS and VNF suppliers to address these concerns with third-party performance tests.

The real test of uCPE is to put it into the lab and try it out. Fortunately, the low cost of the hardware and software, along with the ease of turn-up, makes such lab testing straightforward – at least when uCPE is done right.

Even better than lab tests is a live deployment, and we have one – at Verizon. We at ADVA are pleased to be working with Verizon on their just-announced uCPE platform for their Virtual Network Services (VNS) offering. ADVA's Ensemble division is providing the NFV infrastructure (NFV-I) with our Ensemble Connector software. Verizon has assembled a multivendor ecosystem to achieve the true value of uCPE, and we are proud to be a part of that.

uCPE – Enabling New Services and Driving Innovation
Service providers can leverage uCPE to enable new services and revenue. At the same time, they are deploying a cloud-centric platform for innovation. It's a win-win – concrete benefits today, and preparation for longer-term strategic innovation.

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

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

Verizon Adds Ensemble to Its Virtual Network Services uCPE Solution
Zero Touch Capabilities of Ensemble Connector Deliver Key Agility and Scalability

Raleigh, North Carolina, USA. May 16, 2017. - Ensemble, a division of ADVA Optical Networking, announced today that Verizon has selected its Ensemble Connector as part of the deployment of the service provider's universal customer premises equipment (uCPE) solution. Verizon is using the Ensemble Connector as its network functions virtualization infrastructure (NFVI) on commercial off-the-shelf (COTS) white box servers. Ensemble Connector's zero touch provisioning enables Verizon to drop-ship servers directly from the COTS supplier to the end customer – dramatically simplifying supply chain logistics. Ensemble Connector further simplifies operational processes with access to the industry's largest collection of virtual network functions (VNFs).

"As we expand the number and scope of SDN/NFV-based transformations with our customers, we see significant demand for solutions based on COTS hardware," said Shawn Hakl, vice president, Business Networking and Security Solutions, Verizon. "The demand to move from hardware-based services to software-based, cloud-enabled solutions is growing by the day and is only going to accelerate. Ensemble Connector is an important enabling technology for us to bring these solutions to market. This approach allows us to provide our customers with a simple, rapid installation experience and allows them to securely deploy multiple software-based services on a single uCPE installation."

Verizon's uCPE solution has been built from the ground up to provide end customers with greater agility, functionality and scalability. Ensemble Connector improves OpenStack scalability and manageability by embedding local controllers in each COTS white box. This is something no other NFVI technology on the market offers. Ensemble Connector is also unique in that it provides support for wired and LTE connections. This enables the Ensemble Connector to "call home" using the most suitable access available and automatically configure customers' virtualized services without any need for pre-configuration or onsite visits.

"What we're announcing here is more than an agreement between Verizon and ADVA Optical Networking; it's a dramatic shift in how companies build next-generation networking solutions," commented James Buchanan, general manager, Ensemble Division, ADVA Optical Networking. "Adding our Ensemble Connector to its VNS uCPE solution will provide Verizon's customers with more choice, more services and more flexibility. Ensemble Connector's capabilities help solve deployment, operational and runtime challenges."

Watch this video for more information on Ensemble Connector: https://youtu.be/pCmZV7mxDRc

Further details on the announcement are also available in these slides: http://adva.li/verizon-vns-ucpe

Capacity, Cooling, Conservation: Approaching Access Network Challenges

By Brian Davis - Global Market Development Manager - Carrier Networks
Sebastian Sassi - Market Development Manager - Carrier Networks
Corning

The Internet of Things, increased demand for bandwidth by customers, and the explosive proliferation of mobile devices around the globe all mean that carrier networks are facing massive capacity challenges. With the last decade's explosive growth in handheld computing power and the increasing number of IP enabled devices, carrying capacity must grow substantially in the coming years on carrier access networks everywhere.

Over the next few years access networks will find themselves stretched well beyond capacity, and network operators will have to spend significant capital and effort optimizing their throughput capability in order to meet customer demand.

What's driving this bandwidth shortfall?
  • Continuous growth in IP video traffic.
  • Increase in mobile connections – whether WiFi or cellular.
  • Internet of Things – connected IP devices, everywhere, and lots of them.
  • Bandwidth demand in the home.

To handle the explosive growth in mobile devices and consumer demand for symmetrical last mile speeds that far outstrip today's, telecommunications companies are considering how best to quickly modernize their access networks. The central offices and headends of today will see much higher fiber counts, increased demands for density, and the virtualization of back office functions like BGP, security, access management, and network analytics. Applying NFV and SDN can help drive low cost scaling while providing for a more agile service delivery platform.

One of the inherent challenges for service providers looking to add infrastructure to support these growing expectations is a structural one—legacy telecom infrastructures were built in adherence to 1970s era NEBS standards which could never have possibly anticipated the power, cooling, and fiber connectivity requirements dictated by 21st century access networks. Central offices and headends in use today are not getting any bigger, and thus conservation of white space in them is crucial. To build more access network capacity means to add more fiber, more interconnections, and more racks of networking equipment to move the flow of data to and fro; as such a conflict between available space in telecommunications facilities and the need to expand carrying capacity is in the immediate offing for many access networks currently in operation.

A significant market trend in response to the need for more bandwidth (and the equipment to provide it) is the move toward network function virtualization; by virtualizing the legacy hardware that provides authentication, security, load balancing, and the nuts and bolts consumer services customers demand, significant capex and space savings can be realized along with reductions in power and cooling requirements. Deploying latest generation NFV/SDN appliances in lieu of legacy central office and headend equipment certainly can alleviate concerns about floor space availability to some very real extent. With many market surveys showing a majority of service providers either implementing or planning on NFV/SDN deployments this year, it seems relatively uncontroversial to say that modernized, high-throughput networks for the 21st century are going to make extensive use of NFV/SDN. And capacity is certainly not the only challenge carriers need to address—a generational shift in the market, and the fledgling availability of on-demand provisioning of bandwidth in some markets, means the enterprise space is starting to demand a service model paradigm shift.

Such networks offering consumers throughputs--measured in the hundreds of megabits and beyond into the gigabit range—are going to require fiber run deeper than ever into the network. Fiber is the only medium that can reliably carry gigabit traffic past downtown MDUs and multi-tenant commercial structures, urban developments, business parks, dense suburban and exurban neighborhoods, and make the long haul runs into rural markets clamoring for high speed, low latency connectivity.

> ## "APPLYING NFV AND SDN CAN HELP DRIVE LOW COST SCALING WHILE PROVIDING FOR A MORE AGILE SERVICE DELIVERY PLATFORM."

Essentially, the question is merely when, not if, fiber goes essentially everywhere.

How to manage it?
An effective fiber deployment strategy necessitates an adequate consideration for how to manage and terminate the millions of cross connects and interconnects an FTTx world entails; according to the FTTH Council, in 2015 the number of homes passed by fiber lifted by 13% to over 26 million, and anticipation for acceleration continues for the next several years. Adoption or "take rates" in areas with homes passed by fiber are approaching 50%, and more than half of the 1000+ fiber providers in the US anticipate offering gigabit level services within the next five years. With yet millions more homes—and businesses—to be passed by fiber in coming years, it is certain that telecommunications providers will necessarily have to handle scads more fiber terminations over the next few years.

There are certainly significant advantages inherent in this modernized access network model from an opex and capex point of view; virtualized network functionality means greatly reduced capex for standalone hardware that provides communications services. By moving to a NFV architecture, carriers avoid procuring and servicing legacy equipment that often is purpose-built for a single functionality; they instead can load virtualized telecom services onto commodity servers bought in bulk that cost significantly less. Major carriers are reporting savings

in excess of $10 million as a result of moving network services from non-virtual legacy gear to a virtualized platform. Carriers running NFV/SDN also enjoy lowered opex requirements for powering and cooling their networks—moving a series of telecom services onto more cutting edge virtual servers reduces the power required to operate a network significantly. This does not merely mean a lower power bill, but also a requirement for far less cooling equipment and its associated expense.

Even as the network service appliances themselves are virtualized, the reality is the number of fiber terminations required will increase. How best to manage this massive build coming to a central office or headend on your network? It is simply not a question network providers dare ignore, and it goes without saying that poorly considered and undisciplined fiber management in the central office and headend environment can lend to outages, inadvertent disconnects, and inefficiencies.

Fortunately the fiber optic hardware industry has been planning ahead for this eventuality, and an emerging consensus exists on a few points that should help guide network architecture discussions. While many different approaches for handling fiber in the ISP environment exist, a few best practices have arrived.
• Not all density is created equally—manageable density is the key.
• Excellent finger access to individual connectors helps to prevent inadvertent disconnects and aids in making adds, moves, and changes easier.
• A defined and intuitive jumper routing design makes it much easier to keep day 2 discipline.
• Jumper options should be considered. What sort of jumpers does the fiber solution in question require? 2.0mm? 1.6mm? How many different jumper lengths are required?
• NFV/SDN may introduce different connector types, fiber types, and devices into an ISP space – having a solution that can manage single

mode & multi-mode, simplex & duplex, SC & LC & MTP, as well as various devices such as splitters, port taps, WDM, etc. will be beneficial.

Carriers and access network providers everywhere are considering these sorts of infrastructure questions, assessing the changes necessary for their service models and go to market strategy, exploring new means of revenue generation and cloud based WAN and application services, and grappling with network capacity and whitespace conservation challenges on an unprecedented scale. While these are not insurmountable, they are concerns that will keep strategists and network architects up late at night, and the job of the fiber optic hardware industry is to continue to innovate the next generation optical solutions that make the interconnected world of the 21st century a practical reality we can all rely on—after all, an informed, well connected, educated world with access to information on demand is a better world for the next generation.

Faster Networks Expand the Value of SIP Endpoints through Integration

By Phil Bowers
Senior Marketing Manager
Grandstream

As service providers across the world continue to optimize their networks with new technology that create faster networks, SIP endpoints and technologies have begun to take on a new life. With business having access to faster speeds to build more comprehensive networks, they are able to integrate all of their devices and services onto common networks. This allows devices vendors to expand the features and functionalities of our devices by allowing endpoints to communicate like never before on common networks. The combination of better, faster networks not only allows vendors to expand endpoint functionalities and offer a wider array of new solutions, but it subsequently allows end-users to better protect and manage their offices while having access to more tools and information. For example, instead of having to invest money on a new security, facility access or intercom system, the SIP devices most businesses probably already have allow them to build these

types of solutions. Instead of having to build a video conferencing network, you can use your existing network infrastructure to do so.

Let's look at some of the many ways that faster networks have expanded the value and functionality of SIP devices and technologies.
• Telephony and security – With the addition of a few SIP cameras to your SIP network, you can allow your IP phones to work directly with those IP cameras to keep your business safe and secure. Set IP cameras to make voice or video calls to IP phones when a security event occurs, allowing your IP phones to proactively alert you when something has occurred.
• Telephony and Facility Access – You can use your IP phones to monitor and proactively control access to any facility. By simply adding an IP Video Door Station as an endpoint

on your SIP network (or even simply by using IP cameras that can be integrated with door openers), you can use your IP phones to let people in the building or speak to visitors when they arrive. Your Door System can automatically detect when a visitor arrives and trigger a call to set IP phones, where
• SIP Video conferencing – Video conferencing has historically been too complex for most businesses, in part because of the amount of complicated network management this often proprietary technology required. Now, there are a wealth of SIP video conferencing devices out there that can be integrated into your existing network and the majority of business networks can easily support the bandwidth needed for video conferencing. These devices are more affordable than ever before as well.

