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

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Editor's Letter

Thomas Jefferson astutely observed that "Every generation needs a new revolution." Although technology may not have been on his mind, we are definitely in the midst of dramatic upheaval brought on by the seemingly quenchless quest for mobile devices and the bandwidth to support them. For those of us with a smart phone, a tablet, or other WiFi enabled device, we expect to have access wherever we go. Research indicates we are only beginning to understand where we may be headed with data consumption. Currently averaging nearly 1.5 Gb per month by the average mobile subscriber in North America, best assumptions expect that number to hit nearly 9 Gb in 2018.*

And it doesn't stop there. The Internet of Things (IoT), Machine to Machine (M2M) applications, the growing trend in wearables, and the increasing popularity of the connected vehicle all mean more bandwidth, broader coverage, and heightened demand for 4G service. Increasingly, our most important connections are our non-corded devices that allow us to interact socially, conduct business, perform financial functions, be entertained, stay healthy, remain informed, become more educated, and the list goes on. For many it is no longer about convenience; mobile connectivity is a way of life.

As a carrier, this means providing a network that delivers more value for customers, operates more efficiently, performs reliably and reduces operating costs. That is quite the challenge! Yet, that is exactly what the manufacturing community is focused on – solutions that deliver innovative results.

This issue of Skinny Wire scratches only the surface of the mobile ecosphere. Topics here include LTE, Small Cell Deployment/ Small Cell as a service, Mobile Backhaul, Mobile Fronthaul, Mobile Security, M2M/IoT, mobile policy, Virtualization, WiFi, Point-to-Point and Point to Multi-point (P2P/P2MP), Distributed Antenna Systems (DAS), Data Center/Cloud Services and more. As a networking professional, you know these really are simply conversation starters when it comes to all the new developments in the world of mobile technology. Still, these articles from equipment manufacturers and industry thought leaders provide solid information to consider in meetings already on your schedule. Be sure to carry a copy of Skinny Wire with you.

Speaking of schedules, we hope to see you at any of the industry events highlighted on page 42. These state, regional and national events are setting the stage for plenty of education and hands on experience to equip you for the mobile revolution. You'll have the chance to not only learn from your peers, but also those involved in policy making decisions. You'll find, for example, FCC Chairman Tom Wheeler featured as a keynote speaker at CCA's Annual Conference during Super Mobility Week in Las Vegas, NV and at COMPTel PLUS Fall in Dallas, TX. His leadership is critical as plans finalize for next year's low-band spectrum auctions.

Enjoy our generation's new revolution!

Randy Turner

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*The U.S. officially enters the gigabyte era of mobile data consumption, by Kevin Fitchard, <http://gigaom.com>

All Things Wireless

By Rodney Wise
Director of Technology Selection
Walker and Associates

It seems to me that we have become dependent on wireless services in a short period of time. Is anyone physically connected in their personal lives anymore? Wi-Fi enabled laptops, smart phones, Bluetooth connectivity and cordless phones dominate our personal landscape. And in a lot of cases, wireless connectivity exists in our work environment as well. Regardless of the tool you use or how the radio frequencies are being manipulated, nearly all things wireless rely on access to spectrum. Spectrum is now our industry's most precious asset and the political battles being waged for it are making history. Once you examine the colorful United States Frequency Allocation Chart, you realize the complexity of spectrum allocation.

The newest wave of spectrum attention is around AT&T buying DirecTV and rumors that Verizon is in discussions with Dish. I find it very hard to believe that these two events are motivated by expansions in TV delivery. I believe it has much more to do with the acquisition of choice spectrum.

Google also happens to be very involved with spectrum in terms of identification, reporting, and sharing. You don't have to go much further than reading Google's patent list to realize they have much to gain by understanding and evaluating the spectrum situation. The part that puzzles me in the Google spectrum discussion is the absence of or the lack of visibility of Google owned spectrum. If I had just purchased a sophisticated drone maker, I would be in the market for Dish, DirecTV or other satellite spectrum. Or maybe Google is just so far ahead of the game with their vast R&D resources, they have developed another way to provide broadband service from earth stations to drone to consumers. Free space optics work pretty well in the absence of atmosphere, so a mesh network in high altitudes between drones could work if they find a way to transport traffic to and from the drones.

Current theories point to underserved countries as the first place for Google and Facebook to fly their broadband drones. I would say that is probably a good place to trial and develop their technology prior to bypassing all of us here. Which brings us to the next area of congestion: altitude utilization. The popularity of drones is on the rise. I predict that the FAA will have their own complex color chart for altitude allocation similar to the frequency allocation chart. If this happens, I suspect the military and commercial flights will retain most of the "spectrum" with higher altitudes allocated to items like communications and weather. It will be interesting to see if this turns into an auction process.

Our ever changing industry keeps us focused and interested. The technology and implementation required to keep up with consumer demand will certainly keep us focused on the future.

As Director of Technology for Walker and Associates, Rodney Wise confronts a variety of technical questions on a daily basis. His broad background provides him a real-world perspective of challenges and opportunities telecom engineers and project planners face in the field. The Wise Guy is a regular feature in *The Skinny Wire*.





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A Legacy Maintained

Walker's New CEO Committed to Customers, Quality and Innovation

By Randy Turner

Director, Marketing Communications
Walker and Associates



Earlier this year Walker and Associates announced its new CEO, Chrystie Brown, pictured above. She is the youngest daughter of company co-founders, Chris and Virginia Walker. Understandably, she is quite familiar with the business.

The Walkers began the telecommunications equipment distributing company in 1970 in the basement of their home. Virginia Walker served as CEO since 2000 and announced earlier this year she was retiring. Chrystie Brown assumed her new role in April, 2014

Brown earned a Bachelor of Arts in English from Longwood University in Virginia in 1984. Although she originally worked in a different field, Brown grew up surrounded by the family business and pitched in from time to time before coming to work for the company full time.

Brown has served on the board of Walker and Associates since 2001. Beginning in 2011, she worked as the board's liaison to Walker's quality management effort and has been Vice President of Quality and Contracts since early 2013.

In a recent interview, we discussed the company's legacy, its current challenges, and its future. Here are some of the highlights of that interview.

Question: Having grown up in the family business, what strikes you as the biggest change over the company's 43 years?

Answer: Two things quickly come to mind.

First, there are few family owned businesses left in this industry. We have held firm through thick and thin. I credit the strength of our associates, the founding leadership of my parents and for the past 15 years, the wisdom of my brothers for that.

Second, I can remember when the warehouse was filled primarily with spools of wire and cable. Today this industry is constantly challenged to accommodate the exploding demands made on the network. The impact that the ICT industry is having on an individual's ability to connect and relate with others on a national and global level is astounding. There is a constant evolution of solutions to meet the demands and to meet them effectively, economically, and securely. Today, we carry products from over 250 manufacturers.

As a Value Added Distributor we offer everything from product and solution guidance on the front end of a project, to stocking, inventory management, custom deployed kitting, installation, engineering support and equipment maintenance. These are exciting times in the industry!

Question: In the midst of all this change, what strikes you as being the same throughout the company's history?

Answer: Our company values and our commitment to integrity have remained constant. I recently came across some of my father's notes. It struck me that despite the differences that have taken place in the industry's landscape and the astounding technological changes over the years, our approach to business and our approach to our relationships with customers and vendors has not. Dad

used to say “The customer is the most important person in the company and the customer’s view of us affects every person, every policy, every procedure and every product.” That has not changed.

The technology, the product line, and our menu of leading edge capabilities has expanded and changed over the years. Our commitment to reliability and to helping our customers stay proactively competitive has not. We still treasure the relationships we have with customers and manufacturers. Our values have not changed. Our commitment to integrity has not changed.

Question: A flagship commitment from Walker is that “the ultimate focus of every associate is the needs of the customer”. What does that really mean, and how does it happen?

Answer: My favorite question asked of every associate throughout the TL9000 audit process is “How does your job affect the customer’s experience with Walker?” Every associate knows that they have an important role to play in how well we perform for our customers. We are very much aware that our success is dependent upon our customer’s success. We very much appreciate our relationships with our customers and vendors. When I use the word “relationship” I mean that we bring accountability, reliability, integrity, friendship and professionalism to the table. We are and always have been a customer centric organization.

Question: Speaking of TL9000, Walker’s quality program has been part of your focus in recent years before taking on the role of CEO. What value does a quality program offer for Walker’s customers?

Answer: First and foremost it shows that we are committed to customer service, continual process improvement and a quality experience for our customers. We are keenly aware that we cannot succeed unless our customer’s succeed. That means that our customer’s success is extremely important to us. Building the best practices helps insure the best experience and the best value for our customer. The quality program promotes transparency and attention to detail. Every associate is made aware of the importance of their job and their role in customer satisfaction. Every one of our associates is valued and vital to our success and to making sure that our customer’s requirements and expectations are met.

Question: Sometimes process-driven organizations can become too internally focused, resulting in stifled creativity and growth. What role does innovation play at Walker and Associates?

Answer: Innovation is a part of our daily routine at pretty much every level of the organization. From constantly improving our processes to providing the best solutions for our customers, innovation is an important part of our tool box. In this industry it is often said that the only constant is change. That keeps everyone on their toes. Every customer comes

to us with a unique set of needs requiring a unique set of solutions. We have an extensive product menu and start to finish service offerings with professional, innovative guidance. Innovation is what changes a challenge into a solution. Innovation is what makes us uniquely suited to help our customers succeed.

Question: There are now three generations involved in the family business. What value does a family business bring to Walker’s customers?

Answer: It means that failure is not an option. At the same time it means that how we succeed is as important as success itself.

I am one of four siblings and I can tell you that Walker and Associates was an integral part of our upbringing. Mom and Dad started this company in the basement of our home. The first floor of the house was Walker and Associates. Our dinner table conversations each night involved Walker and Associates. The growth and challenges, the victories and the setbacks of the company were all discussed. The whole family enjoyed the relationships with associates, customers and manufacturers. That is the lens through which we view this company. Providing our customers with excellent service and real solutions and doing so with reliability and integrity are a part of the fabric of who we are. That legacy continues as another generation of the Walker family steps in. We remain committed to earning and keeping our customer’s trust.

Company/Industry Highlights

- | | |
|--|---|
| 1970 - Walker and Associates launches in Chester, VA home of Chris and Virginia Walker | 2000 - Passing of Chris Walker
Virginia Walker becomes new CEO
Walkerfirst.com launches |
| 1978 - Corporate offices relocate to Welcome, NC
Evergood Fabrication founded as manufacturing division of Walker Group | 2001 - Consolidation of remote warehouses to Winston-Salem, NC
Sacramento, CA sales office consolidated with sales office at corporate headquarters in Welcome, NC |
| 1983 - AT&T Divestiture | 2003 - Walker named as ADTRAN’s #1 Service Provider Distributor |
| 1984 - Walker opens a sales office in Sacramento, CA
Walker begins distribution partnership with ADC Telecommunications (currently TE Connectivity) | 2004 - Distribution contract signed with Fujitsu Network Communications |
| 1987 - Walker begins distribution partnership with Telect | 2008 - Walker earns TL9000/ISO 9001:2008 status |
| 1993 - Distribution partner agreement begins with Corning Cable | 2009 - Walker enters into distribution agreement with ADVA Optical Networking
Walker acquires non-affiliate operating assets of Windstream Supply |
| 1996 - Telecom Act of 96 becomes law
Evergood Fabrication sold to Reltec | 2010 - Mark Walker joins TIA Board of Directors
Walker and Associates celebrates 40 year anniversary
Walker recognized as Top 100 Broadband Company |
| 1997 - Walker signs a distribution contract with Telecom Solutions (Later Symmetricom, now Microsemi)
Walker signs a distribution agreement with Telco Systems
Walker upgrades to ERP system, PeopleSoft | 2011 - Walker earns Elite Partner status with Brocade |
| 1998 - Mark Walker announced as new President of Walker and Associates
Walker announces distribution contract with Emerson Network Power | 2012 - Walker earns Elite Partner status with Juniper Networks |
| 1999 - Walker recognized as one of NC’s fastest growing companies | 2014 - Retirement of Virginia Walker
Christie Brown named as new CEO |



Robust Competition Needed to Drive Continued Momentum in Wireless and Wireline Innovation

By Chip Pickering
CEO
COMPTTEL

It's a simple fact – competition drives innovation. And nowhere is this more evident than in the communications industry. More than three decades ago, COMPTTEL was founded on this premise, as a group of entrepreneurial companies banded together to challenge the status quo, and AT&T's monopoly position, in the long-distance market. From that point, in large part due to the passage of the Telecommunications Act of 1996 and the efforts of COMPTTEL's members, competition has spread throughout the entire communications market, driving the advances in communications services that we rely on today both at home and at work.