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Networks Need Better Timing

By Ulrich Kohn
Director Technical Marketing
ADVA Optical Networking

Growing Demand for Precise Synchronization

Communication networks are transforming into intelligent application environments supporting every aspect of our social and business lives. Mobile phones have become highly versatile lifestyle gadgets with an ever-growing need for bandwidth. The IoT is opening up a wide range of new applications using data from various sensors deployed at the edge of the network. And today's business processes from transactional services in the financial market to control systems in critical infrastructures are supported by networked software solutions. All of these applications face a common challenge. They need highly accurate time information at the edge of the network:

- The latest mobile technologies require precise base station timing
- High-speed trading needs financial transactions to be precisely time-stamped
- Digitized cable networks demand synchronized remote PHY devices
- Fault isolation in energy networks builds on accurately timestamped power measurements
- Sensor data in the IoT will need to be associated with precise time information

How to Deliver Accurate Timing

Today, timing is provided in two very different ways. Timestamped packets can deliver this information over data networks. IEEE 1588 Precision Time Protocol (PTP) describes a method for packet-based synchronization delivery. If high accuracy is required, any network node needs to process the PTP packets. Hence, legacy networks are frequently limited to delivering only moderate sync quality. A full network upgrade is required for highly precise time synchronization.

Alternatively, synchronization information can be extracted from the Global Navigation Satellite Signal (GNSS). Accurate timing data is provided to a grandmaster as the source of PTP packets and so synchronization can be implemented completely independently from the communication network. However, jamming or GNSS disruptions can severely impact the quality of the synchronization, leading to service faults. In addition, the GNSS receiver requires antennas to be mounted on rooftops. This can often be costly or completely impossible.

A Flexible Synchronization Solution Makes the Difference

The combination of GNSS-based synchronization with PTP sourced from one or several grandmasters can address most synchronization requirements in a highly efficient way, as the best time source can be selected based on cost and quality metrics. The highly accurate GNSS-derived time is used for standard operations, while the network-based PTP flow is a backup in case of GNSS disturbances. GNSS-derived time information is also used to calibrate the PTP behavior of the packet network. This significantly improves the quality of the network-based synchronization.

New unique PTP solutions incorporating grandmasters and GNSS receivers allow antennas to be mounted at street level or even indoors, removing the need for problematic rooftop antenna installations.

The wide range of accuracy requirements translates into a need for different synchronization products. In case of very high accuracy, the timing source should be very close to the slave clock. This approach is costly and not suitable for moderate timing requirements. In such cases, higher capacity synchronization products need to be applied, which can

source a number of slave clocks concurrently.

Service providers need to identify any deviation from required time precision. That's why synchronization delivery must be complemented by sophisticated synchronization assurance functions. Synchronization is an extremely technical topic and the innovation and expertise of an experienced supplier is essential to design and implement the most suitable solution.

Innovative Solutions for Broadband Requirements EXPLOSIVE

By Peter Radizeski
Rad-info, Inc.
Jim Hollis
Executive Director
FISPA

Since the 1990's members of www.FISPA.org (FISPA) have been bringing a variety of Internet access solutions to America after legacy Bulletin Board System (BBS) operators discovered the Internet as an improved access method for their online communities. Over 7,000 independently owned and operated Internet Services Providers (ISPs) enabled America to access the Internet with improved communication applications, customer support, and web browsers before AOL mass-mailed disks to every household in America.

A new "State of the WAN Report" from Software Defined Wide Area Network (SD-WAN) specialist Aryaka found global WAN traffic increased 200% in one year after analyzing data from more than 5,000 WAN sites in 63 countries. Verizon Wireless saw 33% growth in data usage per customer in 2017 after an even more impressive 45% 2016. Consumers continue to devour Internet bandwidth and companies providing the desired content equally scramble to meet their needs.

Founded in 1996, FISPA was one of several state ISP associations (originally The Florida ISP Association) that recognized the value of a shared knowledgebase, aggregate buying power, and established resale agreements with the then 9-state BellSouth Corporation. Renaming itself The Federation of Internet Solution Providers of the Americas to reflect their national value to ISPs, members would combine their unique value-add services with legacy telecommunication carriers' networks to deliver their own versions of high-speed Internet services. By 2001 technologies like unlicensed fixed broadband wireless, satellite, SDLS, ADSL, ISDN, T1 and DS3's dominated Internet access and "Broadband" was defined. Since the 1990's, flavors of fixed wireless and DSL are the most popular technologies for independent ISPs to bring broadband to their consumer markets.

The technology, however, doesn't matter as much as the ISP's willingness to make it work, support it, bill it correctly, and answer their phone. The current, most identifiable Broadband deployment pattern among independent ISPs is: 1) reselling another provider's network, 2) adding wireless; and then 3) fiber - creating a "Hybrid Service Provider". There has never been a one-size-fits-all network solution for ISPs.

Today's ISPs use a combination of fixed wireless, microwave, satellite, licensed wireless, copper/cable and fiber to deliver their services and they do so through resale, wholesale, and agent agreements; becoming a Competitive Local Exchange Carrier (CLEC); and, ultimately building their own networks.

Fixed Broadband Wireless
FISPA's members have seen this technology evolve with continued improvements in performance and reliability while enjoying decreasing equipment and deployment costs. ISPs are closely watching the evolving TV white space (UHF TV channels in the 470 to 790Mhz frequencies reclaimed by the FCC in 2014) equipment with the promise of better geographic coverage and Non-Line-of-Sight performance.

Satellite
There are two satellite broadband providers serving the US market (Hughes Net and Viasat and their private-label resellers). Like fixed wireless, satellite technologies have improved while costs have decreased. ISPs include satellite options for their most remote customers and to provide an effective back up to other access technologies. Worldwide Google's Project Loon places balloons on the edge of space to deliver broadband and expand the definition of satellite.

Licensed Cellular Wireless
The hype and promise of cellular operators winning the market with fourth generation (4G) and long-term evolution (LTE) – fifth generation (5G) on the 2-year horizon - remains but only 13 percent of households are smartphone only and most of these have no other broadband access or Mom & Dad or government is paying the bill. Services providers like this technology and 'data only' plans as a wireless WAN back up.

Cable Modems
In urban areas Data Over Cable Service Interface Specification (DOCSIS) is the dominant broadband delivery available from most cable providers and used by 60% of residential consumers that have Broadband. DOCSIS 3.1 provides a shared, asymmetrical access with download speeds up to 10 Gigabit (Gb) and uploads up to 1Gb. However, in February, 2016 at the CableLabs Conference, DOCSIS 3.1 Full Duplex was announced with symmetrical speeds of 10Gb by 10Gb.

For customers that require higher reliability, ISPs will bond cable with DSL and/or cellular wireless to provide multiple paths of Broadband access.

Copper
Independent Local Exchange Carriers (ILECs), like AT&T's U-Verse and Verizon's FIOS, are leveraging Very-High-Bit-Rate Digital Subscriber Line 2 (VDSL2) technology connected to Fiber-to-the-Neighborhood (FTTN) that allows them to use existing copper networks to deliver up to 300Mbps. G.fast is a DSL standard for copper connections shorter than 500 meters and is another emerging DSL technology with speeds between 150Mbps and 1Gbps. Service providers love higher-speed DSL solutions but are encumbered by ILEC exclusionary practices, market coverage, distance limitations and poor provisioning, installation, and/or billing practices. AT&T announced Project AirGig which is a Wireless Broadband over Power Lines (BPL) technology.

For customers that require higher reliability or greater bandwidth, ISPs will bond multiple DSL connections or add cable modems and/or cellular wireless data to provide multiple paths and higher Broadband speeds.

Fiber

When discussing broadband access solutions for businesses, the winner is fiber. For the consumer market, there are more than 700 fiber providers with Verizon's FiOS service leading the way. Fiber-to-the-Home (FTTH) providers include smaller ILECs, municipalities, electric coops, CLECs and independent ISPs. Google's Google Fiber Broadband as been announced in 27 US cities and brought to America's attention the need for 'Giga' speeds. Consumers now look to Giga as the Holy Grail of broadband that symbolizes an almost limitless reservoir of Internet content from Facebook, Instagram, Netflix, Hulu, Amazon, Apple and others with multiple high-definition streaming devices while satellite, cellular wireless and copper technologies administer data caps and overage charges. Some ISPs chose FTTH as the design for some communities but the customer acceptance, defined as 'take rates', has been mixed – some with high take rates; others with low take rates. Currently Google Fiber is experiencing the political and regulatory hurdles that all ISPs endure when building fiber networks which prompted Google's purchase of a Wireless Internet Service Provider (WISP) to start delivering broadband by fixed wireless.

Digital Divide

Despite almost one trillion dollars invested in networks in America there is still a Digital Divide with 33% of America's households being 'underserved'. According to Pew Research, "Rural Americans have made large gains in adopting digital technology in recent years but they remain less likely than non-rural adults to have home broadband, smartphones and other devices." Facebook's Connectivity Lab has been tasked with "Connecting the world". In that mission, Internet.org by Facebook has been experimenting in Paraguay and the Philippines with drones and unmanned planes.

FISPA

Subsequent to the great ISP roll up and Telco crash of 2001, 7,000 ISPs become 1,500 comprising of a few national carriers and a scattering of local and regional ISPs. Today that number is up to approximately 4,000 due to start up fiber providers and WISPs. FISPA serves the needs of independently owned and operated local and regional ISPs and CLECs across America. By helping small- and mid-sized ISPs and CLECs compete against and work with incumbent carriers FISPA members increase their probability for success. FISPA is the "How To" organization where members learn, share, and teach. Join FISPA – they make being an ISP or CLEC easier!

Contributing writers: Peter Radizeski @ Rad-info, Inc. and Jim Hollis @ Internet Broadband Consulting, LLC (also serving as the Executive Director of www.FISPA. org)

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FUN FISPA Facts

FISPA FACT 1 - *25% of FISPA's membership own and operate a fixed broadband wireless network and this is forecasted to double in the next 2 years.*

FISPA FACT 2 - *Although DOCSIS provides superior access speeds cable providers that have aging physical plants or over loaded networks result in poor service levels during periods of rain or peak usage.*

FISPA FACT 3 - *Although slower than DOCSIS, DSL modems that are terminated into a fiber backbone provide a more stable, predictable access method for voice and cloud-based applications.*

FISPA FACT 4 - *22% of FISPA's membership operate their own fiber networks and this is forecasted to double over the next 2 years.*

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TIA Names New CEO:
Tech & Telecom Veteran Wes Johnston

Hiring is Part of Strategic Initiative to Align Organization with Industry Advancements

Arlington, VA (June 5, 2017) – The Telecommunications Industry Association (TIA), the leading association representing the manufacturers and suppliers of high-tech networks, today announced that Wes Johnston has been named Chief Executive Officer. Johnston comes to TIA with more than 25 years of experience leading and transforming technology and telecom businesses. Most recently, he was the Managing Director for Technology, Media and Telecommunications (TMT) at The Gores Group, a global private equity firm.

"I was drawn to TIA because its members play critical roles in supplying the innovative equipment and services that enable network connectivity," Johnston said. "The tremendous footprint of these members makes this an exciting opportunity, as TIA adapts to a shifting policy landscape and rapid technological changes. There couldn't be a more important time for TIA to be aligned with its member needs and focused on accelerating business opportunities and innovation."

The selection of Johnston is part of a broader strategic initiative by TIA to invest in, and stay ahead of, the changing needs of members and rapid industry advancements. In addition to his hiring, TIA recently enhanced its leadership team, adding four senior executives with deep communications industry, government, and association experience.