Over the course of the next two years, the Federal Communications Commission (FCC) and lawmakers on Capitol Hill will be addressing a number of issues that could potentially impact the competitiveness of our nation's communications industry. In addition to several proposed mergers, there are a number of other issues under consideration, including:

- **IP Technology Transition** – As the communications networks evolve from underlying time-division multiplex (TDM) technology to Internet protocol (IP), the FCC must reaffirm that the '96 Act's market-opening provisions apply on a technologically neutral basis. In so doing, it must make certain that large incumbents, such as AT&T and Verizon, continue to provide reasonable wholesale access and interconnection to their networks as they transition to IP.
- **Open Internet** – The FCC recently proposed new Open Internet rules to replace those struck down by the U.S. Court of Appeals in *Verizon v. FCC*. The FCC proposes to put more teeth in the network management transparency rule in an effort to ensure that both end users and edge providers have the information they need to evaluate an Internet service provider's (ISP) operating practices. There has been great debate about the FCC's proposal to reinstate the "anti-blocking" rule and how it should be implemented. Any new rules must continue to promote a free and open Internet and not discriminate technically against or impose new tolls on American businesses that use the Internet to deliver goods and services to their customers. Permitting such actions may create barriers to entry that would disrupt the economic activity and innovation that has come to rely on an open Internet, and would be especially harmful to small businesses and start-ups. To continue the Internet economic boom and promote business opportunities enabled by Internet innovation, the FCC must adopt open Internet rules that will protect against blocking, discrimination, access charges and paid prioritization.
- **Review of the Communications Act** – In the U.S. House of Representatives, the Energy and Commerce Committee has undertaken an examination of whether current



Chip Pickering is the CEO of COMPTTEL and a former six-term Congressman from Mississippi. During his time in Congress, he was vice chair of the House Energy & Commerce Committee and served as the founding chair of the bi-partisan Wireless and Internet Caucus. Prior to his election, Pickering worked for Sen. Trent Lott (R-Miss.) and served as a staff member on the Senate Commerce Committee, where he helped shape the Telecommunications Act of 1996. Because of his role in drafting the 1996 Act, he became well known as a Congressional leader on telecommunications issues.

communications laws need to be updated given the pace of technological change. Thus far, the hearings and white papers have addressed the broad themes of updating the Communications Act, spectrum policy and competition. Other topics, such as universal service and interconnection will be examined in the future. The Senate has not followed with its own review of the laws, but things may change if Republicans gain control of the Senate in the 2014 elections.

- Satellite Television Extension and Localism Act of 2010 (STELA) – STELA's provisions expire at the end of 2014, so its extension is a key piece of legislation that must be addressed this year. This law allows satellite providers to retransmit broadcast television content to their customers, and extending its provisions will ensure that consumers continue to have access to that content.
- Spectrum Incentive Auctions – Congress continues to maintain oversight over the FCC's implementation of laws passed in 2012 to authorize new incentive spectrum auctions, which are intended to free up existing low-band spectrum currently held by television broadcasters. In May, the FCC issued an order governing this auction that included competitive bidding rules that will ensure the largest wireless companies – which are also the largest incumbent wireline network owners – cannot dominate the auctions and entrench themselves more deeply in all aspects of communications services.

As policymakers and lawmakers continue to explore these topics and other communications-related issues, it is critical that future actions continue to promote competition. Concentration of power in the hands of a few companies, and lack of competition leads to a stagnant market and slower economic growth.

Look back only about 18 years to see how much innovation has taken place as a result of the competitive markets spurred by the '96 Act and spectrum auctions. Entrepreneurs and other companies have invested more than an estimated \$1 trillion to deploy fiber; bring broadband to homes, offices and even mobile phones; deliver new cutting-edge products and services; and improve the way all Americans can communicate.

Now is the time for policymakers and lawmakers to act wisely and support key principles that enable competition to continue to flourish. By doing so, they will ensure that the gains for consumers and the economy, including innovations in products, services and applications, will continue to multiply. Competition is the gateway to foster start-ups and entrepreneurs, and we need to encourage a market structure that supports this creativity, rather than falling prey to superficial plans and obfuscating arguments made by those companies that seek protectionist rules designed to preserve their market dominance.



Based in Washington, D.C., COMPTTEL is the leading industry association representing competitive communications service providers and their supplier partners.

Our members are catalysts for creating economic growth and improving the quality of life of all Americans through technological innovation, new services, affordable prices and greater choice. These entrepreneurial companies offer a wide array of broadband voice, video, Internet and data offerings, using both wireline (copper/fiber) and wireless networks to reach their customers. Among the state-of-the-art solutions they deliver are managed services, cloud computing and unique applications that are developed and deployed via next-generation, IP-based managed networks.

We advance our members' interests through twice-annual trade shows; networking opportunities; education; and policy advocacy before Congress, the Federal Communications Commission and the courts. Our core mission is designed to ensure that competitive communications providers can continue to offer value pricing, better service and greater innovation to consumers.

FCC Chairman Wheeler to Deliver Keynote Address at COMPTTEL PLUS Fall 2014 Convention & EXPO

Federal Communications Commission (FCC) Chairman Tom Wheeler will be the keynote speaker at the COMPTTEL PLUS Fall 2014 Convention & EXPO, which is scheduled for October 5 - 8 at the Gaylord Texan in Dallas. Chairman Wheeler is expected to address many of the key issues facing the communications industry today, including the ongoing technology transitions and use of IP networks, the importance of promoting competition across all platforms, the benefits of an open Internet and the need for greater spectrum to address consumers' growing demands for wireless broadband solutions.

Chairman Wheeler will deliver his keynote address at 10 a.m. on Monday, October 6.

"We are honored to have Chairman Wheeler join us at the COMPTTEL PLUS Fall convention and share his vision for the broadband communications marketplace," said Chip Pickering, CEO of COMPTTEL. "The Chairman's commitment to competition has been evident since day one. It is clear that he wants all consumers, including business and residential users, to benefit from innovative services and better value that results from robust, competitive markets. COMPTTEL supports the Chairman's goal to promote competition across all communications platforms. And as leaders driving the transition to IP networks, we are working to support the Commission's review of the legal and policy issues surrounding the ongoing technology transitions."

With more than three decades of telecommunications industry experience, Chairman Wheeler is an entrepreneur who started or helped start multiple companies offering innovative cable, wireless and video communications service. He became the 31st chairman of the FCC in November 2013. Prior to joining the FCC, he was managing director at Core Capital Partners, a venture capital firm investing in early stage Internet Protocol (IP) - based companies.

From 1992 to 2004, Chairman Wheeler served as president and CEO of the Cellular Telecommunications & Internet Association (CTIA). Prior to this, he was CEO of several high-tech companies, including the first company to offer high-speed delivery of data to home computers and the first digital video satellite service. He also was associated with the National Cable Television Association (NCTA) for eight years, serving as its president and CEO from 1979 to 1984.

The Network Edge - The Key to Mobile Bandwidth

By Kurt Raaflaub
Director, Global Product Marketing
Carrier Networks Division
ADTRAN



Kurt Raaflaub serves as ADTRAN's senior manager of carrier networks product marketing, and has more than 18 years' experience in telecom. Prior

to his current position within ADTRAN's Carrier Networks Division, he owned global responsibility for directing ADTRAN's Ethernet and optical solutions marketing activities. Some of these solutions include the delivery of business Ethernet services, LTE mobile backhaul and packet optical edge, middle-mile and metro networking. Additionally, Mr. Raaflaub has supported the market development and product management of the ADTRAN Carrier Ethernet solution suite which includes Ethernet service delivery over copper (EoCu), over TDM (EoTDM) or optical facilities (EoF) both point-to-point and ring-based (ERPS, SNCP). In 2006, he joined ADTRAN from Nortel where for over a decade, he held various roles focused on marketing/managing new disruptive market opportunities.

Mobile bandwidth is exploding. Just five years ago, mobile data traffic surpassed mobile voice traffic in the U.S. for the first time. Mobile data traffic increased by 81 percent in 2013, according to Cisco's Visual Networking Index (5/14). Video was a strong driver. Likewise, tablets showed a 52 percent increase and remain in the early stages of adoption. What does this say about the future? The demand for mobile bandwidth is still growing and operators have to find a way to meet the demand.

What's Driving the Demand?

According to Sandvine's "Global Internet Phenomena Report 1H2014", YouTube was the top driver on North American mobile networks with 17.6 percent of peak-period downstream bandwidth, followed by Facebook with 14 percent. Mobile providers are racing to roll out new services to meet the needs of their bandwidth-craving customers. One such example is Verizon's recent introduction of XLTE. This service promises to deliver double the 4GLTE bandwidth in cities coast to coast.

How to Meet the Need without Breaking the Bank

The technology necessary to address the mobile bandwidth explosion is available, but until now, has been limited to core and metro networks. Technologies like WDM, scalable Carrier Ethernet, OTN and ROADM have helped core and metro networks scale successfully, but they have never been adequately packaged to allow easy, cost-effective and seamless integration at the network edge.

These new, advanced optical technologies were introduced as part of expensive "big iron" solutions that require dedicated, large boxes to be deployed. This is reasonable at the network core, but this does not work in secondary and tertiary offices or hubs and street cabinets. The space, cost, power and complexity are simply too high at the edge.

Operators need an optical networking solution that is optimized for the edge and can be integrated into the access products they are already deploying. They are already deploying DSL and fiber-based access solutions like fiber-to-the-node (FTTN) and fiber-to-the-home (FTTH). They also need to deploy technologies like WDM, Carrier Ethernet and OTN to aggregate and transport both new and legacy services. A new, easy-to-deploy and cost-effective Ethernet and fiber-based network is required at the edge. Not only will this network have to serve very-high bandwidth, but it must also gracefully transition legacy services to the new optical and packet-based network. It requires a unique solution optimized for maximum scalability.

Taking It to the Edge

Leading providers, like ADTRAN, have begun to introduce solutions that address optimization at the edge. Optimizing the edge enables the rollout of new services with concern about capacity constraints. In addition, it also takes a load off of the core and metro layers, since the bandwidth is aggregated and groomed at the edge.



These solutions present a unique approach in that they combine legacy networks and services like SONET/SDH with advanced optical access services like Gigabit Ethernet, Active Ethernet and GPON, with technologies more commonly found in core networks such as DWDM, CWDM, Scalable Carrier Ethernet, OTN and ROADM. These advanced, edge-optimized solutions enable their deployment with less capital and only minimal training, thus further reducing the cost to the operator.

The optimum design combines the best-in-class Carrier Ethernet, edge-optimized and right-sized packet optical technologies to minimize service latency as well as support the rapid growth of LTE and next-generation services alongside legacy services. The mobile operator needs a solution with a service management ecosystem from which the operator can not only manage its network, but its customers' SLA expectations.

Therefore, the mobile backhaul solution should consist of an aggregation component that either resides in the mobile telephone switching center, and/or a hub site, and a cell site gateway component for the service delivery. At the cell site a high performance termination device is needed to deliver an intelligent QoS based Ethernet service.

Service Separation Approach is Key

Emerging applications, such as LTE-Advanced, high capacity video and cloud services are pushing packet optical technologies deeper into the access network

to meet the mounting packet capacity requirements. The target solution provides the capacity upgrades desperately required at the edge of the network by integrating key packet optical technologies into a single, common access and aggregation platform. This enables service providers to quickly and cost-effectively handle the network impact of future gigabit and 10G services growth. The primary features required in this scenario include:

- Expanded premium services scalability including support for the rollout of 10Gbps enterprise and datacenter services and 1Gbps 4G/LTE mobile backhaul services.
- Reduced time-to-revenue via the increased network simplicity gained from the support of end-to-end multi-ring, mesh and subtended 10GE access rings topologies.
- Increased quality of experience via reduced network latency and integrated advanced service level assurance (SLA) and services management toolset.

The ideal architecture must effectively address residential, business, mobile backhaul and middle mile markets with a single solution. In the past, parallel packet networks or circuit-based SONET networks would be constructed at great cost to ensure each new service did not impact the quality of another. However, new solutions are now available that meet the needs of a multi-access, next-generation LTE network. These combine both wavelength and Ethernet switching separation with a web-based SLA moni-

toring tool and cell-optimized wavelength service capabilities so that each type of traffic can be guaranteed and provisioned as needed over the same network infrastructure.

Taking a service separation approach can deliver scalable reliability. Service providers are successfully providing multiple dedicated mobile backhaul "circuits". This architecture not only meets today's strict mobile backhaul service level agreements, it also affords the service provider unprecedented hierarchical quality of service mechanisms and services scale providing quality-assurance regardless of the amount of future services growth.

A Final Word

The bandwidth explosion is here to stay, or so it appears. The main challenges for mobile backhaul will be how to provide cost-effective and resilient scalability while supporting growing demand for bandwidth driven by video. Additionally, extending network capacity and coverage through small cell deployment will be a big theme for 2014 and beyond. The solution to meeting this demand is at the edge. Similar to ADSL, TDM and SONET technologies, which were launched at the core and then adapted for the edge, the time has now come to migrate WDM, Carrier Ethernet, OTN, ROADMs and other high-performance optical services to the edge of the network and integrate them with SONET, DSL, Carrier Ethernet, GPON and other access solutions. This evolution will enable operators to manage the bandwidth explosion at the source both rapidly and cost effectively.

Access to Spectrum is Key to Deploying Advanced Mobile Technologies

By Steven K. Berry
President & CEO

CCA – The Competitive Carriers Association

Every carrier, whether large or small, must have a plan for expanding 4G/LTE services and deploying advanced mobile technologies. Consumers expect the best, most-advanced services possible, and carriers must keep up with consumer demand for ubiquitous, high-speed mobile broadband. Representing over 100 wireless carriers throughout the U.S., CCA (Competitive Carriers Association) members are focused on consumer satisfaction and must have access to critical inputs to compete and thrive in an industry dominated by two national carriers.

Spectrum is without question one of the most critical inputs. Because of its importance, carriers have been and are focused on supporting a competitive framework for the upcoming 600 MHz incentive auction, scheduled to take place in mid-2015. This auction is especially important to carriers

because of the superior propagation characteristics of the limited low-band spectrum being auctioned and because the 600 MHz ecosystem will be a critical part of the foundation of these new high speed mobile broadband capabilities. It is a proven fact of physics – low-band spectrum travels further in rural areas and penetrates buildings more deeply. Every carrier wants access to this unique limited resource to build out their networks and reach the advanced mobile technologies that consumers demand – and this may be the last chance to access low-band spectrum at auction.

During the Federal Communications Commission's (FCC or Commission) May Open Meeting this year, the Commission adopted structural rules for the incentive auction that lay the foundation of the auction. FCC Chairman Tom Wheeler has, time and again, stated the importance of competition in the industry. CCA is particularly pleased that the FCC followed through by adopting rules that help promote competition among all participants, but in particular rural carriers, who lack the enormous financial resources of the largest national carriers.

The Commission's incentive rules include three important elements that benefit competitive carriers and will help ensure smaller carriers have meaningful opportunity to participate in and bid on much-needed low-band spectrum. First, the FCC adopted spectrum aggregation limits through a spectrum reserve to ensure no one or two carriers will be able to buy the entire lot. This is huge for competition! Once a certain revenue threshold has been met, up to 30 MHz will be reserved for non-dominant carrier bids. Giving competitive carriers the assurance that they will have a real opportunity to bid on and win spectrum will encourage broader participation; a result everyone wants.

Secondly, all competitive carriers will be allowed to bid on reserve spectrum. The largest two carriers possess vast national market power, and with enormous resources, could easily out-bid smaller carriers. More competitors in a market means better prices and more choices for con-



Competitive Carriers Association
Rural • Regional • Nationwide®



sumers, and the FCC should be commended for recognizing the competitive benefits of low-band spectrum, especially for smaller non-dominate carriers, and the importance of providing choices for consumers.

Finally, the FCC adopted smaller geographic license sizes, using the CCA-led compromise proposal for Partial Economic Areas (PEAs). This will enable competitive carriers to bid on license sizes that make good business sense for their companies. The FCC originally proposed licensing the spectrum in Economic Areas (EAs), which are much too large and essentially would have eliminated smaller carriers' abilities to participate. For example, utilizing EAs, a rural carrier in New Hampshire would have had to bid on a license that included the metropolitan Boston area – this shows how EAs include markets where the rural carrier may not serve and never intend to serve, making them prohibitively expensive. The FCC's decision to utilize PEAs will help retain the benefits of smaller license areas, which are critically important for smaller rural and regional carriers, while allowing aggregate bids for desired areas to truly raise market-based revenue totals.

While the FCC's rules are a positive step forward for competitive carriers, there is still work to be done. AT&T and Verizon still own the lions' share of low-band spectrum and will continue to do everything in their power to acquire more low-band spectrum. CCA does not want the largest carriers' desire to come at the cost of competition harming consumers, public safety and the economy. Competitive carriers are focused on satisfying their customers; they are community-based, locally-owned businesses that deserve the chance to fight and compete on a fair playing field against the largest companies. Spectrum is the most critical element that will allow carriers to provide the latest, most advanced services possible, and CCA will continue to work with policymakers in Washington to ensure all competitive carriers can grow and thrive in the industry and continue to do what they do best – service customers and expand mobile broadband.



Steven K. Berry serves as President and CEO of the Competitive Carriers Association (CCA), the voice of competitive wireless telecommunications providers. With over 100 carrier and over 160 vendor/supplier members serving

more than 95 percent of the U.S. and its territories, CCA speaks with a strong, united voice on issues that impact those providing wireless communications in regional, remote, and hard-to-reach areas and the communities they serve.

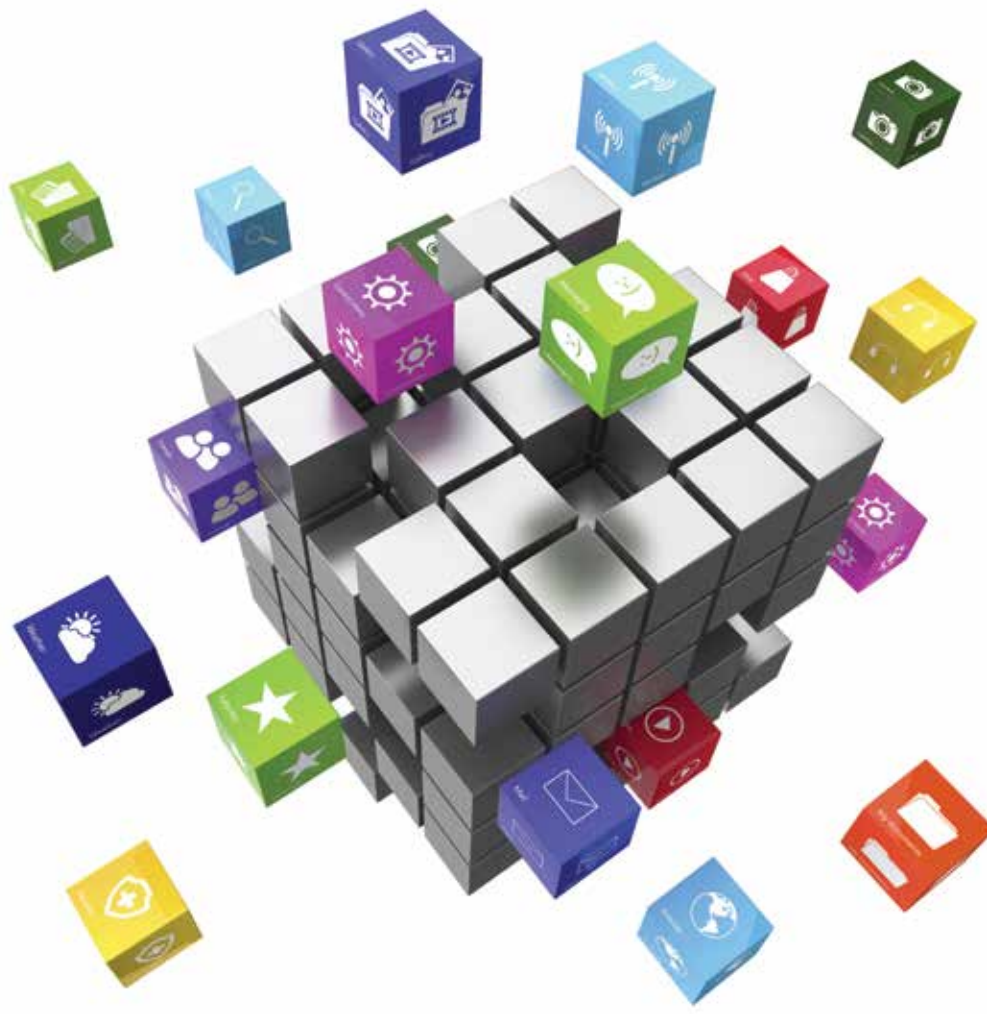
Berry began his government career as Associate Counsel on the House Agriculture Committee, and later became Chief of Staff to the Ranking Member of the Agriculture Committee. He went on to serve in many

key positions - both on and off Capitol Hill - during his government career, including as Republican Counsel for the House Permanent Select Committee on Intelligence, Republican Chief of Staff for the House Foreign Affairs Committee, Assistant Secretary of State for Legislative Affairs for the U.S. Department of State, and Chief Counsel and Director of International Operations and European Affairs for the Senate Foreign Relations Committee.

Berry, a member of the Virginia bar, holds a bachelor's degree from Emory and Henry College, and a juris doctorate from George Mason University Law School.

You can reach Steve at (800) 722-1872 or president@cca-usa.org.

“ . . . this may be the last chance to access low-band spectrum at auction.”



Grow Revenue by Expanding Coverage

By Ray Savich
Marketing Manager
Cambium Networks

OVERVIEW

Big Bend Telephone (BBT) is a family-owned, independent telephone company located in Alpine, Texas that provides telephone service and high speed broadband to subscribers spread over approximately 18,000 square miles in the Big Bend region of Texas. BBTC utilizes the most cost-effective strategies, equipment, and technology to provide voice and broadband service to this rugged terrain. Due to its massive size, low density, topography, and geological characteristics, service to this area poses many unique challenges not found in other parts of the state.

In business since 1960, BBT takes pride in the quality of services they provide to all of their customers. Today, customers want streaming video and VoIP in addition to data transfer. Broadband is popular with business and residential customers, and tiered service offerings have driven upgrades in the fiber and copper network to meet demand.

CHALLENGE

BBTC utilizes the most cost-effective strategies, equipment, and technology to provide voice and broadband service to this rugged terrain. Due to its massive size, low density, topography, and geological characteristics, service to this area poses many unique challenges not found

PROFILE

BIG BEND TELEPHONE (BBT)
Established Service Provider in Texas with 5,000 business and residential customers.

CHALLENGE

Due to its massive size, low density, topography, and geological characteristics, service to this area poses many unique challenges not found in other parts of the state.

SOLUTION

- Point to point licensed and unlicensed wireless backhaul to transport broadband to an unserved area
- Point to multipoint (PMP) fixed wireless broadband access network to distribute connectivity.

in other parts of the state.

REQUIREMENTS

To offer one consistent service offering to all of their customers regardless of the technology, BBT needed the wireless solution to provide performance that is consistent or better than the performance of their fiber or DSL solutions. The wireless solution needed to provide:

- High throughput to support 3, 6, and 12 Mbps downstream, and up to 3 Mbps upstream throughput
- Low 5 msec latency so that video and voice services are consistently clear
- High reliability to perform even in harsh summer or storm conditions

In short, BBT needed a solution that enables them to sell the same services to the customer regardless of the transport technology.

SOLUTION

BBT uses Cambium Networks products

Why BBT chose Cambium Networks:

- High Throughput – with up to 300 Mbps for high speed backhaul, and 125 Mbps from an Access Point.
- Scalability – GPS synchronization reduces access network self-interference and enables frequency re-use in selected areas.
- High Reliability – maximizes customer satisfaction, reduces system down time, and reduces maintenance costs.
- Low Latency – for clear transmission on sensitive VoIP and streaming video applications.
- Proven Performance – to provide data transfer, VoIP services and streaming video services.
- Easy Installation – for rapid and cost effective deployment.

to reach even the most remote subscribers with equivalent or better broadband speeds than they offer from their fiber/DSL network at a fraction of the cost equipment and installation of wired technology.

Their solution includes:

1. Backhaul
 - Licensed PTP 800 microwave links that operate in the 6 – 38 GHz bands with Line of Sight (LOS) connectivity.
 - Unlicensed PTP 600 links operating in the 5 GHz band that provide up to 300 Mbps of connectivity in LOS, near Line of Sight (nLOS) and non-Line of Sight (NLOS) conditions.
2. Access
 - Unlicensed 5 GHz PMP 450 access networks that provide up to 125 Mbps of throughput with low latency needed to support sensitive video and voice services.
 - An Outdoor Residential Gateway from Thinroute Technologies to provide power and the Analog Telephone Adapter (ATA) device to support VoIP services and battery backup.

RESULTS

BBT used Cambium's LINKPlanner software to design the network backhaul infrastructure. This provided a detailed prediction of the performance of the licensed and unlicensed links using coordinates of the source and destination points. LINKPlanner identified obstacles and factored in terrain conditions to provide a view of the path and performance of the RF propagation.

The wireless access network was installed quickly, and performed well from day one. "We have one PMP 450 shot that



"We have hung our hat on being innovative and creative. We are not afraid of finding a new way to do things. You can't solve problems if you are locked onto a particular discipline of thought."

- Rusty Moore, GM and COO of Big Bend Telephone

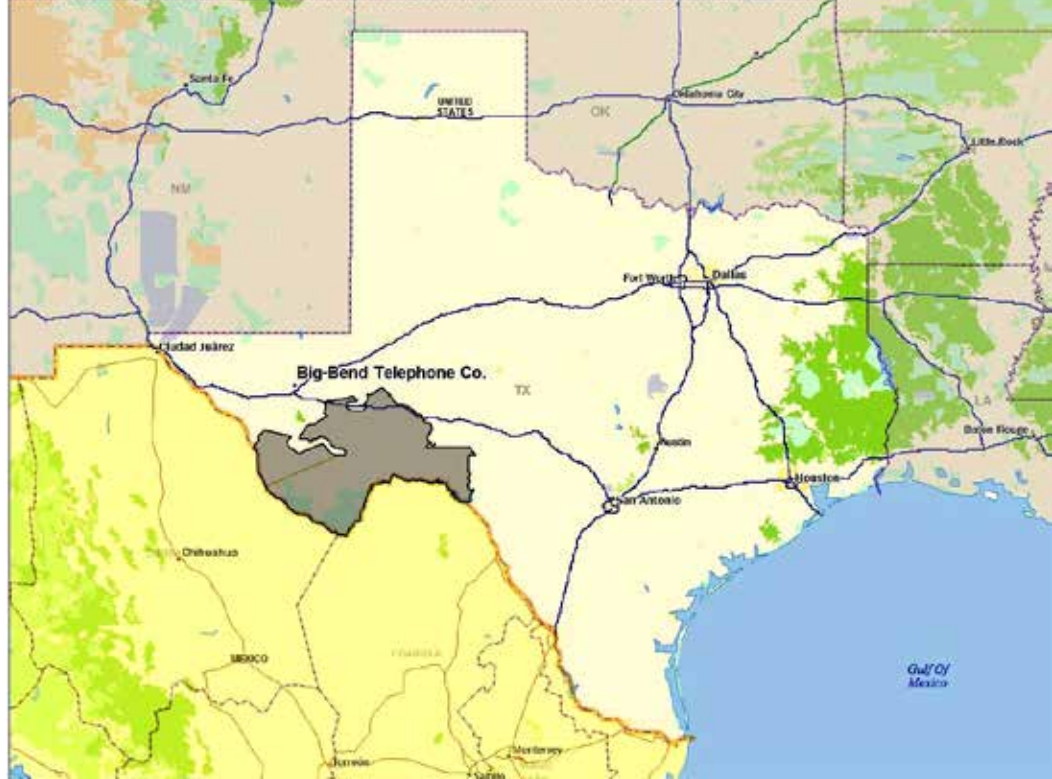
extends 23 miles. That is not the usual, but it is fairly common to have connectivity out to 18 miles."

Customer satisfaction remains high. Network wide, 93% of their customers in the town of McCamey have signed up for the highest speed tier broadband plan which offers 12 Mbps of download speed, and half of the customers in the town of Alpine are receiving their 12 Mbps via the wireless network. Pat Seawell, a professor at Sul Ross State University says, "As an instructor who has been teaching online courses at SRSU for several years, BBT's wireless broadband service has been invaluable. I live outside the city and, prior to acquiring BBT's wireless broadband service, teaching my online classes from home was not possible. Now I can connect to my courses and reach my students from home anytime night or day without disruption."