David Heard, chairman of the TIA Board of Directors commented, "Wes has a tremendous track record of driving change, being customer-focused and making an impact in the tech and telecom industries. He's a perfect fit for TIA's mission to help companies navigate through technology transformation, shifting policy environments and a dynamic innovation environment, which are causing major changes to our member companies' business models and supply chains."

Mr. Johnston has held board and senior executive positions with large global technology firms, as well as with dynamic start-ups. While with Gores, he was a board director with Alpheus Telecommunications, Elo Touch Systems, Imagine Communications and the Tweddle Group. Prior to his work with the Gores Group, he was Executive Vice President and Chief Operating Officer with technology integrator Dimension Data, a $6B information and communication technology (ICT) firm where he led sales, marketing, solutions and service delivery in North and South America.

Johnston will join with other industry executives at TIA's Connectivity Jam, June 5-7 in Dallas. The event is a gathering of senior leaders, who will tackle the challenges of connectivity related to the Internet of Things (IoT), the future of television, network infrastructure and investment, security, smart cities and more. The priorities and recommendations shaped by these leaders will be captured in a communications industry outcomes report produced by TIA with partner analyst firm IDC.

About TIA

The Telecommunications Industry Association (TIA) represents manufacturers and suppliers of global communications networks through standards development, policy and advocacy, business opportunities, market intelligence, and events and networking. TIA enhances the business environment for broadband, mobile wireless, information technology, networks, cable, satellite and unified communications. Members' products and services empower communications in every industry and market, including healthcare, education, security, public safety, transportation, government, the military, the environment, and entertainment. Visit tiaonline.org for more details.

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Walker Renews ISO Certification

"At Walker and Associates, Inc., quality is definitely no accident . . . "

By Chrystie Walker-Brown
CEO
Walker and Associates, Inc.

As William A. Foster once wrote, "Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillful execution; it represents the wise choice of many alternatives". At Walker and Associates, Inc., quality is definitely no accident and has ultimately been the driving force for a successful business.

Walker chose to highlight its commitment to quality by becoming ISO certified in 2008 and has remained certified for nine years. The preparation for officially earning quality certification, and the work involved in retaining it for nearly a decade, has been easy since the focus on quality is a cornerstone of the Walker Values, which were established many

"Quality is not what happens when what you do matches your intentions. It is what happens when what you do matches your customers' expectations." ~Guaspari

years ago by the late co-founder, Chris Walker. The Associates at Walker understand these values and exude awareness that the processes they utilize each day are vital to a positive customer experience. In addition, Associates have the voice, the power and the responsibility to see that adjustments and improvements are made as needed. This empowers everyone in the organization to initiate change.

Every Associate is equipped and engaged in preventing, responding and resolving any issues that arise. In fact, associate empowerment contributed significantly in the success of Walker's most recent ISO audit to the new standard 9001:2015 on June 2nd, 2017.

The new standard "2015" brings with it some key updates such as an emphasis on risk-based thinking to enhance the application of the process approach, and increased leadership requirements. Walker has met the challenge of compliance to the new standard by incorporating Risk Awareness throughout the quality system by conducting training on risk awareness and analysis for all associates and by incorporating the risk factor within the Corrective Action process. Additionally, the company is incorporating a focus on risks within the Management Review process. The increased leadership requirements are also evident through the Management Review process, which has been documented to be an ongoing strength for Walker throughout its decade of certification audits.

Walker continues making strides in its quest to improve processes in ways that deliver stronger value to customers. Whether it is supplier relationships, handling of materials, assembly of integrated products, managing returns, processing orders and more, Walker seeks to continuously enhance everything that matters to the customer experience. The company's basic agreement is reflected in its values statement: "We take our commitment to service, quality and on time to promise very seriously. We are solution oriented. We cannot merely promise reliability and excellence. We must back it up daily with action and with processes that are engineered for success."

The business benefits sought and successfully achieved by many companies who are ISO certified includes higher rates of survival and growth, increased wages, reduced waste, enhanced productivity and improved health and safety performance. Walker is committed to maintaining a sound quality management system that brings with it many rewards. Enhancing the customer experience, building steadfast relationships with suppliers, and strengthening the current and future associate base with quality driven employees are actively pursued through Walker's quality initiatives.

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DEPLOYING 10 GIGABIT SD-ACCESS NETWORKS

Using the Emerging NG-PON2 and XGS-PON Standards to Build Next-Gen Broadband Networks

By Michael Sumitra,
Strategic Solutions Marketing Manager,
ADTRAN

What is Driving the Need for Next-Gen PON?

Rapidly rising bandwidth usage in both residential and business subscriber bases combined with the need to deliver user-driven services has network operators around the globe taking stock of their existing networks. They must identify the technologies needed to ensure their competitive position moving forward when facing both existing and new entrants into the markets they serve. Next-Gen Passive Optical Network (PON) technologies will enable access speeds up to 10 times that of existing Fiber-to-the-Premises (FTTP) service offerings, while also providing the agile physical layer for on-demand services creation and cloud-based services delivery.

Converging Multiple Services over a Common Access Services Architecture

The primary value of Next-Gen PON technologies -- NG-PON2 and XGS-PON --is their 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 is developing a single system that meets the scale and flexibility needs of premium enterprise, G.fast and 4G/5G densification access services while also delivering on the price points needed for mass market residential applications. Next-Gen PON technologies will provide these traits while doubling the life of operators' investment in their optical distribution network.

Flexible Optics Balance Cost and Scale

Realizing that the major cost component of any Next-Gen PON system is the optical transceivers (both at the Optical Line Terminal (OLT) and Optical Network Terminal (ONT)) it is vital to develop a flexible optics approach to NG-PON2. ADTRAN has done so in allowing for a single NG-PON2 OLT system to utilize multiple types of optical transceivers, enabling the service provider to better align cost with the target application. These flexible optics range from innovative Class G, low-cost fixed optics

for residential, business, and small cell densification applications to fully tunable NG-PON2 optics for premium enterprise, datacenter, fronthaul and backhaul services.

In terms of fully tunable NG-PON2 optics, ADTRAN is introducing Subscriber Edge Tunable (SET) optics, a new category of tunable optics addressing several key technology and innovation gaps that have hindered market development for multi-wavelength access networks. SET optics will be a key enabling technology for the NG-PON2 solution, facilitating the delivery of highly elastic fiber services to the customer premises equipment (CPE). This flexible optics approach allows for mass market 10/10G NG-PON2/ XGS-PON adoption for all broadband applications while maintaining flexibility for the future overlay of an additional fixed optics 10/10G business PON and/or multiple Time and Wavelength Division Multiplexing (TWDM) PONs using higher performance tunable optics. This innovation will enable access providers to cost-effectively and efficiently leverage Nx10G NG-PON2 to deliver even higher speed FTTH services to homes, businesses, G.fast MultiDwelling Unit/ Distribution Point Unit (MDU/ DPU) and 4G/5G densification installations.

Applying Data Center Architectures to Access

As telecom and cable operators look to optimize their networks, they are applying lessons learned from data center networks. Therefore, they are looking to build modular, component-based network architectures that are open, programmable and scalable. This approach represents a major shift from closed, monolithic systems controlled by multiple misaligned vendor-specific management systems.

ADTRAN Mosaic is the industry's most open and complete Software Defined Access (SD-Access) solution that natively integrates a complete FTTx portfolio with an open source SDN controller whether ONOS or ODL. With the inherent scale

and agility of multi-wavelength NG-PON2 access technology, this offers unprecedented fiber distribution and network flexibility, supporting fiber network auto-grooming and reducing the need for expensive truck rolls.

Open Systems, Endless Possibilities.

Open interfaces for cable, video and DSL broadband networks allow carriers to select customer premises equipment, middleware and access platforms based on their specific network topology and service requirements. Traditional rollouts of Fiber-to-the-Home (FTTH) broadband networks, however, have used a closed system. This has historically forced service providers into selecting the same vendor for the fiber aggregation and the ONT equipment, limiting the available solutions. In a multi-vendor network, this further complicates the ability to offer network-wide services and solutions. NG-PON2 will be the first PON technology that will be implemented day one as a multi-vendor solution supporting fully open physical and application programming interfaces (APIs) to create best of breed access solutions.

With an open architecture approach, service providers have the freedom to choose network elements and control the introduction and rollout of new customers applications and broadband technologies, eliminating high overhead costs. As shown in the diagram below, a single system can meet the scale and flexibility needs of premium enterprise, G.fast and 4G/5G densification access services while also delivering on the price points needed for mass market residential applications.
[Insert illustration diagram attached separately]

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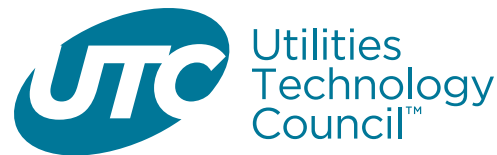
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UTC is Advocacy in Action

By Bobbi Harris
Vice President of Market Strategy and Development
UTC

The Utilities Technology Council (UTC) is a global trade association headquartered in our nation's capital. The membership of UTC is comprised of utilities and critical infrastructure providers as well as the solution providers who serve those industries. One of the important ways UTC services its members is through advocacy in Washington, D.C. and with other government agencies outside the U.S. UTC advocates for utility spectrum access and utility innovation as part of integrated policies for safe, clean and secure energy, water and gas services, which are essential to improving U.S. economic productivity, enhancing our quality of life, protecting our environment and ensuring our Nation's security.

Utilities and other critical infrastructure industries (CII) face increasing demands for wireless communications in order to support smart grid and cybersecurity requirements. They lack access to sufficient and suitable RF spectrum to meet their increasing communications needs. At the same time, they face challenges affecting their existing wireless communications systems, due to interference and congestion, as well as reallocation of radiofrequency spectrum by the FCC.

UTC has advocated for and promoted opportunities for utilities to have access to funding through the Connect America Fund (CAF) to allow utilities to provide Rural Broadband Experiments (RBE) and to access even more broadband funding that will be available through the CAF Phase II reverse auction. Utilities that applied for RBE Category 1 project funding will be able to compete for access to CAF Phase II funding in those census blocks where they proposed to provide service, and in addition utilities will be able to access compete for funding in other areas where the ILECs declined their right of first refusal for access to model-based support (i.e. funding) to provide service in states like Missouri, Virginia, Pennsylvania and New York. UTC is working to promote access to sufficient funding and suitable spectrum to meet the increasing communications needs of utilities and other CII, and to protect their existing communications networks against threats to their operational reliability, safety and security.

Most recently, UTC filed comments with the FCC in response to its Notice of Proposed Rulemaking in WT Docket No. 17-84, and it opposed the proposals to shorten deadlines for application processing and make ready, as well as proposals to eliminate capital costs from make-ready fees and pole attachment rates and to entitle ILECs to regulated rates. UTC explained that reduced timelines would impose costs on utilities that must be reimbursed and that the timelines must provide flexibility for circumstances outside of the control of the utility, including lack of resources. UTC also explained that any further reduction in make-ready fees or pole attachment rates would systematically under recover costs and would thus violate the Fifth Amendment of the Constitution. UTC supported the adoption of rules to promote the use of one-touch-make-ready, which should accelerate the deployment of broadband and at the same time ensure that pole attachments comply with safety codes. Finally, UTC's comments opposed the adoption of a 180-day shot clock for FCC review of pole attachment complaints. UTC's Comments also opposed all of the proposals by the FCC to eliminate consumer protections that require carriers to provide direct notification to residential and non-residential customers, including utilities, prior to the replacement of a legacy service or its discontinuance of a legacy service. UTC explained that these rules, which were only recently established by the FCC, should not be eliminated now, during a time when carriers continue to transition away from legacy copper-based networks and services. To read the comments filed by UTC, visit the UTC website at UTC.org/respected-and-effective-advocacy/. For more information, contact the UTC Regulatory Department through email at legal@utc.org.