As more customers leave cable and stream video over broadband, BBT is providing a clean streaming service that works consistently with no buffering.

EXPANDING OUT OF REGION

Having proven wireless broadband technology within their certificated area, BBT seized the opportunity to expand beyond its traditional service area. BBT has broadened their business plan by launching a Fixed Wireless Broadband offering to create a competitive high speed broadband offering for to the subscribers of the neighboring incumbents, basically any underserved area that touched their network. In recent months, they have won over 1,000 new customers by offering services that are superior in



BBT Coverage Area

bandwidth to the DSL offering of the incumbent. They have also updated their service offerings to include streaming video, VoIP and cloud services.

success is to extend our reach to underserved areas outside of our certificated area."

NEXT STEPS

Cambium's products provide BBT with a carrier class, cost effective option to support both their remote in-region and out-of-region subscribers and provides a new and growing business by expanding out of their traditional wired footprint.

As is the case in any network deployment, out of region builds must provide a positive ROI, independent of any government funding support. Fixed Wireless Broadband has proven to meet BBT's business goals for out of region expansion.



Thinroute Residential Gateway for VoIP Services



Tower with backhaul and Access Points



Subscriber Module at Customer Location

Understanding the FCC's Innovation Band: Unlocking "Vast New Opportunities"



By Grant Seiffert
President
Telecommunications Industry Association (TIA)

As president of DC-based TIA, Grant Seiffert oversees all facets of the leading international association representing the manufacturers and suppliers of global networks.

Seiffert joined TIA in 1996 as director of government relations. His main priority was the representation of the equipment industry's interests, particularly regarding competitive issues during implementation of the Telecommunications Act of 1996 by the Federal Communications Commission (FCC). He was promoted to vice president in 1998, directing domestic and global policy to help the association's supplier members gain marketing opportunities around the world. In that role, he oversaw policy, including interaction with the U.S. Congress, the FCC and the Administration, as well as with international regulatory bodies and government leaders and fulfilling the senior management role for association membership and TIA trade-shows.

Seiffert serves on the Executive Committee of Connected Nation, the American National Standards Institute's (ANSI) CEO Advisory Committee, and the Board of Directors of the Sustainable Technology Environments Program (STEP).

Seiffert serves on the Executive Committee of Connected Nation, the American National Standards Institute's (ANSI) CEO Advisory Committee, and the Board of Directors of the Sustainable Technology Environments Program (STEP).

He holds a Bachelor of Science degree in political science from Radford University. He and his wife, daughter and two sons reside in Mt. Vernon, Virginia.



***"... we should not flinch from the opportunity simply because it is not standard operating procedure."
- FCC Chairman, Tom Wheeler***

The ICT industry is all about connection. And prompted by an august panel of White House advisors, the FCC has designed a massive, highly interconnected, "Innovation Band" at 3.5 GHz. This spectrum will be used for small-cell backhaul, Internet of Things, and other uses yet to be discovered. It will be managed through a network-intensive approach of a type never before implemented.

FCC Chairman Tom Wheeler wrote that "This proposal could unlock vast new opportunities for wireless - in huge verticals like energy, healthcare, and financial services. ...We should not flinch from the opportunity simply because it is not standard operating procedure."

The regulatory framework for this band is highly unusual - and on a fast track. After receiving hundreds of formal comments and hosting two public workshops on the subject, the FCC in late April 2014 released the second of two sets of proposed rules for what it calls the Citizens Broadband Radio Service (CBRS), to be allocated 3550-3650 MHz and possibly additional spectrum just above 3650 MHz [FCC 14-49, GN Docket 12-354].

Glimpse into the future

FCC Commissioner Jessica Rosenworcel called this band "a glimpse into the future of spectrum policy," while her colleague Commissioner Michael O'Rielly described it as "one big experiment in terms of the proposed sharing design and licensing scheme. ...It is ideal for placement of small cells which are helping carriers manage network congestion as data use increases exponentially every year."

Recent research underscores this demand. A November 2013 report of the National Science Foundation (NSF) expects that the number of wireless devices per person will grow tremendously, soon to reach 1.5 devices per person on average in the world, and later to reach ten or even 100

devices per person: "Wireless networks will increasingly be used locally, e.g. intra-building, intra-vehicle, inter-vehicle, and personal body-area networks. ...Sensors in such systems will generate massive data inflows, and will produce as much if not more data and network traffic than the World Wide Web," NSF scientists predicted. "This will reverse current loads, where most data is produced in the cloud and consumed at the edge." [Final Report, NSF Workshop on Future Directions in Wireless Networking, Arlington VA, November 2013]

TIA's 2014 ICT Market Review and Forecast predicts that by 2017, wireless data will comprise 60 percent of subscriber spending. Driven principally by growth in ARPU, total spending on wireless services will expand at a projected 6.9 percent compound annual rate to \$263 billion in 2017 from \$201 billion in 2013.

Protecting incumbents, introducing new players

The FCC proposes to meet this demand not by merely allocating spectrum and auctioning it away to a handful of large carriers. Instead, the CBRS will mix together -- in the same 3.5 GHz band -- incumbent defense radars, satellite and fixed service links; new licensed service providers; general public users, and a category of protected, indoor and institutional users.

The CBRS proposal is modeled on recommendations of the PCAST, the President's Council of Advisors on Science and Technology. Its July 2012 report, *Realizing the Full Potential of Government-held Spectrum to Spur Economic Growth*, argued firmly that turning over more federal spectrum to the private sector would be a costly and unsustainable way to meet the growing needs of the wireless industry.

Spectrum cleared of incumbent users will always be the more straightforward and reliable approach to launching a new service. On this point, PCAST diverted from the views of some in the industry, when the council insisted that the future of spectrum must entail more sharing between the private and public sectors. To facilitate such sharing, the PCAST proposed a novel "information and control clearinghouse" known as a Spectrum Access System (SAS).

Instead of fixed, FCC-assigned frequencies, SAS administrators would direct users to available channels on request. In joint comments to the FCC, AT&T and Google described SAS as "a new iteration

of database technology administered by commercial entities." FCC Chairman Tom Wheeler called the SAS a "traffic cop for spectrum."

Industry standards needed

With regard to the SAS, the FCC said, "We expect that industry participants will take it upon themselves to develop technical implementations of these requirements and, where applicable, to develop industry-wide standards." The Commission will institute a comprehensive process to test, certify and approve SAS administrators.

The SAS would manage frequencies in real time, protecting incumbent operators from interference while enabling potentially tens of thousands of license holders to serve customers on channels based on local usage conditions. These entities, known as Priority Access Licensees (PAL), would bid for licenses that would last one year and cover 10 MHz. These license duration and bandwidth limits, however, are under debate and could change in the FCC's final rules. Applicants could aggregate licenses for longer periods, additional channels or larger coverage areas; and could bid repeatedly for licenses in annual auctions.

General users must register

Besides PAL, the FCC introduced another tier of user: the General Authorized Access (GAA) operator. GAAs could use the CBRS on a so-called "license-by-rule" basis, as no license documents are issued and operation is, for practical purposes, unlicensed. GAA users would be required to use only FCC-approved equipment and must register with the SAS. "Devices operating on a GAA basis would be required to provide the SAS with all information required by the rules -- including operator identification, device identification, and geo-location information -- upon initial registration ... GAA users would also be required to comply with the instructions of the SAS and avoid causing harmful interference to Priority Access Licensees and Incumbent Access tier users," the FCC said.

GAA users would have access to PAL channels at such locations and times where PAL is not using them -- another controversial aspect of the proposal. In formal comments, TIA told the FCC that "more clarification is required regarding the extent to which a PAL approach would permit underutilized spectrum to be employed for unlicensed uses. For example, a key question is, how would Priority Access Licenses co-exist with microcell solutions using unlicensed spectrum within a

building or operating at short distances." A further tier of user, the Contained Access User (CAU), could reserve spectrum for Wi-Fi type use in indoor facilities. The CAU scheme would permit such users as hospitals, public safety organizations and local governments to request up to 20 MHz of reserved frequencies from the GAA pool for indoor use within their facilities. These frequencies could be used only for private internal radio services and could not be made available to the general public.

Elephant in the room

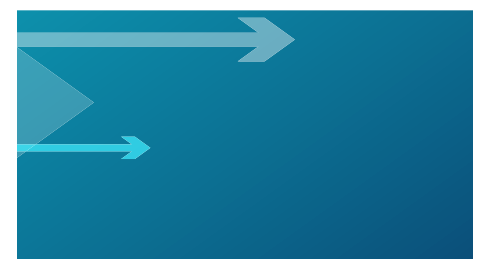
The "elephant in the room" in CBRS remains the substantial deployment of incumbent users, especially defense radars along the coasts. Interference protection areas around these existing users, known as exclusion zones, would cover approximately 60% of the U.S. population and would make the CBRS unavailable to conventional wireless infrastructure in those areas.

However, the FCC noted, "these very disadvantages could be turned into advantages if the band were used to explore spectrum sharing and small cell innovation." Technical approaches to reducing or even eliminating the exclusion zones could include beacons that would inform the SAS of incumbent operations.

At this writing, interested parties are preparing their latest round of filings in the FCC Further Notice on CBRS. These comments are due July 14, 2014, with reply comments due August 1, 2014.

Major ICT players signaled their interest at earlier stages of this proceeding. In addition to AT&T and Google already mentioned, companies presenting at FCC-sponsored CBRS workshops included Alcatel-Lucent, BAE Systems, Cisco, Iconnectiv, Intel, Motorola, Nokia, Qualcomm, Skype, T-Mobile, Verizon and others.

At TIA we believe that our consultative process, informed by our participants in standards development, continues to serve as a center of industry consensus. The innovations needed to put this Innovation Band to work must come from researchers' labs, from the boardrooms of carriers and suppliers and from the imaginations of ICT entrepreneurs. Government has marked this path - it is up to us to travel it.



Skinny Wire Partnering With Fall Events

By Randy Turner
Director, Marketing Communications
Walker and Associates

Skinny Wire will join CCA's Annual Conference and Expo as a Media Sponsor in Las Vegas, NV during September's Super Mobility Week. In addition, the publication is a Media Sponsor at COMPTTEL PLUS Fall, scheduled for October in Dallas, TX. Both of these events will feature FCC Chairman Tom Wheeler as a keynote speaker. Additional educational content will cover a broad spectrum of current issues for the industry. Skinny Wire is pleased to partner with these two important national events.

Since 2007 Skinny Wire has connected its readers with content that informs, educates and connects readers with resources and news that help network professionals. Contributors from a broad range of the Information Communications

Technology (ICT) industry have shaped Skinny Wire into a widely recognized publication that connects with customers of Walker and Associates and other industry players. Contributions from association leaders provide an opportunity to read a variety of points of view in one publication. The equipment manufacturing community has been an avid supporter of Skinny Wire through advertising programs and content submission. Collectively, this all seems to resonate with our subscribers.

Your readership is important to us, and we want to hear from you on topics you would like included in upcoming issues. Skinny Wire accepts non-solicited articles so we welcome new contributors, whose content may be used based on editorial review. You may also contact us if you are interested in advertising in upcoming issues (based on availability and editorial approval). We encourage you to connect with us at SWEditor@walkerfirst.com. Let us know what you think!



Skinny Wire

High-Power DAS in High-Rise Buildings



By Jason Engler
Marketing Manager,
In-building
TE Connectivity

Mobile subscribers in high-rise buildings expect clear and consistent services wherever they are, but the nature of high-rise buildings and wireless service poses several challenges. By using high-power distributed antenna systems (DAS), mobile operators and building owners can overcome these challenges.

There are four key challenges in delivering seamless wireless services in high-rise buildings, and DAS overcomes them in the following ways.

Subscriber Density – The high numbers of subscribers within buildings places an excessive burden on the macro network, reducing capacity for subscribers outside the building. High-power DAS provides coverage and distribute dedicated capacity from the baseband radios throughout the building. A high-power DAS system

with 20 watts or more of power provides strong enough signal to drive multiple antennas over multiple floors, thus reducing the number of active elements.

Signal Dominance – High-rise buildings experience interference from nearby macro cell sites, which causes subscriber phones to hunt between signals. Constant hunting reduces the mobile device battery life and reduces quality of service for the mobile subscriber. Because high-power systems put out a lot of power, they can easily produce a dominant signal that will overcome any signals coming in from the outdoor macro networks. User devices have one strong signal to receive, and so they don't hunt unnecessarily.

Access – Mobile operators deploying DAS in high-rise buildings must contend with problems accessing the equipment for maintenance and during deployment. Depending on the building tenant, it can take days or weeks to gain access to a needed area. While low-power DAS systems often use active electronics in building ceilings, high-power DAS systems have active elements only in building

basements and wiring closets. From each wiring closet, a remote radio head drives coaxial cabling and passive antennas located in the ceilings. Since the equipment in the ceilings is passive it requires no maintenance and therefore eliminates the need for access in private offices.

Neutral Host Capabilities – Major mobile operators may want to deploy a neutral host wireless system to which other mobile operators can lease access. The challenge is that many solutions don't support additional operators without expensive and inconvenient forklift upgrades to the equipment. An advanced high-power DAS system will support up to eight frequencies or services with one set of remote radio heads. This means that the neutral host can add frequencies as other mobile operators sign onto the system without forklift upgrades of the equipment.

So while high-rise buildings pose challenges to mobile service, the right high-power DAS system can overcome them and present a positive business case for building owners and mobile operators.

Developing Your Hybrid Data Center Infrastructure

By Jim Morin
Enterprise and Channel Marketing
Ciena

Building a 21st Century Platform for integrating your data center and cloud environment often starts with a focus on cloud infrastructure services designed specifically for the customer. These new hybrid cloud resources often need to be integrated with existing infrastructure and applications.