About UTC

The Utilities Technology Council (UTC) is a global trade association dedicated to serving critical infrastructure providers. Through advocacy, education and collaboration, UTC creates a favorable business, regulatory and technological environment for companies that own, manage or provide critical telecommunications systems in support of their core business.

History: UTC was founded in 1948, to advocate for the allocation of additional radio spectrum for power utilities. Over the last 65 years, has evolved into a dynamic organization that represents electric, gas and water utilities, as well as natural gas pipelines, critical infrastructure companies and other industry stakeholders.

From its headquarters in downtown Washington, DC, UTC provides information, products and services that help members:

- *Manage their telecommunications and information technology more effectively and efficiently*
- *Voice their concerns to legislators and regulators*
- *Identify and capitalize on opportunities linked to deregulation worldwide*
- *Network with other telecom and IT professionals.*

UTC is an authorized certified frequency coordinator for the Private Land Mobile Radio Services below 512 MHz and 800-900 MHz frequencies. UTC is the sole frequency coordinator authorized to coordinate channels previously allocated exclusively to the Power Radio Service. In addition, UTC maintains the national Power Line Carrier (PLC) database for the coordination of PLC use with licensed government radio services in the 10-490 kHz band.

Access Monitoring for OPEX Reduction

By Ed Ullrich
Technical OEM Development Manager
Walker and Associates, Inc.

Why consider monitoring fiber access links?

Fiber in the access is becoming increasingly difficult to manage. In an ever changing world, more and more fiber will be deployed in the access for everything from IoT, Mobile, SmartCity, Business and Residential. Congestion in the access with fiber runs will make it more difficult to quickly gain access to fiber, while access at times may be blocked to due weather, special events or secure locations. In addition to these difficulties, the cost to chase these outages and have them repaired poses additional challenges.

What is the true cost from fiber access outages? While it is difficult to assign a dollar amount, it is entirely accurate to state that costs can be significant. When a company experiences a fiber outage in the access, it usually means that systems will be down until the fiber is repaired. In addition to financial penalties due to lack of performance, companies face increased financial loss due to bad press, word of mouth and even loss of customers to competition. The longer the downtime, the greater the cost. The bad press and potential loss of a customer is probably the largest expense to anyone that operates their own fiber systems. All are undesirable consequences in today's fast paced competitive markets.

The upfront true cost from a fiber access outage

Whenever you have an issue in your fiber access network you must dispatch a truck roll. Truck rolls are expensive and if using third party companies for truck rolls they are even more expensive. Often with bad conditions in the field, technicians working to locate the outage often leave a path of destruction by accidentally tapping into the wrong circuits which can then cause additional outages. And lastly bad weather can make chasing an outage difficult. In times of severe weather conditions or other natural disasters, numerous outages can occur making location identification even more challenging.

So how much time does fiber access monitoring actually save? How much OPEX can it actually save?

"The cost of emergency restoration is approximately \$25,000 per repair. The FCC reports that historically an average of 4.4 major fiber outages occur per year per 1000 miles of cable. Sources differ on the average mean time to repair for a fiber optic cable. The average meantime to repair to be anywhere between 5 and 11 hours. Based on this information, a monitoring system which eliminates 3 outages per year, 7 hours in duration, would recover an average of \$21,000 per 1000 miles per year or as much as \$168,000 per 1000 miles per year.

The FCC and Bellcore reports show an increase in the rate of fiber outages through the last four year. This can be surmised that this increase is due to the fact that the fiber in telephony systems is being installed closer to the "Local loop", which has always been known as the harshest environment for outside plant."

Lost time is lost money: The time to detect an issue with a fiber access monitoring system is almost instantaneous compared to how long it takes to dispatch a truck to seek the issue. The OPEX savings are significant compared to the OPEX that is taken right off of the bottom line of company savings.
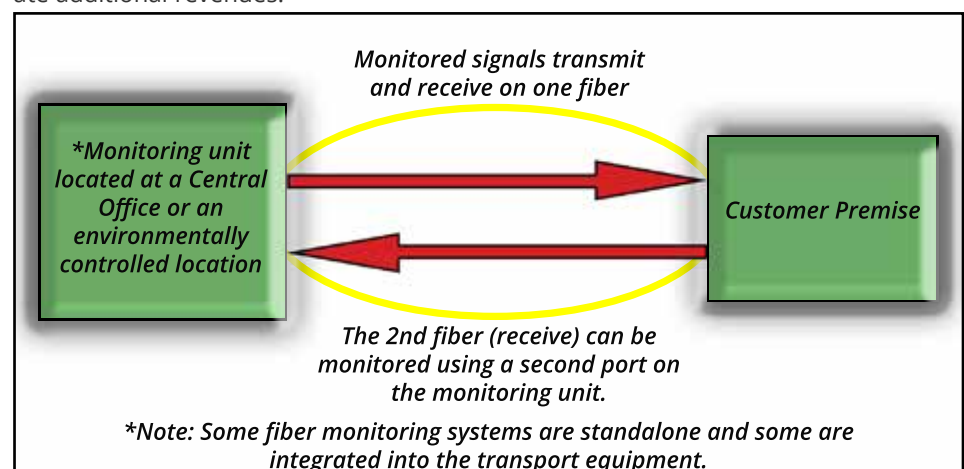
This is a very simple discussion. Do you want to pay for a faster, more modern way of determining when there is a problem? Or, do you want to continue with an older, slower method of operation? One additional twist on this newer method is that your product team can now propose "Gold" plated service for fiber access due to the faster detection ability and generate additional revenues.

How do "Next Gen" fiber access solutions work?

Fiber access monitoring solutions work by monitoring an access network 7x24 with a signal that is outside of the normal bandwidth channel. They first establish a benchmark and then alarm on any change it detects such as a fiber break or fiber bend. The customer may not even be aware of the condition if it is a slight fiber bend. Once the change is detected the information is sent north bound along with the alarm severity. This information can now assist in determining if a truck roll is necessary and where that truck should be sent. No more lost time looking for the problem, only the time needed for the repair. See drawing below of how these "Next Gen" systems work.

Summary:

Walker and Associates represents several manufactures of fiber access monitoring solutions. Some are designed for larger networks while others are better suited for small deployments. Some are embedded within the transport equipment while others are fully stand alone and will work with any transport vendor. Learn chow you can save OPEX while increasing the value of your fiber access network. Stay competitive and speak with your local Walker Representative today.

Monitored signals transmit and receive on one fiber

Monitoring unit located at a Central Office or an environmentally controlled location

Customer Premise

The 2nd fiber (receive) can be monitored using a second port on the monitoring unit.

Note: Some fiber monitoring systems are standalone and some are integrated into the transport equipment.

Broadband Deployment: A Path to the Future

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

I like to say we've never met a problem that more competition can't fix. When it comes to wanting more broadband choices, faster speeds and lower prices, the rest of America agrees with me. Yet, over 51 percent of Americans only have ONE choice at home for broadband, and 38 percent have no more than two choices. That's a whopping 89 percent of Americans stuck with little to no choice.

Busting consumers out of monopoly town has proven tricky. Since we passed the Telecommunications Act of 1996 and made competition the law of the land, smaller, more innovative companies have come onto the scene. Even though customers are desperate to try their service and these competitors are eager for the business, most still cannot connect.

Why? Building new networks is already a daunting task – a problem that is true in both rural America and urban centers – and bigger, incumbent players have been using every trick in the book to block new competitors from building out these new networks of the future. Much of this blocking takes place around infrastructure, like access to poles and multi-tenant buildings. Indeed, competitive wireless carriers seeking to upgrade their networks can sometimes spend more time and expense on regulatory approvals than it takes to deploy the new infrastructure.

How big of a deal is broadband deployment? Consider this: $275 billion could be invested over the next seven years, which would create three million new jobs. While the intricacies of how companies expand their infrastructure may not be the world's sexiest topic, we simply cannot afford to ignore the resounding impact competitive broadband deployment—both wired and wireless—will have on our economy.

Consumers will see faster movie and music streaming services, businesses will grow with new software applications in the cloud, and communities will have better health and public safety systems that could mean the difference between life and death. And that's just the services available today.

Now consider the potential impact on future cutting-edge technology everyone is talking about—connected vehicles, drone delivery, the Internet of Things and Artificial Intelligence. These services are going to require massive network infrastructure and new 5G networks that can carry a bigger data load with near zero latency. Looking at it this way, it's easy to see why network deployment issues are critical.

The good news is the Federal Communications Commission (FCC) is currently reviewing how to speed infrastructure deployment for wired and wireless providers. With increasing consumer demand for reliable, high-speed connectivity, it is important our policies reflect advancements being made in this area.

One of their first areas for review must be pole attachments. Current practices and timelines are like molasses running uphill. In order to prepare poles for new connectors, each attacher already connected to the pole must move its facilities to make room – a laborious process exacerbated by the fact that attachers often work one at a time. We also cannot ignore the fact that existing attachers and pole owners with broadband service have an incentive to delay the process, as new connectors may be their competitors.

Currently, the process provides 60 days for each connector to make room for a new attachment. There is an alternative to this inefficient system. It's called one-touch make-ready. Here, the new attacher uses one approved contractor to perform all the 'make-ready' work to the pole in one procedure, rather than requiring sequential work that can take months on end to ready one pole for a new attachment. This will drastically cut down the time it takes to deploy new networks in addition to being safer for workers and more convenient to the public.

It's important to note that all levels of government can do more to work together and enable wireless deployments. The FCC and Members of both parties in Congress have identified that 5G deployment is central to economic growth and global competitiveness. Getting the small cell revolution right will be key. If done right, we could see 150,000 small cell deployments by the end of 2018, and 800,000 by 2026.

To ensure this wave of new broadband investment in rural, urban and tribal lands, unnecessary governmental reviews on small cell deployment and the resulting costly fees should be eliminated.

Finally, the FCC should end monopoly power abuse in apartment buildings and condo complexes across America. These multiple tenant environments, or MTEs, have long been a barrier to deployment, more competition and lower prices for consumers.

The FCC has addressed this problem in the past, but sweetheart deals between big cable and landlords are locking up consumers and keeping competitors out of these buildings. This makes it impossible for customers to access better deals, services, speeds and prices from competitors. Renting an apartment shouldn't mean giving up your American right to competition and tenants in these buildings would be well-served to have the FCC prohibit practices – like revenue sharing and exclusive wiring arrangements – that stifle competition in MTEs.

Thankfully, we believe the FCC is on the right track to streamline infrastructure deployment in several proceedings. INCOMPAS and its members are participating in those proceedings to help lower barriers to competitive deployment.

We know that these important reforms will help to increase competition in the market and provide diversity in customers' choices. More choices will benefit consumers, both in price and in the quality of services being provided. Expanding broadband infrastructure will benefit small businesses and entrepreneurs who need reliable, high-speed internet to launch new ventures. Education improves when students can go home to reliable internet service to aid them in their studies. The expansion of broadband into underserved communities will also bolster local economies and spur job creation.

It's time America puts competition in the position to win the future.

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Finding the Path to Profitability for Mobile Network Operators

By Juniper Networks

Potentially the most disruptive new trend impacting networks is the arrival of the Internet of Things, or IoT. Industry experts predict that by 2020, about 21 billion connected devices will be collecting data and sending it across the network to IoT applications. For service providers, the pending IoT boom presents a milestone opportunity as their mobile voice and data revenues slow.

For this opportunity to materialize, carriers must make some hard decisions. At Juniper, we see this as a pivotal moment in the IoT evolution. Much depends on the choices that carriers make today, and the partnerships they forge, to cultivate profitable IoT business models.

The Service Provider Dilemma
As IoT connected devices ramp up, service providers are struggling to find ways to make that multitude of connections profitable. Revenue from the machine-to-machine (M2M) communications that make up IoT is nominal compared to the average revenue per user (ARPU) from traditional mobile traffic. A smart meter, for example, might generate 50 cents a month in data transport revenue, compared to an ARPU of $70 for a monthly smartphone plan.

At these rates, it doesn't make economic sense for carriers to serve this market with their traditional network architecture and service delivery cost structure.

IoT's Unique Characteristics
In addition, IoT presents new challenges in terms of traffic behavior, device scale, security, and billing and provisioning—

implying that mobile network operators (MNOs) should consider building overlay IoT networks to address them. For example, IoT generates widely diverse traffic patterns unique to each IoT application. That characteristic demands special attention to network capacity planning, load balancing, and quality-of-service implementation. The unpredictable nature of IoT traffic—especially during peak traffic periods—could also negatively impact the experience for existing mobile subscribers.

What if someone gains wireless access to vehicles on the road? Or tampers with weather sensors to simulate an emergency?

Further, IoT presents new vulnerabilities with far-reaching safety and privacy implications. What if someone gains wireless access to vehicles on the road? Or tampers with weather sensors to simulate an emergency? Or manipulates medical data?

The network of a bona fide IoT provider must be able to address all of these situations. But how can an MNO justify investments in IoT networks, when a typical IoT device generates less than a dollar of revenue per month?

Getting IoT to Pay
To turn a profit with IoT, service providers need to look beyond providing solely connectivity and transport services. Most current research agrees that IoT's true revenue opportunities for service providers will lie in applications and added-value services.

One promising avenue is data monetization. Successful service providers will collect, correlate, aggregate, and contextualize data from the network, devices, and applications, and then present it to third-party analytics platforms, or directly to customers.

Ultimately, IoT's primary value for MNOs will lie in the management, analysis, and use of the data it generates—so it makes sense for carriers to provide data-centric value in addition to shuttling the data from point A to point B. The sweet spot where carriers can differentiate themselves and make real money lies beyond traditional transport.

Building a Network for IoT
It goes without saying that to make IoT pay, carriers must control OpEx—they cannot let orders of magnitude in the growth of connected devices lead to a significant increase in operational costs. At the same time, the sheer volume of IoT devices introduces new requirements for quickly provisioning, scaling, and securing data.

The only way to reconcile minimal operating costs with the demand for fast, highly scalable provisioning is with automation.

The key is for carriers to harness network and IT resources that meet their customers' requirements dynamically. A flexible telco cloud, for example, can dynamically shift and manage resources, whether those resources reside within the end device, customer premises, carrier edge, or in the cloud.

Data Center Transport: An Eye to the Future

By Mohammed Sarwar
Principal Systems Design Engineer
Fujitsu

Data Center Interconnect (DCI) applications have gained market traction as a result of significant developments in optical technology to support the efficiency, capacity and reach requirements. Today, the growing prevalence of hyper-dense DCI solutions owes itself to technological maturity in areas such as coherent optics, Digital Signal Processors (DSPs) and Analog Coherent Optics (ACO) with 16QAM modulation. While some of the newest developments—such as client and Link-Level Discovery Protocol (LLDP), Remote Network Monitoring (RMON), and encryption—are already integrated into DCI solutions, more developments are on the horizon. These developments will be driven in large part by the ever-present downward pressure on cost-per-bit as well as the need to control total cost of ownership (TCO).

Big Fat Smart Pipes

DCI was originally all about what are colloquially termed "fat dumb pipes" that connect data centers hundreds to thousands of kilometers apart. Now, however, these "dumb" pipes are not only getting bigger, but they are also going to get smarter—smarter as in more flexible, more intelligent and more programmable across Layers 0–3. Big fat smart pipes are in the future for DCI applications.

Given the forecast of enormous expansion in the scope and diversity of cloud applications over the coming decade, it should come as no surprise that data center transport will need to advance in order to keep up with demand. Enterprises moving their services and applications into the cloud already demand seamless connectivity, sometimes among multiple data centers spread over large geographical areas. Virtualization; automation; "conscious" networking; centralized remote management; and self-healing/self-optimization capabilities are all examples of cutting-edge developments

that will benefit greatly from richer features at the optical transport level.

Towards More Flexibility and Efficiency

The relationships and interfaces among standard speeds and feeds at each of the various network layers results in successive levels of granularity, imposing cumulative overhead that limits the agility of data center networks. This is especially notable where links are bonded together (for aggregation, when the overhead of traditional link aggregation is not desirable) or sub-rated (Media Access Control (MAC) can operate at variable rate).

The increasing mixture of pipe sizes, protocols, and client/network interface types is imposing a significant burden on network management and network design. Incompatible pipe sizes across layers further amplify the granularity problem. There is a need for separate controls on each of Layers 0–2, to manage aspects such as configuration, redundancy, and sizing. There is an additional imperative to further collapse the functions of these three layers to make things simpler, and to address the limitations imposed by granularity among the different layers. Flexible sizing is also a highly advantageous capability.

New Features on the Horizon

The next wave of coherent Digital Signal Processors (DSPs) will offer a range of new possibilities for reach, capacity and spectral efficiency that enable much more agile approaches to network design.

Flexible modulation schemes at Layer 0 will increasingly optimize utilization of fiber assets by enabling selection of the most appropriate modulation scheme for the desired reach, capacity, applications, and performance. At Layer 1

(OTN), ODUFlex can now provide a flexible (rather than a fixed-size) OTN container. This overcomes an important limitation that has prevented use of OTN in DCI applications.

Flex-E (Flexible Ethernet) is now providing an option to decouple MAC from Ethernet PHY, hence allowing MAC rates to be variable at 5G granularity, regardless of the PHY rates. Flex-E, therefore opens up the capability for Ethernet pipes to be sized dynamically. Combining Flex-Lambda with ODUFlex and Flex-E now has the potential to achieve the ultimate goal of coordination and adjustment of pipe sizes across Layers 0–2 at the data path level, obviously with coordinated, smart software controls.

An earlier concept of managing transponders with a variety of configuration options that operators can evaluate and experiment with, is already becoming reality with a combination of next-generation DSPs and optics. However, greater value can be achieved by extending this concept across Layers 0–2, such that operations and management work seamlessly across layers and provide more coordinated and coherent DCI pipes. Architectural Considerations

For today's typical data center architecture, DCI infrastructure (transponders and line systems) is statically connected to the packet infrastructure within the data center. Future DCI applications will emphasize flexible client grooming and any-to-any mapping of client ports to network ports. It will also become possible to add cross-connectivity in transponder elements that can map any client port to any network port, enabling a variety of new use cases and more effective use of client ports across wavelengths that can carry 100G to 600G in 50G granularity on a network port. Without such connectiv-

ity, although line-side ports can already provide flexible rates, it is necessary to compromise on space or spectral efficiency.

Important developments in DCI will include increasingly sophisticated capabilities for coordinated and automated/assisted discovery and configuration, in addition to optical networks that are more self-aware and intelligent. This means it is necessary to harness and simplify the additional flexibility and rich feature set that come with new transport technologies.

Applications

Conscious network applications will be utilized at every point in the network operations cycle, from design through test and startup to runtime; these applications will enable intelligent manage-ment and control at both the transponder and, using SDN concepts, at the network level. Examples include operations-related essentials like simplifying NE configuration – to untangle the plethora of interdependent configuration options and building blocks for optical links and automatically determine the optimal settings.

Automation thus offers immense potential and enhanced zero-touch provisioning applications are pointing the way to the next level, where for example, transponders can readjust their own capacity by changing parameters automatically (such as the modulation or error correction scheme) based on policy or system profile.

Conscious, automated networking and cross-layer optimization will also enable live network monitoring and scaling based on events, policies, or the addition of new services and links. Changes in error rates, network failures, congestion and quality degradation will all become faster and simpler to manage as networks increasingly monitor and evaluate their own performance metrics—and react or adjust automatically.

A Future Taking Shape

The next generation of DCI is still taking shape, and the industry will continue to refine it as the various enabling technologies line up. However, it is certain that DCI applications will become more conscious, flexible and programmable both from software and hardware perspective. In turn, DCI applications will continue to increase spectral efficiency of fibers and lower cost per bit.

100 Gigabit Ethernet—Fundamentals, Trends, and Measurement Requirements

By Peter Winterling
Senior Technologist and Application Specialist
Viavi Solutions

Nearly every two years, a new hierarchy level is announced for telecommunications. The introduction of the 40 Gbps technology has dominated telecommunications for the last two years and now everyone is talking about 100 Gbps as the next generation. On the surface, everything looks simply like a change of generations is taking place and 40 Gbps seems to be outdated already. However, the introduction of 100 Gbps technology is quite different from the introduction of previous generations.

If we look at this more closely, the terms 40 Gbps and 100 Gbps are general terms for comprehensive technological changes in transmission technology. Particularly during this phase of implementing new technology, measurement technology plays an extraordinarily important role.

The transition from Gigabit Ethernet (GigE) to 10 GigE brought Ethernet technology to transport networks and, from the aspect of the transmission protocol, this represented a more important milestone than the introduction of the 100 GigE technology. The standardization is still not finalized; however, no significant changes relative to 10 GigE technologies are expected. Anything revolutionary will be determined by physical parameters. It was clear with the 40 Gbps technology that transmissions in existing transmission infrastructure are possible only with substantial modifications to the optically transmitted signal and path. Now, all possibilities must be exhausted for the transmission of 100 GigE (OTU4) in Wide Area Networks (WANs).

Standardization for 100 Gigabit Ethernet Three organizations are involved in the standardization for 100 Gigabit Ethernet. IEEE's Higher Speed Study Group (HSSG) defines the Ethernet specifications under the term 802.3ba. At ITU-T, the SG15 standardization group deals with the integration of the 100 GigE and 40 GigE signals within the OTN framework. At OIF (Optical Internetworking Forum), the PLL (physical and link layer) work group is working on the integration of these signals in DWDM technology for Metro Area Networks (MANs) and WANs.

The initial position for the standardization of 100 GigE specified retaining the past frame sizes and frame formats of the IEEE 802.3 standard. For the MAC layer, the target was a transmission quality with a bit error rate of less than BER = 10-12. Efforts would be made to use the OTN technology as a transport medium and to support it with corresponding specifications.

Test requirements for CFP modules for 100 Gbps More than ever, the introduction of 100 GigE requires a measurement technology that has been customized appropriately in order to accompany the stage-by-stage introduction.

Manufacturers of components and systems require measurement engineering for 100 Gbps. For testing the CFP modules used in the transmission systems, a 100 GigE signal must be produced with ten parallel electrical connections that are coded as 20 virtual channels. The Ethernet signal coming from the MAC layer is not firmly allocated to the virtual channels. In accordance with the specification, the virtual channels on the transmitting end can be shifted as desired at the entry of the multiplexer. They are being sorted as per the so-called roundrobin principle. The receiver must synchronize itself automatically. It must be possible to set any configuration at the time of the test.

(This article is an abbreviated version of a Viavi Solutions white paper, available at http://www.viavisolutions.com/en-us/literature/100-gigabit-ethernet-fundamentals-trends-and-measurement-requirements-white-paper-en.pdf.)

ReadyNow

Infrastructure Investment. It's not just a catch phrase: it's imperative to keeping America competitive.