Here are some things to consider for this strategy.

Build a seamless hybrid cloud architecture

The distinction between public, private and hybrid clouds will become driven more by the Service Level Agreement (SLA) than by the service name. The success or failure in building a seamless hybrid cloud architecture will be measured by how key SLA parameters, such as high levels of performance, security and reliability, are delivered.

Think about your platform

Platform could mean several things in a cloud context: physical infrastructure, virtualization software, cloud operating system or even migration and runtime management tools. Develop a consistent platform between core data centers and your hybrid and public clouds. Consistency benefits include less time spent on modifying applications when changing platforms, more consistent API interfaces for less programming changes and simplified management.

Application requirements drive the cloud model

The application requirements drive the appropriate environment. For example, some applications can operate perfectly well in a total public cloud environment where the physical location of the virtual machine and storage is unknown. Other applications may have a regulatory compliance or operational requirements where the physical location must be known.

Understand the effects of latency on your applications

Latency can affect the performance of cloud applications. There are two components of latency to consider: The first is latency due to distance, which is about 1 millisecond round trip per 100 miles.

If this is the major contributor, move the cloud application to a data center location nearer the user. The second factor affecting latency is too much network congestion causing application performance delays. In this case we might be asking the IP network to do too many things as it is overloaded with data, VOIP, streaming video and other applications.

Alternative technologies include Carrier Ethernet, enabling scalable bandwidth to avoid congestion, ranging from Megabits to 10 Gbps. Packet optical networks can also be built using WDM equipment that enables scaling to multi-terabit transport networks.

Consider both local and national providers

The cloud market is evolving into a multi-provider environment providing access to both local and global providers because enterprises have different business and application requirements.

In summary, cloud services are only as good as the network that supports them.



Jim is an advocate for cloud networking and Ciena's cloud backbone strategy. He is focused on the rapidly growing inter-data center, cloud and network virtualization opportunities which are defining "the new service provider" business segment and a "data center without walls" operation.

AnyCell™ Connectivity

Backhaul and Fronthaul Efficiency for Radio Access Networks

By Michael Ritter
Senior Director Technical Marketing and Analyst Relations
ADVA Optical Networking

Mobile network operators face the continuing challenge of building networks that effectively accommodate high data growth rates. Mobility and an increased level of multimedia content require end-to-end network adaptations that support both new services and the increased demand for broadband and flat-rate Internet access. To support the expected data growth, the 3rd Generation Partnership Project (3GPP) has developed radio interface standards that balance the limited availability of new spectrum, leverage existing spectrum and ensure efficient operation. Small cell technology has evolved to become a revolutionary force in the formation of public wireless networks. In parallel, centralized baseband unit architectures have been developed to provide a flexible, cost-effective and more scalable modular environment for managing the radio access evolution.

Scalable Mobile Backhaul for 4G

Packet-based mobile backhaul is at the heart of the fixed network infrastructure deployed to interconnect base stations and the mobile core. Carrier Ethernet-centric network infrastructure has

evolved to support the complete set of 2G, 3G and 4G radio access technologies and enables operators to deliver performance assured services following the Carrier Ethernet 2.0 recommendation developed by the Metro Ethernet Forum (MEF). Both self-provided mobile backhaul as well as backhaul services offered by incumbent operators and alternative access providers are widely deployed.

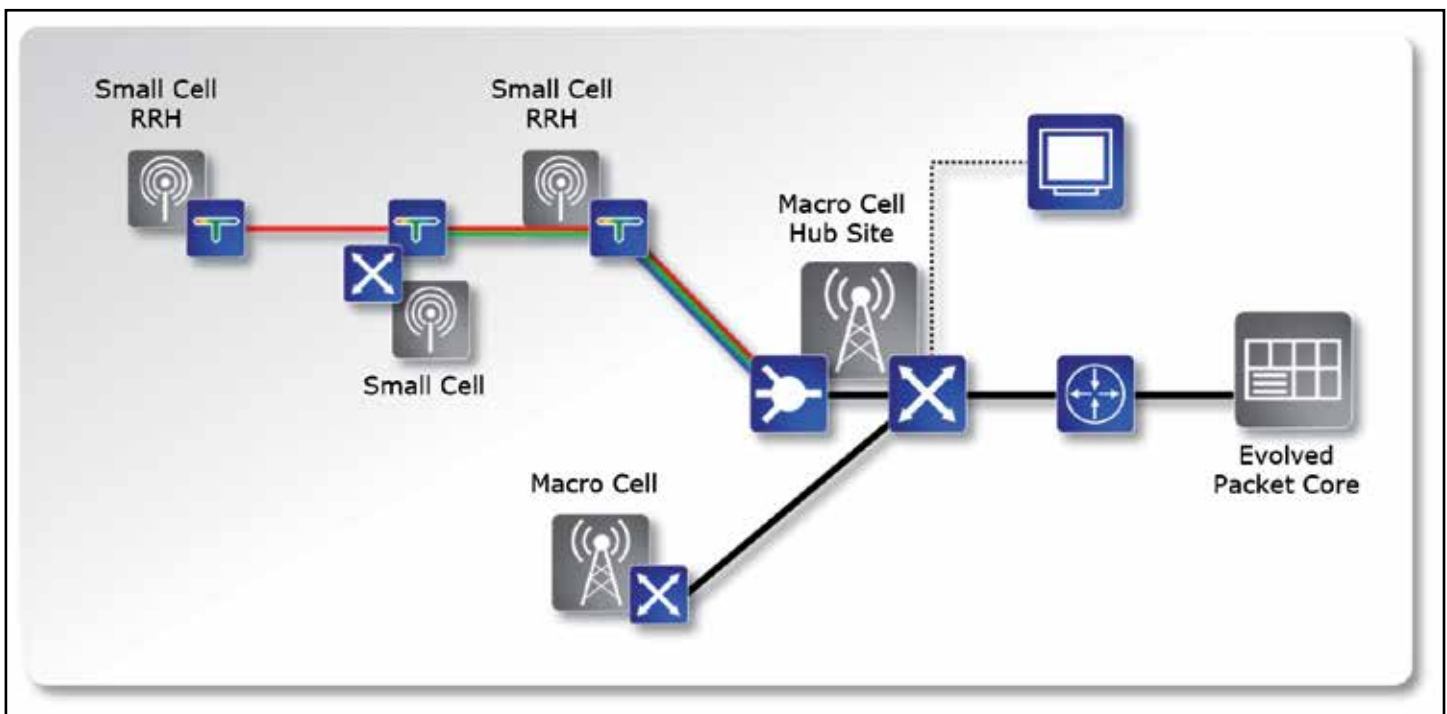
Keeping Radio Base Stations in Phase

Deploying a large number of public access small cells overlaying the macro cell layer can create significant interference across the radio spectrum. Adaptive power and frequency coordination schemes such as Enhanced Inter-Cell Interference Coordination (eICIC) and Coordinated Multipoint (CoMP) transmission are mandatory to limit interference, increase network efficiency and improve mobile user experience. Efficient interference coordination requires base station clocks to operate in phase, an attribute that is also mandatory when introducing Time Division LTE (TD-LTE) operation for dynamically adapting the up- and down-link capacity ratio. Distributing synchroni-

zation information inherently across the backhaul network is the preferred solution for most operators.

Flexible Fronthaul for 4G and Beyond

The Common Public Radio Interface (CPRI) standard introduces an interface separating the Base Band Unit (BBU) of a base station from the Remote Radio Head (RRH) utilizing optical fiber. CPRI defines a digitized radio interface and operates at data rates between 600 Mbit/s and 10 Gbit/s, which mandates optical fiber. The network infrastructure interconnecting RRHs with the corresponding pool of BBUs is commonly referred to as a fronthaul network. Pooling BBUs and distributing RRHs greatly helps mobile operators to resolve cost, performance and efficiency challenges when deploying new base stations on the road to fully developed 4G networks. Even though benefits are significant, many mobile network operators are aiming for combined deployment of conventional base stations and RRHs. This strategy drives the need for integrating backhaul and fronthaul technology into an overall connectivity solution.



AnyCell™ Connectivity is a blueprint for the mobile industry that offers a direct migration path from current radio access network (RAN) infrastructures to high-performance mobile broadband networks. AnyCell™ Connectivity is based around three elements: performance-assured Carrier Ethernet backhaul, precise time and phase synchronization and managed optical fronthaul, using wavelength division multiplexing (WDM) technology. For more information, go to <http://walkerfirst.com/manufacture/adva-optical-networking/>.

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Configurations: Rack Mount

DC UPS

Voltage/Power Range

12,24 VDC Input / Output 5-20 amps

Configurations: Mobile Mount

Battery Chargers

Voltage/Power Range

120/240 VAC Input, 12,24,110 VDC Output

Configurations: Wall Mount, Mobile Mount

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Remote Control of DC and AC Equipment



Hot Swap Rectifiers



Power Modules



Power Management



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Power Plants



Inverters



Inverter-Chargers



DC Distribution Panels



Battery Chargers



DC UPS



Site Monitor & Control

For more information, contact your Walker and Associates representative or visit walkerfirst.com

Combining Connectivity and Power in Small Cell Deployments

By Ryan Chappell
Business Development Manager
TE Connectivity



Small cell deployments are allowing service providers to satisfy the demand for greater high-performance broadband connectivity in harder-to-reach locations – and the challenges can be considerable. Some of the obstacles include backhaul, spectrum management and radio access integration (RAN). However, before some of these other challenges can even be addressed, there is often the “simple” problem of electrical power.

Every small cell or distributed antenna system (DAS) requires power, and arranging access to power has become a major issue in many small cell deployments. A small cell deployment typically starts with selecting the placement location, running fiber to the location, mounting the small cell and plugging it all together. But what about power? Access to electrical power must be arranged with building owners and utility companies – not always a trivial matter, as many service providers have discovered.

For example, one major South Korean carrier is supplementing its 4G services in Seoul with small cell deployment. Fiber isn't the problem – South Korea has one of the most ubiquitous FTTH deployments in the world with plenty of available optical fiber. Instead, the biggest deployment snag has come from negotiating for power access, which is driving up costs in terms of time delays and additional power meter installations. When

time is money, access to power is a stumbling block that service providers need to avoid in deploying small cell devices.

Power in the fiber

The solution to streamlining small cell deployments while removing the power challenge from the equation is an innovation that incorporates power and optical fiber into a single hybrid cable. These cables combine a singlemode or multimode fiber cable and a copper power cable together into one system. In fact, plugin electrical connectors can also be incorporated to eliminate the need for electricians during installations.

Each powered fiber cable is capable of powering a 25-watt device to a distance of one kilometer, providing longer reach than standard power-over-Ethernet systems. A remote powering unit can also correct for DC line loss, eliminating the need for electrical design calculations. Some early estimates are indicating that a powered fiber cable system can lower up-front planning and engineering time by more than 50 percent in many small cell deployments.

But perhaps the most notable benefit achieved by combining fiber and power together is the capability to deploy small cell technology wherever it is required. Mobile operators are putting small cells to use for extending their service coverage and increasing network capacity. Rural coverage is also a target for small cell deployments, particularly smaller communities that only have 2G coverage or where service coverage may not even exist. There are also other revenue-generating locations, such as city centers, airports, shopping malls or sports and entertainment venues, which may also present even greater challenges to powering the equipment.

In today's market, the keys to successful small cell deployments are rapid installation speed, use of lower-skilled labor, and future up-scale capability. A powered fiber cable solution contains all of these keys to streamlining small cell deployments, regardless of electrical power availability at the site. It optimizes connectivity and manageability to the most remote and difficult locations while making local power availability a non-issue.

“... the most notable benefit achieved by combining fiber and power together is the capability to deploy small cell technology wherever it is required.”



Ryan Chappell is a Business Development Manager at TE Connectivity in Shakopee, MN.

Rural Telco's Chance at Beachfront Property

By Shirley Bloomfield
Chief Executive Officer
NTCA—The Rural Broadband Association

The FCC is poised to conduct its first ever incentive auction of 600 MHz spectrum next year and lawmakers, stakeholders and industry advocates are abuzz as the commission decides how the auction will be designed and handled. The agency recently released a report and order implementing rules for the auction designed to reallocate this valuable low-band spectrum, and to the delight of NTCA—The Rural Broadband Association and other advocates for small wireless providers, the commission decided to auction the spectrum in smaller partial economic areas, giving rural carriers a more meaningful chance to participate when pitted against the largest national providers. This is a big win for NTCA member companies and other small wireless carriers. But as this battle over this precious mobile broadband wages on, the real fun is about to begin.

Many NTCA members tell me they would like to offer wireless services to their customers, but the challenges to doing so are just a bit too steep. A survey we conducted last year bore this out: Sixty percent of respondents to NTCA's "2013 Wireless Survey Report" indicated they are already providing wireless service

to their customers; however, the majority of respondents reported that while investment in wireless services continues to be a priority, the ability to obtain spectrum at auction is a major concern. A frustrating fact for far too long has been that a large carrier can win an auction for spectrum covering a large geographic area and fulfill its buildout requirements without ever building out its spectrum holdings into its large rural areas. Policies like this, coupled with a prolonged lack of reasonably priced consumer devices and continued challenges securing fair and reasonable wholesale data roaming rates, have led the two largest carriers to now control more than 70% of available public spectrum, while some of the smallest players sit on the sidelines.

For that reason, NTCA's policy team has worked tirelessly for nearly a year to ensure meaningful participation by our members in this auction. We commissioned a study in January to explore the use of smaller geographic area licenses in the auction, rather than the economic areas the commission initially proposed. Since then, we have been working with the commission and other rural groups to come up with a new map to ensure

meaningful participation in the auction by rural carriers and this spring we filed a consensus proposal with that map. As a result of these efforts, the commission voted to use the proposed map, maximizing the number of carriers that will be able to participate and providing a refreshing shift from the usual "world domination" that the largest carriers have typically been able to sway.

The big question now is, will rural carriers participate?

Commission Chairman Tom Wheeler has called this incentive auction a once-in-a-lifetime opportunity to expand the benefits of mobile wireless services to all Americans, including those who live in rural America, and I couldn't agree more. This low-band spectrum is the last bit of "beachfront" property available, and it has characteristics perfectly suited for serving the sparsely populated areas and uneven terrain in which many NTCA members operate. So while the challenges associated with providing wireless service are not insignificant, this may be rural carriers' best and last chance to secure valuable spectrum under favorable terms—and a golden opportunity to show that rural America is committed to delivering mobile broadband solutions.

I know rural telcos are committed to expanding the benefits of broadband coverage to rural America. I am eager to see NTCA's membership step up and show that not only are they already providing these services and that they're the best and most qualified at doing so, but that they are also eager to expand wireless broadband services and take advantage of this last chance opportunity. I urge rural telcos to continue to engage in this collaborative process and encourage them to maximize this opportunity to participate.

About Shirley

Shirley Bloomfield is a staunch advocate for rural telecommunications. During the course of her career, she has led efforts to raise the visibility of the value and innovation of independent, rural telecom companies. As CEO of NTCA—The Rural Broadband Association, Bloomfield's leadership has been a significant factor in moving the organization forward in uncertain regulatory times. Her rural telecom knowledge, ability to build alliances and visionary drive have energized and advanced NTCA and the rural telecom industry.

Recently, Bloomfield served as the staff lead for the unification of National Telecommunications Cooperative Association (NTCA) with the Organization for the Promotion and Advancement of Small Telecommunications Companies (OPASTCO). Working with the boards of directors of both organizations, Bloomfield brought to fruition a combined industry organization that was years in the making. With the unification of the two leading industry organizations, Bloomfield now leads a strengthened association that speaks with one voice on national issues related to rural telecommunications.



Bloomfield also serves as a board member of the National Rural Telecommunications Cooperative, helping rural utilities in creating and advancing telecommunications and related businesses, and GlobalWin, an organization of women leaders in the high-tech industry. Through the organization, she participates in efforts to support and advance women in telecommunications through educational opportunities and networking. She serves as a mentor and advisor to those interested in developing their careers in telecommunications.

From her days as a congressional aide to her years as a lobbyist for NTCA, Qwest and Verizon, Bloomfield has developed expertise in understanding complex issues and advocating effectively on behalf of her constituency. Bloomfield received her Bachelor of Arts degree in economics from Northwestern University and a master's degree in public administration from American University.

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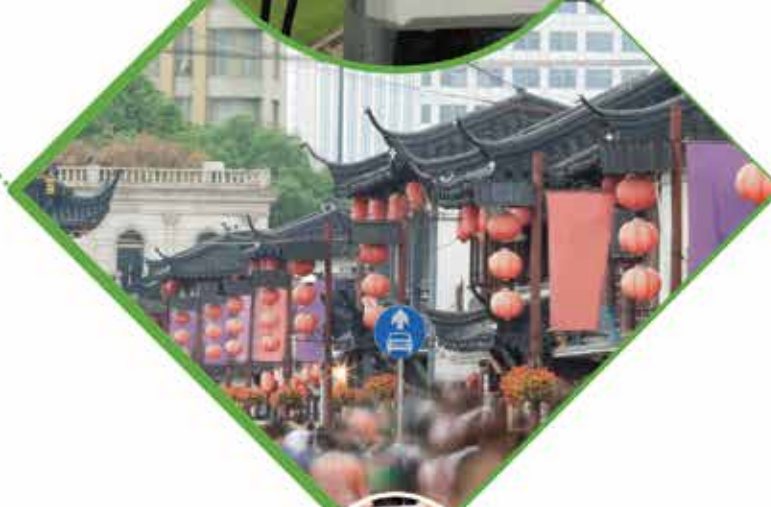
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Expanding Unlicensed Spectrum Allocation

By Randy Turner
Director, Marketing Communications
Walker and Associates

Earlier this summer, U.S. Senators Cory Booker (D-NJ) and Marco Rubio (R-FL) introduced S. 2505, dubbed the Wi-Fi Innovation Act. The purpose of this legislation is to expand unlicensed spectrum use by requiring the Federal Communications Commission (FCC) to test the feasibility of opening the upper 5 GHz band to unlicensed use.

The Wi-Fi Innovation Act:

- Directs the FCC to move swiftly in seeking comments and conducting testing to assess the feasibility of opening the 5850-5925 band to unlicensed use.
- Recognizes the need to balance the importance of developing Intelligent Transportation and incumbent licensees in the 5 GHz band, while also maximizing the use of the band for shared purposes.
- Establishes a study to examine Wi-Fi deployment in low-income communities and the barriers preventing deployment of wireless networks in low-income neighborhoods. The FCC will also evaluate incentives and policies that could increase the availability of unlicensed spectrum in low-income neighborhoods to increase adoption in the communities.

"There is a clear and growing demand for increased availability of spectrum," said Booker. "Senator Rubio and I came together on this legislation because we want to see this valuable resource made available for further use by the public. Not only does access to wireless broadband open the door for innovation and transformative new technologies, it helps bridge the digital divide that leaves too many low-income communities removed from the evolving technology landscape and the growing economic opportunities. Our bill also authorizes an important study of Wi-Fi deployment in low income communities and the barriers preventing deployment of wireless broadband in those neighborhoods."

"In a century defined by drastic and colossal technological advancement, it is hard going even a day without using our cell phones, tablets and other wireless devices," said Rubio. "Access to mobile broadband enhances our daily lives, facilitating quality work and timely communication.

But our wireless devices rely on spectrum, a valuable and limited resource.

"To meet the demands of our time, action must be taken to ensure spectrum is utilized effectively and efficiently," added Rubio. "This bill requires the FCC to conduct testing that would provide more spectrum to the public and ultimately put the resource to better use, while recognizing the future needs and important work being done in intelligent transportation. I am pleased that Senator Booker has joined me in this effort to foster the innovation and economic growth needed to make this century another American century."

Just how important is this? Already, Wi-Fi carries more data than any other Internet technology. Devices using unlicensed spectrum range from garage door openers and baby monitors, to health monitoring devices, home security systems, entertainment devices and more. It seems the conversation has moved from the Internet of Things to the Internet of Everything. According to Phil Solis, Research Director at ABI Research, "Wi-Fi has a massive installed base of more than four billion products and is expected to surpass ten billion in 2018." Gartner forecasts that the total number of Internet-connected devices - excluding PCs, smartphones and tablet computers - will rise from 900 million in 2009 to 26 billion in 2020.

While the Wi-Fi Innovation Act focuses primarily on delivery of Wi-Fi as a service to low-income communities, unlicensed spectrum is an issue that deserves attention for many reasons. One of the frontrunners in this dialog is definitely an economic one. According to a new report from the Consumer Electronics Association (CEA)®, unlicensed spectrum generates \$62 billion a year for the U.S. economy, "Unlicensed spectrum is the fuel that powers innovation in our increasingly digitized, interconnected and untethered world." states Gary Shapiro, president and CEO of CEA.

CEA's report finds that there is an estimated cumulative annual growth rate of roughly 30 percent from 2011-2016 for the devices that connect to unlicensed spectrum. In a separate CEA report, research indicates that Internet-enabled TVs, Blu-ray Disc players, tablets,



smartphones and portable wireless speakers currently lead the way in use of unlicensed spectrum. The rising stars, however, are a myriad of other connected devices that include the smart thermostat, smart watches, connected fitness tracking devices, and smart lighting systems.

Clearly, there will only be increasing demand for the devices that rely on unlicensed spectrum. As a result, availability of this resource is reaching a critical juncture. Innovation that drives economic growth appears to be an important gauge for FCC leadership.

Tom Wheeler, FCC Chairman stated "The Commission is working to make available not only licensed spectrum, but unlicensed spectrum, which has enabled breakthrough innovations like Wi-Fi and Bluetooth. In March, the Commission adopted an order to take 100 MHz of unlicensed spectrum at 5 GHz that was barely usable - and not usable at all outdoors - and transform it into spectrum that is fully usable for Wi-Fi. This is a big win for consumers who will be able to enjoy faster connections and less congestion, as more spectrum will be available to handle Wi-Fi traffic."

Spectrum, both licensed and unlicensed, is forecast to quickly reach a crisis point based on the National Broadband Plan that was released in 2010. That report indicated that "... the mobile revolution is likely to hit a hard stop if the FCC doesn't make available an additional 300 MHz of spectrum by 2015, and 500 MHz by 2020." With auctions in place beginning in 2015, additional leadership from the FCC, and bi-partisan advocacy by elected leaders such as Booker and Rubio, perhaps the crisis can be averted.

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As the demand for high-speed broadband continues to grow, so too does the need for new technologies to deliver these services. Optical resources at the core are no longer enough. That capability must now move to the edge. ADTRAN's Optical Networking Edge (ONE) solution is reinventing the network by reducing packet optical networking complexity with right-sized optical networking (WDM, OTN and ROADM). This enables flexible wavelength service delivery with pay-as-you-grow modularity resulting in an expedited revenue stream.

To learn more, visit adtran.com/one

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Fixed Wireless Offers Carrier Grade Services

By Dave Kitzinger
Consultant, Access Solutions
Walker and Associates

The good news in today's marketplace is that a variety of technologies are available to deliver mobile connectivity. All mobile solutions, however, are not created equal. Certainly there are distinct advantages of each, driven by price, signal range, capacity and more. In some cases, Fixed Wireless can be the ideal solution.

Traditional mobile service is the best option for those on the move between cell towers. Although mobility signal strength can carry several miles, the signal strength varies and data rates vary depending on the proximity of the mobile device in relationship to the tower. As the mobile device moves around, the signal strength increases or decreases and the call can be handed off from tower to tower.

Likewise, Wi-Fi can be an ideal solution to provide connectivity for a mobile device user, but only within limited ranges. Wi-Fi is similar to mobility in performance since the signal strength is relative to the proximity of the end user device and the Wi-Fi radio, whose signal strength is limited to a few hundred feet.

Using a Fixed Wireless (FX) network, the end user device (Remote Subscriber Module) is permanently mounted on the outside of a business or residence and the signal strength is constant; Fixed Wireless technology simply outperforms mobility and Wi-Fi in bandwidth speeds and reliability. Fixed wireless can also provide QOS and SLA type services which mobility and Wi-Fi cannot; however Wi-Fi with the right backhaul modem may be able to offer an SLA report. When designed properly, Fixed Wireless can be "Carrier Grade" Service. The better products offer 40 years of Mean-Time-Between-Failures (MTBF).

Multiple manufacturers offer Fixed Wireless Products that can be classified as either full-featured/high end, middle, and basic. Key features a Service Provider should consider are Orthogonal Frequency Division Multiplexing (OFDM), Multi-Input and Multi-Output (MIMO), and GPS Synchronization.

- **OFDM** takes the line of site frequency and divides the frequency

into sub-frequencies, which results in high spectral efficiency, resiliency to RF interference and lower multipath distortion.

- **MIMO** places all the radios in transmit mode, then alternates to receive mode - which increases throughput.
- **GPS Synchronization** reduces the chance of self-interference and provides reuse of channels in tightly spaced deployments.

Thus, Fixed Wireless can accommodate Line of Site, Near Line of Site, or No Line of Site. Some MHz bands of licensed or unlicensed frequency have limited bandwidth and re-use of bandwidth may become critical. The 5.4 GHz and the 5.8 GHz bands of unlicensed bandwidths are typically used for Fixed Wireless, but also the 3.65 GHz lightly licensed bandwidth is now being widely considered, as the Service Provider pays a small charge to have exclusive use of this bandwidth typically per exchange.

The full-featured Fixed Wireless products can handle Internet, VOIP, Streaming OTT Video, and IPTV. Applications include:

- Last mile access/Rural connectivity
- Backhaul feeds to DSLAMS
- Replacement of Twisted Copper Plant
- Alternative to FTTH

In a typical, new Fiber to The Home (FTTH) deployment, 60% of the total installed fiber cost is the cost of burying drops. If a Telco wants to eventually migrate to FTTH they may wish to consider placing approximately 14 fibers out to a Node which can act as the backhaul for the FX. This FTTN may be installed at 35% of the cost of an all FTTH deployment. The FX can be added for about 10% of the cost of FTTH drops. Thus, the combination can be deployed at a savings of as much as 65% compared to an all FTTH deployment. Fiber drops can still be deployed if the end-customer wants to sign a five-year service agreement. Years later, if the Service Provider wants to deploy all FTTH, the Fixed Wireless can be moved to another exchange, CLEC, or sold as used in the marketplace. Thus, the Service Provider receives a quicker payback with FTTN/FX with all future options still open



for deployment. In effect, a more cost-effective deployment in migration steps.

Fixed Wireless throughput can be estimated with Propagation Studies (Heat Maps) based on GPS coordinates, which show estimated bandwidth throughput, antenna pole or tower locations. From this, a list of building materials can be estimated before committing to a project. The FCC recently changed their recommendation to 10 Mbps downstream minimum X 1 Mbps upstream. Connect America Funds (CAF 1) are currently available to "Price CAP" carriers and should become available to the "Rate-of-Return" carriers in the future. Fixed Wireless bandwidths of 5 Mbps, 10 Mbps, 20 Mbps, 30 Mbps, and 50 Mbps can be offered. The upstream and downstream bandwidths can be remotely applied.

One size does not fit all in designing a mobile network. A variety of solutions are available, each with its own set of unique qualities. An evaluation of all the options delivering broadband connectivity should include Fixed Wireless, which is a viable option for reaching subscribers when the cost of a full FTTH deployment is deemed too great.

Contact Walker and Associates to learn more about Fixed Wireless equipment and associated Propagation Studies for bandwidth throughput estimations in specific geographic communities.