January 2017 heralded the long-anticipated FCC roll out of the Connect America Funds (CAF) and Alternative Connect America Cost Model (A-CAM) funding. Walker is partnering with carriers to help build the networks that will provide advanced services to the underserved communities CAF Programs target.

CAF has been a long and deliberate process. For the last 20 years, the U.S. has endeavored to ensure its residents are connected to essential telecommunications. We saw the roots of the investment take place in The Telecommunications Act of 1996, which states that "advanced services" should be accessible to all Americans.

The goals of Universal Service, as mandated by the 1996 Act, were to:

- Promote the availability of quality services at just, reasonable and affordable rates for all consumers
- Increase nationwide access to advanced telecommunications services
- Advance the availability of such services to all consumers, including those in low income, rural, insular, and high cost areas at rates that are reasonably comparable to those charged in urban areas
- Increase access to telecommunications and advanced services in schools, libraries and rural health care facilities
- Provide equitable and nondiscriminatory contributions from all providers of telecommunications services to the fund supporting universal service programs

Connect America Fund Phase II commitments represent the largest single federal effort to expand broadband infrastructure in history. Targeted areas were identified by using data gathered through Connected Nation's State Broadband initiative in states where it has had active State Broadband Initiatives. Over the next six years, companies such as AT&T, CenturyLink, Consolidated Communications, Cincinnati Bell, FairPoint, Frontier, and Windstream will now be able to build out fixed voice and broadband networks offering speeds of 10 Mbps download/1 Mbps upload to designated locations in these identified areas, using approximately $1.5 billion in annual subsidies. Of the total subsidies offered, carriers only declined a total of $175 million annually.

With new initiatives well underway, Walker is excited and looking forward to partnering with carriers to help build these networks providing advanced services to the underserved communities the CAF Programs target. With nearly 50 years of experience in building and expanding US telecommunication networks, Walker and Associates will be a fundamental core partner assisting carriers as they implement the CAF goals and meet the CAF and A-CAM commitments.

Walker's experienced extended logistics services team and CAMP Program will be fundamental in ensuring service rollouts timetables are met. Their experienced EFI&T team is ready to fit; test and burn in cabinets and configurations, and qualified installation teams are prepared to field these solutions during all phases of CAF deployment.

Walker is ReadyNow for A-CAM/CAF projects. Carriers across the country are already engaged in projects designed to deliver enhanced communications services to their communities. Walker's resources are providing solid solutions as these projects advance to completion. Contact us to learn more at info@walkerfirst.com.

ReadyNow

WALKER AND ASSOCIATES INC

NTCA Testimony on Improving Broadband Deployment: Solutions for Rural America

For Immediate Release
Contact:Kelly Wismer, (703) 351-2015, kwismer@ntca.org

Arlington, Va. (June 22, 2017)—Michael Romano, senior vice president of industry affairs and business development for NTCA–The Rural Broadband Association, testified today before the House Committee on Small Business Subcommittee on Agriculture, Energy, and Trade during the hearing, "Improving Broadband Deployment: Solutions for Rural America." The following is excerpted from Romano's written testimony:

"Providing robust, scalable, and sustainable broadband in rural areas is not the kind of endeavor that tends to attract substantial capital from multiple private lending sources or tends to excite Wall Street. For small carriers like those in NTCA's membership, there are very few lenders that even look to work in this space—the Rural Utilities Service under the U.S. Department of Agriculture, CoBank, and the Rural Telecommunications Finance Cooperative represent the primary lenders to whom such small rural network operators might look in borrowing investment capital.

"Moreover, even where capital may be available, it can be difficult, if not impossible, to justify loans for investment in rural areas without a better business case than the rural area provides on its own. The costs of deploying networks and maintaining the service are considerable, and the few customers gained (typically less than seven per mile, and often less than one per mile) cannot afford to pay hundreds of dollars a month for broadband to cover those costs. Direct support from the federal USF High Cost program is therefore essential to make the business case for rural broadband." The full text of the testimony is available online.

NTCA–The Rural Broadband Association is the premier association representing nearly 850 independent, community-based telecommunications companies that are leading innovation in rural and small-town America. NTCA advocates on behalf of its members in the legislative and regulatory arenas, and it provides training and development; publications and industry events; and an array of employee benefit programs. In an era of exploding technology, deregulation and marketplace competition, NTCA's members are leading the IP evolution for rural consumers, delivering technologies that make rural communities vibrant places in which to live and do business. Because of their efforts, rural America is fertile ground for innovation in economic development and commerce, education, health care, government services, security and smart energy use. Visit us at www.ntca.org.

Bridging the Digital Divide

July 13, 2017 - 2:25 pm
By Ajit Pai | FCC Chairman
Last month, I logged a five-state, 18-stop, 1,672-mile road trip from Wisconsin to Wyoming to learn firsthand about the connectivity challenges in that part of the country. And this week, I took a three-state, 8-stop, 800-mile drive through rural West Virginia, Virginia, and Maryland that highlights how the digital divide is hardly confined to the middle of our nation, but is a real and pressing challenge just a short drive from our nation's capital.

Consider this fact: more than 70% of the world's Internet traffic runs through data centers in Northern Virginia, but you can't even get 4G LTE wireless service on more than 7,700 road miles in rural parts of the same state. And this is unfortunately common nationwide. If you live in rural America, there's a better than 1-in-4 chance that you lack access to fixed high-speed broadband at home, compared to a 1-in-50 probability in our cities.

I saw the cost of lack of access at almost every stop during this week's travels. In Hampshire County, West Virginia, I heard how a resort in the town of Capon Springs that doesn't have broadband has had trouble attracting guests who prize connectivity. On that same stop, I spoke with the owner of a chocolate store from nearby Kirby who told me that poor or nonexistent Internet access prevents him from serving his customers, maintaining the store's Facebook page, and growing his business.

But this week's road trip has left me invigorated, not discouraged. That's because I also saw firsthand the opportunities that are unlocked when next-generation networks connect rural communities.

For instance, in Wardensville, West Virginia, I heard how broadband has enabled a transcription company that requires massive video downloads to thrive (it's hired 28 full-time employees and plans to expand to two additional buildings in the near future). And in Staunton, Virginia, I learned how a regional hospital has used connectivity and technology to stabilize stroke patients more quickly and cut the mortality rate from sepsis by 34%. And in Hagerstown, Maryland, I learned how the Washington County school system is incorporating broadband to help children learn, and how the On-Track program (motto: "from cradle to career") aims to use technology to prepare county residents to enter the digital economy workforce.

With this week's trip fresh on my mind, I'm pleased to announce that August will be Rural Broadband Month at the FCC. Our agenda for the open meeting on August 3 will feature several items that will help bridge the digital divide.

Leading off will be a Public Notice to initiate the pre-auction process for the Connect America Fund Phase II auction. This auction will award up to $2 billion over the next decade to broadband providers that commit to offer voice and broadband services to fixed locations in unserved high-cost areas in our country. To maximize the value the American people receive for the universal service dollars we spend, this will be the first auction to award ongoing high-cost universal service support through competitive bidding in a multiple-round, reverse auction. With this Public Notice, we are seeking comment on the procedures to be used during this auction. Moving forward now will put us on track to conduct the auction in 2018.

The FCC will also consider taking the next step in implementing Phase II of another key universal service program, the Mobility Fund. In February, the

CAF SOLUTIONS
Broadband Services for Rural and Remote Areas

By ADTRAN

OVERVIEW

The Federal Communications Commission's (FCC) strategic initiatives, such as the Connect America Fund (CAF) and Alternative Connect America Cost Model (A-CAM) funding, present a significant opportunity for service providers to expand broadband coverage in rural and remote areas and help bridge the digital divide that still remains in the nation, all while gaining market share. However, delivering profitable broadband services to this underserved segment presents major challenges due to low population density, varied and difficult terrain and long loop lengths. In addition, service providers are challenged to deploy services within the FCC service obligation timeframes, while at the same time managing the on-going operations of their existing network, all with limited IT staff.

For service providers looking to rollout broadband services in these underserved areas, it is critical to work with technology partners that possess the level of experience and comprehensive expertise necessary to successfully execute such projects. The overview below highlights the key capabilities service providers should consider and expect from partners. These consist of a flexible and cost-competitive approach to broadband service delivery as well as a range of turnkey solutions including full lifecycle professional services, a complete portfolio of SD-Access technologies, and an entire ecosystem of partners to accelerate services rollout.

DELIVERING COMPETITIVE BROADBAND: A TOOLKIT APPROACH

Delivering fiber all the way to the customer device (e.g., FTTH) can be both cost-prohibitive and time-consuming. A more practical and actionable approach offers a comprehensive Fiber-to-the-x (FTTx) toolkit that enables service providers and technology partners to utilize existing copper assets and deploy an optimal mix of access technologies that match Capital Expenditure (CAPEX), and Return-on-Equity (RoE) and competitive needs. The following matrix shows a comparison of these technologies, architectures and costs (see table below).

COMPREHENSIVE PROFESSIONAL SERVICES

One of the biggest challenges service providers face when scaling residential services for CAF requirements is the time and resources associated with planning, pre-provisioning and deploying access equipment. Service providers should expect to rely on a vendor partner deeply rooted in the requisite services for these types of network deployments. Successfully operationalizing broadband access projects in multi-vendor networks demands that professional services programs focus on the following:

- Designing objectives around each customer's specific needs—from programs that augment existing network build-outs to complete turnkey implementations
- Prioritizing and accelerating new technology for network rollouts that enable the operator to monetize their network investments quickly and profitably
- Ensuring reliable, predictable costs

NETWORK INTEGRATION MADE EASY

A successful network deployment of this complexity requires that technology partners offer service providers a comprehensive range of network integration services. Such services must enable oper-

	Bonded VDSL2 17a	VDSL2 17a (Vectoring)	G.fast (212 MHz)	FTTH (GPON)	Fixed Wireless (RF)
Deployment Model	FTTN / FTTB	FTTN / FTTB	FTTB/FTTdp	FTTB/H	Fiber-to-Tower
Physical Medium	Copper	Copper	Copper / Coax	Fiber	Air
CAF2 and Beyond (downstream rates)	25 Mbps*	100 Mbps*	Up to 1.5 Gbps**	1 Gbps	100 Mbps
Ideal Range	<18 kft*** (5.5 km)	<3 kft (900 m)	<1.5 kft (450 m)	<25 miles (40 km)	<1 mile (1.3 km)
Deployment Costs	$	$	$$	$$$	$$

* To achieve typical rate at maximum range requires 2-pair bonding   ** To achieve "up to" rate requires <100m loop lengths with no X-Talk   *** Leverages a DMT mid-node

A-CAM/CAF: Special Report

ADTRAN CAF2 At-A-Glance

Majority share in CAF2 solution deployments

Completed turnkey turn up of 10,000 access nodes (over 1 million homes passed)

Automated service activations resulting in 10x less back office/ support tasks

Over 10 million vectoring ports deployed worldwide

Extend 25/3 DSL services up to 18,000 feet

Primary supplier for two country-wide G.fast deployment

ators to accelerate broadband network implementations, rollout new services to gain market share, and, at the same time, increase customer satisfaction. Network integration services should be expected to cover complete turnkey system integration–planning, engineering, network build-out, product, material, labor, and project management for inside plant (ISP) and outside plant (OSP) projects.

MODERNIZING SERVICE TURN UP AND BACK-OFFICE OPERATIONS

With any new rollout of broadband technologies and new customer applications, today's evolving advances in network architecture demand that operators enlist partners that can apply best-of-breed software defined networking (SDN) expertise to their operations. ADTRAN's unique service orchestration and automation solution is enabled by combining modern software defined access (SD-Access) techniques with our vast domain knowledge. Our implementation of orchestration and service activation

automation with service providers has proven extremely positive, with operators realizing substantial Operational Expense (OPEX) and time savings within both the customer's home and business services, as well as the back office, resulting in faster time to revenue and improved customer experience.