Breathe New Life into Your Career in Five Steps



By Brenda Abdilla
 Founder, President
 Management Momentum



Over a lifetime, we will spend an average of 90,000 hours on the job. How great would it be to feel excited about going to work? To feel challenged, interested and even engaged? Engagement is the new standard, yet according to the brilliant people at Gallup Inc., only a measly 30% of us are actually engaged and inspired at work while 50% are just present and not inspired and a full 20% of us are actively disengaged.

So, if you are experiencing some “professional pain” at the moment, at least you are not alone. The following five steps can help you obtain a fresh outlook on your work and from that place you can make bigger decisions—if necessary.

Step 1: Name your pain.

Stress levels are usually pretty high by the time most people come to a career coach for help. The first order of business is to move from a general to a specific understanding of what your current state is. Instead of saying, “I can’t do this anymore,” or “This is miserable,” try to be more specific about what is going on.

Rate yourself in the following areas on a pain scale from 1-5 (with 5 being highly descriptive of your current career state):

1. I am burned out. I worked so hard for so long that I find I am mentally and physically fatigued. I am cooked.

1 2 3 4 5

2. I am under-challenged and bored senseless. I can do my job in my sleep. I shut my real intellect/talents off to do my job.

1 2 3 4 5

3. I am unhappy at work but I feel handcuffed by income and benefits. I have kids to send to college and/or would like to retire someday. I can’t afford to take risks.

1 2 3 4 5

4. I lack any meaning/purpose at work. My work means nothing to me and is disconnected from my life values.

1 2 3 4 5

For which items did you score a 4 or higher? Many people score 4 or 5 in all categories. Not to worry if you are in this camp—it only means that there is enough dissatisfaction to cloud your view of things. If you do have multiple high

scores ask yourself which one is the very worst for you at this age and stage—if you had to pick one.

Step 2: Stop complaining about your job—right now.

Seriously. This advice is not a value judgment on your complaining; it’s a prescriptive piece of advice about your brain. With each complaint you program your brain to look for evidence to support the complaint. Keep on doing this and you will create a continuous loop of negative perspective bolstered by the selective input you gather to support that perspective—all the while convincing yourself that what you are seeing or experiencing is absolute fact. You need to interrupt that thought pattern in some way. You are smart; you will think of a way to interrupt yourself.

Step 3: Make peace with the past.

Let’s face it—sometimes bad things happen at work. We get passed over for a promotion, get moved to a department with a horrible boss or get asked to “take one for the team” one too many times. Stressful events can cause us to carry a grudge or emotional “baggage,” and simply trying not to dwell on it often makes it worse.

One of the cornerstones of emotional intelligence is being able to accurately identify the emotions we are feeling. Spend a little time over a weekend thinking about all of the “wrongs” you have endured in your career, then identify the emotions connected with each, like anger, disappointment, disgust, etc. Now take it one step further and ask yourself what is behind that emotion—were you insulted? Blind-sided? Hurt? Frustrated?

Once you have fully identified that unpleasantness, take a step to let it go. This does not need to be a public confrontation—the entire exercise can be a solo event. You may be surprised to discover how much baggage you have been lugging around and how much relief you feel when you process it and let it go.

Step 4: Work less in some areas and more in others.

This is a great time to closely evaluate the tasks and projects you are involved with at work. What we are looking for here is scrutiny. There is a good chance that you are performing tasks purely out of habit or fear, or simply to cover your posterior; those very tasks may be creating dissatisfaction at work. While you are at it, ask yourself what you are not doing that you could be. Where could you be using your strengths?

Step 5: Propose change.

You may have noticed this is not step one of this process. Proposing change is a bad idea if you have not processed your own thoughts and emotions about your past and your current state; if you are constantly complaining about your job; or if you have not scrutinized your own work processes. Once you have done these things it's your responsibility to take some action on your own behalf. One of the steps we take with career coaching clients is to make a list titled, "What it would take to keep me." The lists always surprise me because no one lists anything unreasonable. If you want to do more meaningful work and you think you have an idea how to do it—propose it. If you are about to die of boredom, propose something different. And don't let the fact that you tried five years ago deter you. Put your data together, make sure it makes sense and ties to the good of the organization, and propose change in your life. You deserve it.

"As a metaphor for the draining of energy, burnout refers to the smothering of a fire or the extinguishing of a candle. It implies that once a fire was burning but the fire cannot continue burning brightly unless there are sufficient resources that keep being replenished."

*Source: Burnout: 35 years of research and practice
Schaufeli, Leiter & Maslach*



Brenda Abdilla is a certified career coach, author, leadership expert, and the founder of Management Momentum LLC. Since 2004, Management Momentum clients have had access to a battery of proven tools, resources and assessments that help them reach their desired outcomes sooner rather than later. After working with Brenda, clients feel engaged, challenged, energized, fulfilled and certain about their career direction. Brenda helps clients navigate career changes and job promotions, increase productivity, improve leadership skills and remove obstacles in the way of moving forward.

Brenda's new book, *What's Your Lane? Career clarity for moms who want to work a little, a lot or not at all* is now available for moms in career-question mode. See more at: <http://www.managementmomentum.net>

Walker Recognized in Broadband Communities' Fiber-To-The-Home Top 100 List

*By Randy Turner
Director, Marketing Communications
Walker and Associates*

Broadband Communities magazine recently announced it has rebranded its annual Top 100 to the Fiber-To-The-Home Top 100. The list highlights integral suppliers for broadband deployment projects, bringing products to market throughout North America. For the fifth year running, Walker and Associates is included in the list. A variety of businesses among a broad cross section of telecom markets know Walker as a reliable partner for their projects.

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

To be included in the FTTH Top 100, organizations must advance the cause of fiber-based broadband by:

- Deploying FTTH networks that

are especially large or ambitious, have innovative business plans or are intended to transform local economies or improve communities' quality of life

- Supplying key hardware, software or services to deployers
- Introducing innovative technologies that have game-changing potential, even if they have not yet been commercially deployed
- Providing key conditions for fiber builds, such as early-stage support or demand aggregation.

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 over four decades 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 2014 Top 100 list, such as Walker manufacturing partners ADTRAN, Corning, Fujitsu, TE Connectivity 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](http://www.walkerfirst.com).



Orchestrating the Cloud for Providers with Multiple Data Centers

By Michael Schiff

Product Marketing Manager, Service Provider Products
Brocade Communications Systems, Inc.

With the advent of cloud services that require massive computing resources on-demand, the architectural model of data centers is in need of a change. In order to deliver high-quality premium services with tight SLAs, the model is drifting towards a multi data center environment, where pools of shared resources are geographically distributed, so that applications and content are closer to the customer. In fact, it is estimated that by 2015 over 90% of all profitable traffic will travel less than 40 miles across the network to the end user. While this model presents many benefits, challenges arise, especially in regards to manageability between data centers. Software-defined networking (SDN) opens up the possibility of creating virtual networks that can be extended across these data centers and orchestrated on a per tenant or per customer basis. This will provide capabilities to implement inter datacenter multi-tenant services or to migrate tenant services, such as a virtual machine (VM), from one data center to another. For service providers, especially those looking to provide

cloud and managed services this has the potential of simplifying the manageability and overall efficiency of inter-data center multi-tenancy, for instance, exploiting geographical variations of energy costs.

OpenStack is an open-source software cloud computing platform that is on the rise with the trend towards SDN. The goal of OpenStack is to help organizations control large pools of computers, storage, and networking resources within and between data centers. More than 200 companies have joined the project, including service providers, web service companies, enterprises, technology equipment vendors, and others. OpenStack is ideal for orchestration of multiple data centers because it provides a flexible and automated solution that addresses the challenge of maintaining connectivity and policy context for VM migration between data centers. The OpenStack community is currently working on a solution that leverages MPLS, so providers can enable the deployment of layer 2 and layer 3 VPNs between data centers with QoS

guarantees. This solution would allow tenant virtual machines located in different data centers to communicate transparently and be seamlessly moved between data centers, which would greatly improve the management of applications such as cloud bursting or disaster recovery.

Figure A below shows the high level physical topology for orchestrating the inter datacenter connectivity between DC1 and DC2 using MPLS VPN to extend the L2/3 networks in an OpenStack framework.

Brocade has been working with the OpenStack community for many years and is directly involved in the development of this solution. As public and private clouds are still evolving, Brocade continues to prioritize projects such as OpenStack to enhance the orchestration and control framework for cloud infrastructure and services. Open, collaborative efforts like this are what help service providers deploy enhanced cloud services.

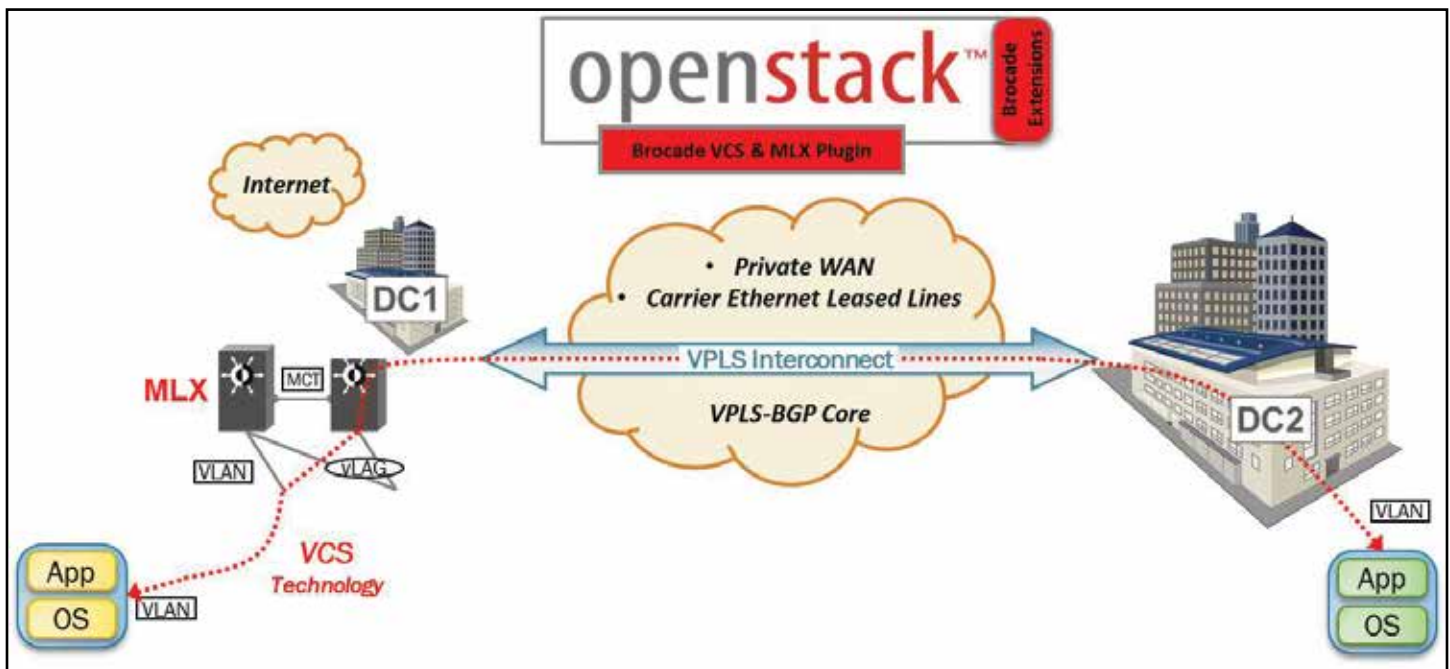


Figure A

Wireless Backhaul at its Best

Microwave Heats Up as a Low-Cost, High-Capacity Solution

By Blake Hlavaty

Sales Engineer

Fujitsu Network Communications, Inc.

Operators at the edge of the network know the challenge all too well – upgrade fast, or lose business to someone who will. It's a race to stay ahead of the surging demand for bandwidth and accommodate the new technologies that businesses and consumers demand.

For smaller telcos and private network owners, the mission is clear, but the methods to achieve it are debatable. At issue: how to backhaul the increasing deluge of data traffic to the core network – quickly and cost-effectively, through a pipe that won't burst by next year? In many cases, wireless microwave backhaul can provide a high-quality, flexible solution without a colossal investment of time and money.

Blame it on Mobile Madness

Without question, the explosion of mobile broadband devices is a major force necessitating rapid network upgrades. 58% of American adults had smartphones as of January 2014, according to the Pew Research Center (and that number seems like an understatement). With smartphones, of course, come mobile email and texting, social networking, sharing photos and videos, and online gaming, all of which gobble up bandwidth at alarming rates. Combine that with the growth of cloud computing among business customers, and it's easy to see how even recently constructed networks are being pushed to the brink of obsolescence.

As the appetite for boundless bandwidth spreads well beyond major metro areas, rural telcos and ILECs alike are working to expand coverage and capacity – and fast. Keeping customers happy depends on finding reliable and affordable means to backhaul all that far-flung traffic to the core network.

Forgoing Fiber

For years, optical fiber has been the preferred method of backhaul transport. The trouble is, laying new fiber lines where the infrastructure doesn't already exist is not only extremely expensive; it's a time-consuming process requiring months (even years) of planning and manual labor. In some cases, fiber is simply not an option, such as when the network must span water or rocky terrain.



When fiber won't fit the bill, wireless is the way to go. The practicality benefits are obvious – installing wireless radios is magnitudes faster, easier and cheaper than digging miles of trenches. But what some operators may not realize is that some of today's advanced microwave backhaul systems also offer quality of service and scalable capacity to rival those of fiber.

Making Waves Work Harder

For some service providers, achieving a viable backhaul solution isn't a question of fiber versus wireless. It's about upgrading the wireless connections they already have, from TDM to Ethernet. High-capacity Ethernet is superior in its ability to handle bandwidth-intensive applications like cloud computing and unified communications (VoIP, videoconferencing, etc.). Moreover, it is a must to make the transition to 4G LTE mobile service.

Network operators are under pressure to support these services today, and an Ethernet-enabled wireless transport system can make it possible with minimal capital and operating expenditures.

Improving Private Networks

Of course, telecom carriers aren't the only ones with the need for ever-expanding data capacity. Increasingly, public and private organizations build their

own wireless networks to support specific operational needs, such as utilities that transport data from smart meters throughout the electrical grid. For these organizations, which may also include school systems, hospitals, or local governments, wireless microwave backhaul offers an attractive opportunity to modernize their services and enhance productivity.

Choose Wireless Wisely

Any network operator making the move to wireless microwave backhaul should select equipment with several important factors in mind, not least of which is the reputation of the manufacturer. Technically speaking, capacity comes first – does the solution offer the throughput and scalability to meet your network needs today and for the foreseeable future? Density is also critical – more RF channels per unit amounts to a more efficient investment and/or room to grow the network in future. And don't forget environmental concerns – a system that takes up less space and requires minimal power is greener and good for business.

Fujitsu Network Communications, Inc. has been a leader in microwave technology for more than 50 years. The Fujitsu FRX-3E wireless backhaul system offers up to 4 Gbps of Ethernet/IP traffic throughput and 16 channels in a single sub-rack.

In the Spotlight

By Randy Turner
Director, Marketing Communications
Walker and Associates



Mike Falletti has joined Walker and Associates as the Director of Wireless Business Development. Mike will lead Walker's wireless radio business development effort including go-to-market strategy, product portfolio management and wireless network design & deployment.

Mike has worked in sales and business development roles for Comsearch, Northern Telecom, DSC, Positron Fiber Systems, RELTEC, ECI, Zhong, Nortel and Positron/Aktino over the past 3 decades. He is a familiar face to Walker from his periodic channel engagements while at those OEMs. He has sold Wireline Access, Optical Transport, Switching, FTTH, and wireless radio solutions in the Service Provider, Federal, Utility and Enterprise Markets in the Eastern U.S.

Mike will work with engineering, sales and marketing to build wireless business in both wireline and wireless carrier customers. Walker recently added wireless radio engineering capability and a preferential fixed wireless buying position for the carrier space. With Mike's wireless experience in tow, the company will build on its WiFi and DAS sales support capability.

Mike brings a wealth of customer relationships throughout the industry, particularly on the East Coast. Accordingly, he will also assist Walker's sales team with targeted customer engagements to help expand its existing sales base.

Mike lives in Chantilly, VA near Washington, DC, where he will work and travel from his home office. He can be reached by email at mike.falletti@walkerfirst.com.



Dan Kuebler, Credit Manager for Walker and Associates has been named Chairman of the Board for the Telecom group of the Tampa division of the National Association of Credit Management (NACM). NACM

Tampa, an affiliate of the 25,000-member National Association of Credit Management, is a trade association dedicated to improving accounts receivable management and the performance of today's business credit manager and staff. More than 500 area businesses belong to the association. There are currently over 25 NACM affiliates that exchange tradelines so coverage includes not only Florida but the whole U.S. Members represent diverse segments of the economy including manufacturing, distribution, telecommunications and financial businesses.

Kuebler has worked for Walker 8 years, and has been Credit Manager since 2010. Congratulations on his new role as Chairman of the Board for this division of NACM.



Jerry Lamm recently joined Walker and Associates as Regional Account Manager, managing the New England territory, which includes MA, CT, RI, NH, VT, ME and Upstate NY. He is based out of the southern NH area.

Lamm stated "I'm anxious to learn about customers' business and future network requirements. Please view me as a single point of contact within the Walker organization that can assist with delivering products, services and solutions for your company's infrastructure."

Jerry joins Walker with 36 years of experience in the telecommunications industry in a variety of roles including sales, marketing, customer service, installation and project management. Areas of focus include transport, access, switching and mobile backhaul with service providers ranging from IOC's, CLEC's to tier 1 carriers.

He can be reached by phone at 603-229-2215, and by email at jerry.lamm@walkerfirst.com

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Strategic Businesses Recognized by Walker and Associates

By Randy Turner
Director, Marketing Communications
Walker and Associates

Customers of Walker and Associates were recognized during the 2014 spring season with the company's Red Ribbon Awards. The prestigious award acknowledges customers based on a variety of factors, including purchasing volume, growth rate, partnership, diversity of products and services purchased from Walker, and more. This annual listing of top customers includes a broad cross-section of the industry, recognizing many of the leading service providers, utilities, government and enterprises throughout North America.

Tom Kane, Vice President of Commercial Sales at Walker stated "Walker and Associates is pleased to recognize its strongest performing customers, who repre-

sent our industry's finest leaders. Their partnership with our company is noted by the strength of relationships spanning throughout both entities, with key contacts, communication that drives improved results, and continued growth in critical performance metrics. We are honored to support them in building networks that meet their business objectives."

Walker Regional Account Managers schedule meetings with awardees throughout the spring and early summer season. They make award presentations to strategic contacts within each customer organization. The award presentation is also attended by members of Walker's sales management team.



Pete Thomas, Walker Director of East Region Sales (center), presents a Red Ribbon Award to Spirit Telecom recipients, Richy Brensinger (L) and Jim Kent (R).

Since 1970 Walker and Associates has built a reputation within the telecommunications industry as a customer-centric company. Success is measured by processes and systems that effectively resolve customer challenges in ways that are mutually beneficial. This dynamic results in ongoing dialog with customers and key industry leaders that fosters innovation, creativity and new opportunities.

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The Mobile Security Challenge

By Juniper Product Marketing

Smart mobile devices are an indispensable part of consumer and enterprise users' digital lifestyles. As users' dependency on smart mobile devices increases, the volume of non-voice related services that users consume is also expected to increase. By 2015, more than 50% of mobile service revenue is expected to come from non-voice services.¹

As services and content accessible on smart mobile devices become richer, digital data traffic will continue to increase, placing greater strain on network infrastructures designed originally for voice services and constrained by limited bandwidth. Maintaining network uptime and availability will be a high priority for MNOs seeking to keep customer satisfaction rates high and churn rates low.

The deployment and management of mobile service and content offerings will be further complicated by a myriad of new platforms and devices flooding the market. Each new device on the network represents not only associated deployment, support, and management costs, but increased security risk as well. Each new mobile device increases signaling and data traffic load, exacerbates connection rate issues, and increases the number of potential attack surfaces within the network. Mitigating future advanced, persistent threats, as well as existing issues, requires a comprehensive strategy and a scalable solution.

Applications used on mobile device platforms add a further layer of complexity. The current open-market application development environment and laissez faire purchase model enable vast numbers of developers, unskilled in security and with little understanding of mobile network operation, to create a steady stream of new applications for a variety of mobile devices. The sheer volume of applications available—as well as the variety of locations from which applications can be procured and downloaded—makes rigorous testing of each combination of applications on each mobile device nearly impossible.

As more and more applications enter the ecosystem, it is inevitable that some will be inefficient, even harmful, increasing backhaul traffic and generating significant amounts of signaling events that can have unintended, adverse consequences on mobile device battery life, negatively affecting subscriber satisfaction ratings.



Rogue applications can prove problematic as they can create vulnerabilities within the network or, worse, be a “wolf in sheep’s clothing”—malware exploiting vulnerabilities in the guise of a legitimate application.

The widespread adoption of smart mobile devices as a part of everyday life represents many opportunities for MNOs. But the challenges associated with providing services, securing devices and the information and data on those devices, securing transmissions to and from devices, and protecting the network while generating revenue must also be taken into account.

Juniper Networks Mobile Network Security Solutions

Juniper Networks mobile network security solutions address the needs of MNOs with comprehensive sets of products and services designed to protect the device, network, and applications.

Addressing the needs of MNOs, these end-to-end solutions secure the network and protect devices from evolving threats, while enabling cost control measures and revenue generation opportunities. In addition, Juniper mobile network security solutions’ components suit the unique needs of the MNO, with carrier-class features for high availability and long, trouble-free service life.

“Each new device on the network represents . . . increased security risk . . .”

1 - The Hindu Business Line newspaper e-edition, July 28, 2011



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C-RAN Fronthaul – A Challenge to Network Infrastructure

By Michael Ritter

Senior Director Technical Marketing and Analyst Relations

ADVA Optical Networking

Centralized Radio Access Network (C-RAN) is a new cellular network architecture promising to boost efficiency and lower costs when deploying public access small cells. The C-RAN architecture separates the Base Band Unit (BBU) from the Remote Radio Head (RRH) using the Common Public Radio Interface (CPRI). The network interconnecting both instances is often referred to as fronthaul network. Centralizing BBUs at macro cell sites or central office locations as an alternative enables more precise spectrum control and interference coordination while reducing power consumption, footprint and complexity of small cells deployed at street level or in indoor locations.

The clear advantage of C-RAN has resulted in first live network implementations in dense environment such as stadiums, malls, tall buildings and city centers. The increased flexibility and efficiency on the radio access network side however comes at the expense of fronthaul connectivity challenges. CPRI is a digitized, serial radio interface with capacities in the range of multiple Gigabits per second, well beyond the data rate of the user traffic it actually carries. In addition, CPRI has very strict requirements on transmission

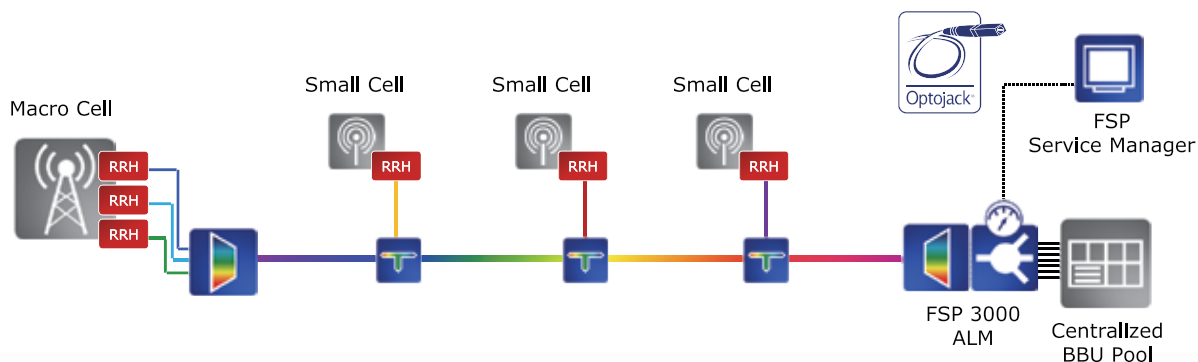
latency and jitter in order to guarantee faultless system operation and therefore superior user experience.

The requirement for Gigabit per second transmission capacity with strict low-latency performance between pooled BBUs and distributed RRHs has driven mobile network operators to build their first C-RAN deployments utilizing dedicated, direct fiber connectivity – often referred to as dark fiber – across the fronthaul network. Building on dark fiber is a viable method, but is not practical in the future when the public access small cell rollout reaches the next level. As opposed to network infrastructure technologies such as Optical Transport Network (OTN) and Multi-Protocol Label Switching (MPLS), dark fiber is difficult to manage and troubleshoot. The missing monitoring capability of dark fiber networks does not support detecting faults and service impairments. In many cases, a fiber break cannot be isolated from a failure caused by the RRH. Contrary, infrastructure technologies such as OTN and MPLS cannot be applied due to their system latency, jitter performance and phase shift characteristics that do not support the CPRI specification. Due to the cost-sensitivity

of CPRI-based fronthaul, the significantly increased connectivity cost compared to dark fiber would be prohibitive in addition.

However, there are solutions coming to market that meet the simplicity and cost challenge when connecting RRHs to centralized BBUs. Active fiber monitoring based on an advancement of Optical Time-Domain Reflectometer (OTDR) technology enables network operators to actively monitor their fiber plant during provisioning and while in service. Mobile network operators now have complete visibility of their leased or self-provided fiber access infrastructure and can isolate fiber breaks from failures caused by network elements. Sources of errors can be located quickly at an accuracy of less than 10 meters. In the same way, dark fiber providers can now offer managed dark fiber or wavelength services to their mobile network operator customers, assigning strict Service Level Agreements (SLA) to their offering. Active fiber monitoring is a straightforward solution that addresses the operational requirements and meets the cost challenges of fiber access networks for C-RAN volume deployment.

Optojack™ Monitoring for C-RAN Fronthaul



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UPCOMING EVENTS

AUGUST

MTIA Summer Conference	Branson, MO
ACTA Cable Show	Orange Beach, AL
Tri-State Conference	Midway, UT

SEPTEMBER

ITA Vendors' Showcase	East Peoria, IL
OTA CO & IT Seminar	Newport, OR
* UTC Region 1 & 2 Meeting	Providence, RI
NFOC-NETS Communications Conference	Verona, NY
* CCA Annual Conference and Expo	Las Vegas, NV
SCTE CableTec Conference and Expo	Denver, CO
Technet Augusta 2014	Augusta, GA

OCTOBER

* UTC Region 3 Fall Meeting & Expo	Nashville, TN
* UTC Region 4 Annual Meeting	Indianapolis, IN
WSTA Fall Conference & Exhibits	La Crosse, WI
* MATSS	Kansas City, MO
PTA Technical Showcase & Conference	Harrisburg, PA
KTA-TTA Joint Fall Conference	Bowling Green, KY
TASE Annual Convention	Point Clear, AL
ATA Associate Member Showcase	Anchorage, AK
* COMPTEL PLUS Fall	Dallas, TX
OSP EXPO	Baltimore, MD

NOVEMBER

SCTA Fall Conference	Columbia, SC
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DECEMBER

MTA 33rd Annual Showcase	Billings, MT
SDTA Fall Plant & Technology Workshop	Mitchell, SD

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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