A COMPLETE ECOSYSTEM
Building out a broadband access network in a challenging environment is a complex task and involves multiple third-party vendors to ensure a successful rollout. Service providers should fully expect their partners in access technology, services, and telecommunications logistics to help lead the way in overcoming any barriers that arise. ADTRAN has a deep understanding of the complete ecosystem of products required to build a broadband network and an equally long history of enabling service providers to deliver the transformative effects of broadband to the communities they serve.

Commission adopted a Mobility Fund framework to allocate up to $4.53 billion over the next decade to advance 4G LTE service, primarily in rural areas that would not be served in the absence of government support. The proposed Order on the August agenda would establish a "challenge process"—that is, a process for resolving disputes over whether areas should be eligible for Mobility Fund subsidies. This measure will allow us to proceed to a reverse auction as soon as possible.

It is critical that we use accurate data to determine which areas will be included in that reverse auction. Many have complained to the FCC that the data that we currently collect through our Form 477 isn't good enough to serve as the basis for that decision. I agree. Therefore, I am proposing to collect new and more granular data that will serve as the starting point in deciding which areas will be included in the Mobility Fund Phase II auction.

Separately, we need to do a better job collecting data through the FCC's Form 477. It's often said that you can't manage what you can't measure. Consistent

with that dictum, I'm proposing that we improve the data we collect about broadband service in America. Specifically, we will consider changes to the FCC's Form 477 to improve the value of the data we collect, while also identifying and eliminating unnecessary or overly-burdensome filing requirements.

Increasingly, meeting the connectivity needs of all Americans—no matter where you live—means freeing up spectrum to meet the growing demand for wireless broadband. That's why, in three weeks, the FCC will vote on starting to explore opportunities for next-generation services—particularly for wireless broadband—in the mid-band spectrum range (3.7 GHz to 24 GHz).

Sticking with wireless, at the August meeting we will also vote on whether to replace a patchwork of service-specific renewal rules for wireless licensees with a consistent set of rules. Uniformity provides certainty and promotes investment. And it'll help ensure timely construction of wireless networks and intensive, continuous use of spectrum in all areas of the country. We will also tee up whether we should increase build-out

obligations for carriers that are seeking to renew wireless licenses so that more of rural America can receive service.

Bridging the digital divide and expanding access to wired and wireless networks will be the central theme of our August meeting, but it won't be the only focus. We'll also vote on providing a waiver for a carrier identification requirement for satellite news trucks, and other temporary-fixed satellite earth stations transmitting digital video in order to alleviate the unforeseen, burdensome costs of compliance with respect to old equipment that cannot easily be upgraded. The agenda also includes a Hearing Designation Order and an enforcement item, each of which must remain confidential until the meeting.

In my first remarks to FCC staff as Chairman on January 24, I declared that my highest priority would be making sure every American who wants Internet access can get it. During the almost six months since, we have repeatedly and consistently taken steps in service of this goal. I'm pleased that our August agenda includes yet more measures that will help us bridge the digital divide.

DISRUPTING OUR WORLD:
The Challenge of Cybersecurity in a Hyperconnected Society

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

Disruptive technology is nothing new. In 1793, the introduction of inventor Eli Whitney's cotton gin began a revolution that would quickly automate many tasks that had previously been done by hand, changing forever the face of modern manufacturing. In the 1950s, the proliferation of the television set in American homes created new ways for us to relate to each other and to the world. And in the 1960s, the introduction of communication satellites linked the far corners of the world together for the very first time, ushering in a truly global era in which all people, wherever they might be, were connected.

But the disruptive technology developing today – hyperconnected societies, the Internet of Things (IoT), and smart cities – has the potential to be even more of a game-changer than anything that has preceded it. Of course, with this potential for societal advancement come definite risks, risks that must be considered and conquered before moving forward into a new age of human integration with technology. One of the foremost risks that comes hand-in-hand with hyperconnectivity is the increased potential for cybersecurity threats.

The current explosion of hyperconnectivity will lead (and is leading) inevitably to the creation of "smart cities," largely defined as those that seamlessly integrate information and communications technology with existing infrastructure in order to improve the quality of life of its citizens in a sustainable manner. This might result in smart utilities that would be able to monitor and analyze resource usage, and adjust water flow accordingly to accommodate peak demand times. Or it might be a smart traffic system, that knows when an emergency vehicle is on its way to an accident site, safely turning the traffic lights green in its path to expedite arrival.

All of this would be done by a widespread system of sensors and data collection devices distributed around the city in order to perform specific functions. As integral as they are to the operation of the smart city, however, these sensors are vulnerable to intrusion and hacking, which makes cybersecurity not just an important issue, but a critical one, when hackers can gain entry and feed erroneous data into the system. Each connection enlarges the "attack surface" of the system, increasing the vulnerability of the overall network. In light of the new hyperconnected networks appearing around the globe, it is becoming apparent that traditional protection schemes, those successfully used to defend prior networks, may not be enough.

Dallas, Texas recently experienced an attack on their connected infrastructure when hackers gained access to the emergency system. Late one night, they were able to activate the warning sirens – more than 150 throughout the county – sounding them for more than 90 minutes before city personnel were able to shut them all down. While no real harm was done in this attack, it makes clear the ability of hackers to penetrate essential municipal systems from outside. Had they instead attacked city traffic lights, water management systems, or the electrical power grid, the results could have been devastating.

Critical, then, as cybersecurity might be to the operations and safety of smart cities, many experts say that it is not being given nearly enough attention by those building and installing the infrastructure. One problem is that many cybersecurity experts tend to think of internal networks – those that exist within a building or company, for example – as "safe," and in many traditional settings, they are. But the concept of "internal networks" really doesn't apply to smart cities, as the model is made up of a number of separate systems, all linked together, and all open to outside access. They're also all integrated, so the loss of function in one part of the network can have a cascade effect throughout the system. Imagine, for example, that the electricity grid is taken down. Without power, subways won't run, preventing people from getting to work. Critical hospital systems will be shut down, necessitating alternative – and possibly unavailable – care methods for patients. Traffic lights will not function, snarling traffic, and much more. Thus, the interconnectivity that is at the heart of the smart cities concept can be its biggest potential liability.

So what can be done about this problem, in that the very thing that makes smart cities work – the increased access and connectivity – is also its greatest weakness? Part of the solution lies in making cybersecurity a key component of a smart city's design from the very beginning, complying with major cybersecurity standards and regulatory requirements, rather than trying to cobble something together later in the process. In the rush to join the IoT revolution, the focus is often on bleeding-edge technology, with security left as an afterthought, if it is considered at all, leading to inadequate or entirely absent safety systems. As well, both hardware and software to be utilized should have security built into them, and must be tested rigorously to ensure compatibility with the overall infrastructure design. Finally, cybersecurity training at every level must be established and maintained, and everyone involved at any level tasked with

> *"... the interconnectivity that is at the heart of the smart cities concept can be its biggest potential liability."*

learning and applying best practices in situational awareness. Above all, those seeking to design a smart city need to pay much more attention to their overall cybersecurity programs, and ensure sufficient funding – with board approval – to integrate the needed security measures from conception to the delivery of the finished product.

But there are many smart city systems in place today that are far past their initial design stage, and desperately need a cybersecurity assessment that examines the networks, storage, servers, software, mobile devices, the IoT, and cloud, as well as the user population. In addition, it is important to call on both IT and OT experts to detect, define, and analyze potential threats from both physical and virtual sources, as these two formerly separate areas are coming together to a greater degree than ever before, each now largely dependent on the other. This holistic view will allow the development of an optimal security plan for tomorrow's hyperconnected infrastructure.

In addition, network architecture should be reviewed, as it is often the first line of defense, the "perimeter," in a cyberattack. A vulnerability assessment should be performed in order to detect potential weak points, security holes, improper configurations, and any other likely access point for malicious activity. These assessments should be done at regular intervals, with all threat databases kept meticulously up-to-date. Finally, next-generation security devices such as Firewall, IDS, IPS, etc., should be installed, ones capable of safeguarding and detecting internal networks and systems from hostile activity. Although it is impossible to entirely "attack-proof" a system, taking these steps will ensure the highest possible level of protection against outside intrusion.

The promises and benefits of smart cities are very real, and can provide a great boon to communities around the world. But the inherent threats that they bring with them are real as well, and will require vigilance, forethought, and dedication to overcome and resolve. Now is the time to install, update, or manage cybersecurity systems and protocols to ensure that smart cities, and the people that live in them, are kept safe and protected from malicious attacks.

FCC ANNOUNCES TENTATIVE AGENDA FOR AUGUST OPEN MEETING

WASHINGTON, July 13, 2017 – Federal Communications Commission Chairman Ajit Pai announced that the following items are tentatively on the agenda for the August Open Commission Meeting scheduled for Thursday, August 3, 2017:

Connect America Fund Phase II Auction (Auction 903) – The Commission will consider a Public Notice to initiate the pre-auction process for the Connect America Fund Phase II auction which will award up to $198 million annually for 10 years to service providers that commit to offer voice and broadband services to fixed locations in unserved high-cost areas. (AU Docket No. 17-182)

Mobility Fund Phase II Challenge Process – The Commission will consider an Order on Reconsideration and Second Report and Order that lays out a robust challenge process that will enable the Commission to direct Mobility Fund Phase II support to primarily rural areas that lack unsubsidized 4G Long Term Evolution (LTE) service. (WC Docket No. 10-90; WT Docket No. 10-208)

The full press release is available at https://www.fcc.gov/document/fcc-announces-tentative-agenda-august-open-meeting-3.

improving the capabilities of existing services and applications, and allowing his team of DevOps superheroes to create or rapidly deploy new applications that further enhance network operations.

Please understand—our hero's journey isn't meant to be definitive, nor will it provide all answers for everyone. Instead, this tale is intended to provide an example of a single network operator's journey to autonomous networking. The goal here is to help give others a glimpse of the potential benefits and opportunities to be gained by moving toward a more automated service delivery engine.

In the future, our hero's journey will indeed lead to a fully autonomous network infrastructure. While he once dreamed of a network that would deliver new services quickly and efficiently, he has gained the ability to explore and seek out new market opportunities, designed to grow his business, now and for the foreseeable future. And his network will increasingly rely on machine learning, or artificial intelligence, to maintain performance levels that support primary customer needs, autonomously.

The only way to reconcile minimal operating costs with the demand for fast, highly scalable provisioning is with automation. In communications networks, this translates to a software-defined network (SDN) architecture with Network Functions Virtualization (NFV).

SDN and NFV represent the path to quick service provisioning and transformation for all networks, but none more so than IoT. An operator cannot run an IoT network successfully, let alone profitably, without significant use of automation and virtualization.

Network operators need an easy, cost-effective way to harness NFV to deliver new services for users. One such way is to build a parallel IoT network using a virtual Evolved Packet Core (vEPC), dramatically changing network economics by using automation and intelligence for the highly efficient delivery of new services.

Security as a Competitive Advantage
As previously mentioned, service providers will need to address IoT-specific security concerns. But rather than representing only an obstacle and expense, the new IoT security landscape could also offer a moneymaking opportunity.

The situation suggests a potential requirement for a trusted security broker to handle IoT security processing in the network or cloud. MNOs are strong candidates for this role.

How? The Public Key Infrastructure used by traditional VPNs consumes too much processing power for the battery-run devices that largely comprise IoT. And IoT application developers generally don't account for all the necessary aspects of security—authenticating endpoints, preventing hacks, and maintaining the communications link integrity—in their software.

The situation suggests a potential requirement for a trusted security broker to handle IoT security processing in the network or cloud. MNOs are strong candidates for this role. These carriers already have several communication and security systems in place for mobile data traffic that would port over to IoT.

The world already trusts mobile service providers with managing phones and subscribers and securing connections. This basic trust model could extend to IoT, with operators providing secure IoT life-cycle management and shielding enterprises and IoT application developers from the complexities and risks of the IoT threat surface. At the same time, it would fortify MNOs with an additional revenue stream.

IoT-Ready Network Infrastructure
At Juniper, we look forward to helping MNOs navigate their way to IoT monetization. That means implementing end-to-end solutions tailored for particular verticals, and monetizing data, analytics, security, and SLAs. Success lies in the ability to build an open platform for ecosystem innovation, and to forge strategic, complementary partnerships.

While many describe IoT as "the wild, wild west," as we see it, seldom does such a rich opportunity present itself. Its rewards will go to those who step forward to redefine the market through innovation.

Walker Recognized in BBC Top 100 List

The Broadband Communities annual list of Top 100 Fiber-to-the-Home Companies and Organizations celebrates organizations for their contributions to "Building a Fiber-Connected World." For the eighth consecutive year, Walker and Associates is included the list for 2017. A variety of businesses among a broad cross section of telecom markets know Walker as a reliable partner for their fiber projects.

The selection was based how important the organizations are to advancing true broadband rather than how important broadband is to them.

Customers recognize Walker by their extensive manufacturer relationships, strong commitment to value, high standards of customer service, and innovative services that reflect a genuine interest in customer success. For nearly 50 years Walker has built and maintained a reputation for excellence, resulting in high levels of customer commitment and confidence. Awards and recognitions such as this one confirm customer satisfaction ratings that indicate trust and brand loyalty.

Walker joins other industry leaders in the 2017 Top 100 list, such as Walker manufacturing partners ADTRAN, CommScope, Corning, Fujitsu, and Telect. The list also includes customers of Walker whose successful FTTH projects reach across North America. Walker is pleased to join these companies in accepting a place in this year's Top 100 list.

For more information, about FTTH services and solutions from Walker and Associates visit their website at visit www.walkerfirst.com.

In the Spotlight

By Randy Turner
Director, Marketing Communications
Walker and Associates

Jeff Brown joins Walker and Associates as a Regional Account Manager, responsible for customer accounts in the states of PA, NJ, WV, OH, DW, MD as well as NYC. Jeff is an accomplished sales executive with over 30 years of experience in the Telecommunications/ Broadband industry, including more than 23 years in various sales, sales management and business development roles. His professional sales experience consists of sales and support of a variety of end to end networking infrastructure solutions including inside and outside plant fiber optic & copper management platforms, IP and TDM based wireline and wireless networking technologies, optical transport solutions, microwave networking solutions and professional services. Jeff's primary role has been a direct contributor working with Tier I, II & III IOC's, MSO's, Wireless Service Providers, Utility Companies and Fiber Optic Network Service Providers.

Jeff can be reached by email at jeff.brown@walkerfirst.com, or by phone at 336-731-5367.

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Rob Kahrmann recently joined Walker and Associates as Regional Account Manager covering Alaska, Idaho, Montana, Oregon, and Washington.

Rob joins the Walker team with over 30 years experience in the telecommunications industry. For the past 17 years, he worked for Electric Lightwave (ELI) in Vancouver, Washington. ELI was recently acquired by Zayo Networks. At ELI, he was Director of Engineering for some time and most recently was the Director of Vendor Management, Contracts, and Procurement. Rick has worked extensively with telecom distributors over the years and has built strong relationships with carriers, independents, and other people within the industry.

He assures his new customers that "I have spent many years being a customer, and I will provide you the level of service and respect I had grown to expect from my vendors. By working together, we can help your company achieve even greater results for your bottom line and for the customers you serve."

Rob can be reached by email at rob.kahrmann@walkerfirst.com, or by phone at 336-731-5256.

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Rick Poston has joined Walker and Associates as its Software Network Engineer, managing Walker's recently announced software networking lab. Rick has over 25 years of Enterprise IT experience and has deep technical understanding of many Operating Systems, Virtualization Platforms, Networking, Security and Storage infrastructures. In previous roles Rick led the virtualization of 98% of the compute infrastructure for a leading litigation company, ripped and replaced ATM/Ethernet cores and Firewall platforms, deployed IDS/IPS, and developed a web frontend for campus network management. Rick also led a Cloud Services DevOps team migrating services into AWS and building a successful cost competitive fully automated internal cloud platform. In the role of Software Networking Engineer, Rick is responsible for building Walker's Next Generation Networking Lab where Walker is building SDN/NFV platforms to assist our customers with validation and integration testing of the next generation of software network platforms.

Rick comments "I am excited to be working on these next generation software defined network platforms with Walker. The IoT explosion with everything in the home connected, the proliferation of cell phones, video and streaming TV have pushed traditional static network architectures to their limits. Dynamic, scalable and automated SDN/NFV technologies running on standard COTS platforms provide the next generation network platforms that break away from the traditional vendor appliance lock-in, will scale to 10 of billions of connected devices, provide the 5G foundation while offering our customers the ability and agility to provide more services and capture more revenue"

Rick can be reached by email at rick.poston@walkerfirst.com, or by phone at 336.731.5277.

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Rick Walker, Director of Walker Services Development, recently announced his retirement from Walker. Rick, elder son of company co-founders Chris and Virginia Walker, has worked in some capacity for the family business since 1992. Through the years he has taken on challenging roles that connected him with customers and industry leaders. He is admired for his commitment to quality, his natural leadership style, and his focus on exceptional customer outcomes.

Rick commented to associates at Walker that "Services are vital to Walker's continual evolution as a value added distributor capable of handling larger, more complex network design/builds going forward. I am of the age and have a passion to pursue more time with family, hobbies, and other interests on my bucket list. Some of you have managed me, and mentored me and I cannot thank you enough for your professionalism, patience, and kindness. All of you are who Walker is, our face to the industry, and through your commitment and loyalty we have built a very special company second to none in our industry. It is a blessing to know you and work with you all these years. Because of you Walker has a very bright future!"

Rick will remain an active member of the Board of Directors, staying informed of company performance and market directions. Even in retirement Walker expects his influence will be felt in numbers of ways. Congratulations Rick, and thanks for all the opportunities you've created during your storied role in telecommunications.

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Jim Houhoulis has joined Walker as Department of Defense (DoD) Client Director, covering DISA, WHCA, EOP and STRATCOM.

He joins Walker with over 30 years of experience in the telecommunications/IT industry, with the last 11-year tenure being with Juniper Networks. His expertise and primary focus is in support of the above accounts, delivering Cyber Security, IP Networking, and Optical solutions.

Jim states "I am excited to be a part of the Walker team and look forward to meeting customers in upcoming weeks and months. By working together, we can help your agency achieve mission success by compressing your deployment life cycle.

Jim can be reached by email at jim.houhoulis@walkerfirst.com, or by phone at 336-731-5267.

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Joey Manno joins Walker as an Inside Sales Executive for Federal Customers. Joey, Marine Corps Veteran and UNC-CH Alum, began his career at Walker and Associates as an ISE in 1998, then moved into the structured cabling industry as a Manufacturer's Outside Sales Rep for Data Connect from 2001-2013. Manno spent the past three years as Branch Manager of a datacom and security distribution supplier and is excited at returning to Walker and serving as an ISE role in the Federal group. Outside of his career, Joey enjoys spending his time with his wife, Sherri and their four children.

Joey can be reached by email at joey.manno@walkerfirst.com, or by phone at 336.731.5315.

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Trudy Nance retired from Walker and Associates following 15 years with the company, where she worked in Inside Sales. Over the years Trudy was recognized by Walker's manufacturer community for her outstanding sales performance. Most recently. Trudy received the Inside Salesperson of the Year Award from Walker. Customers and colleagues alike praised Trudy for her commitment to exceptional service and her leadership.

She looks forward to spending more time with her family, pursuing some hobbies, and travel. Congratulations Trudy - you are missed!

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Congratulations to **Chris Lasley** on her recent retirement from Walker and Associates following her 25 year career in the telecommunications industry. Chris joined Walker in 2009 as part of Walker's Windstream Supply assets acquisition. Chris reports she is excited to spend time with her first grandbaby and family later this year. In addition to her family, Chris will be using her available time to focus on her church family and those in need of her spiritual guidance.

Chris's customers and the Walker family will miss her passion and dedication along with her strong work ethic. Best wishes go to her as she steps away from her career to serve family, friends and her community.

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In late spring Walker was saddened at the sudden loss of one of its longtime associates. Deborah Catherine "Debbie" Stogner died on Friday, April 21, after a brief illness. A memorial service was held April 25 at Davidson Funeral Home Chapel in Lexington, NC.

Debbie was born October 15, 1956 in Lexington. She graduated from Central Davidson High School and spent the majority of her career as a salesperson for Walker and Associates. Debbie loved cooking, gardening, going to the beach, and spending time with her family and friends. She was a close friend to many and will be greatly missed by all who were lucky enough to know her, including her Walker customers.

Debbie often boasted that she was the company's eighth original hire. Her career at Walker included working as an Inside sales Executive for both commercial and government accounts. While working on the government team, she was instrumental in assisting the company in its successful pursuit of the NASA SEWP contract. She was credited with solid recognition of her work by fellow associates, sales management, as well as within the company's manufacturer community.

Please join Walker in extending thoughts, prayers and condolences to Debbie's family and friends.

CONNECT

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

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

We look forward to seeing you at these events!

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AUGUST 2017	
Tri-State Telecom Annual Conference	Park City, Utah
NCEC/NCAEC Technology Conference	Myrtle Beach, SC
TTA Convention & Product Showcase	Horseshoe Bay, TX
TechNet Augusta	Augusta, GA
Tinker AFB - AFCEA Technology Day	Oklahoma City, OK
SEPTEMBER 2017	
ITA Vendors' Showcase	East Peoria, IL
* ISE Expo	Orlando, FL
* UTC Region 1 & 2 Combined Meeting	Galloway, NJ
OTA CO-IT Seminar	Newport, OR
TAM Convention	Rockport, ME
Modern Day Marine	Quantico, VA
* Light Reading Carrier NFV & SDN	Denver, CO
OCTOBER 2017	
ANMTA Fall Conference	Scottsdale/Fountain Hills, AZ
Northeast Telecommunications Showcase	Binghamton, NY
* UTC 2017 Region 3 Fall Meeting	Myrtle Beach, SC
TELSE Annual Convention	Point Clear, AL
WSTA Fall Conference & Exhibits	Wisconsin Dells, WI
TSTCI Annual Membership Meeting	Austin, TX
MATSS	Kansas City, MO
TANE Annual Meeting and Convention	Whitefield, NH
KTA-TTA Fall Conference	Bowling Green, KY
Great Lakes Technology Showcase	Ft. Wayne, IN
ATA Showcase	Anchorage, AK
Berkeley Labs Labtech	Berkeley, CA
NASA Kennedy Space Center	Cape Canaveral, FL
TechNet AsiaPacific	Honolulu, HI
NOVEMBER 2017	
SCTBA Fall Conference & Showcase	Columbia, SC
MTA 36th Annual Showcase	Billings, MT
C-CAP	Ridgecrest, CA
DECEMBER 2017	
SDTA Fall Plant & Tech Workshop	Mitchell, SD

* - Indicates Walker and Associates is an event sponsor

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