DAS WINS GOLD AT THE OLYMPICS

Injured Tower Climber | Antenna Mounts | Smartphone Saturation

Infrastructure, regulatory and financial information for the antenna-siting community

ABOVE GROUND LEVEL

agl ™

October 2013

Structural Stresses

Wireless State of Mind

Small Cell Releases

NATE Participation

PRODUCT SHOWCASE

Lighting & Monitoring

agl-mag.com A BIBY PUBLISHING, LLC PUBLICATION

YOUR SIGNAL STARTS HERE.®)))

IN OUR BUSINESS, IT IS ALL ABOUT THE SIGNAL.

Our clients depend on SBA to provide the wireless infrastructure that allows them to transmit the signal to their customers. As their first choice provider of wireless infrastructure solutions, we are continuously setting the standard for customer satisfaction by "Building Better Wireless".

TOWER OWNERSHIP

LEASING

SITE MANAGEMENT

SITE DEVELOPMENT

CONSTRUCTION

TECHNICAL SERVICES

800.487.SITE | sbasite.com

SBA)))
Building Better Wireless®

DAS WINS GOLD AT THE OLYMPICS

Injured Tower Climber | Antenna Mounts | Smartphone Saturation

Infrastructure, regulatory and financial information for the antenna-siting community

ABOVE GROUND LEVEL

agl ™

October 2013

Structural Stresses
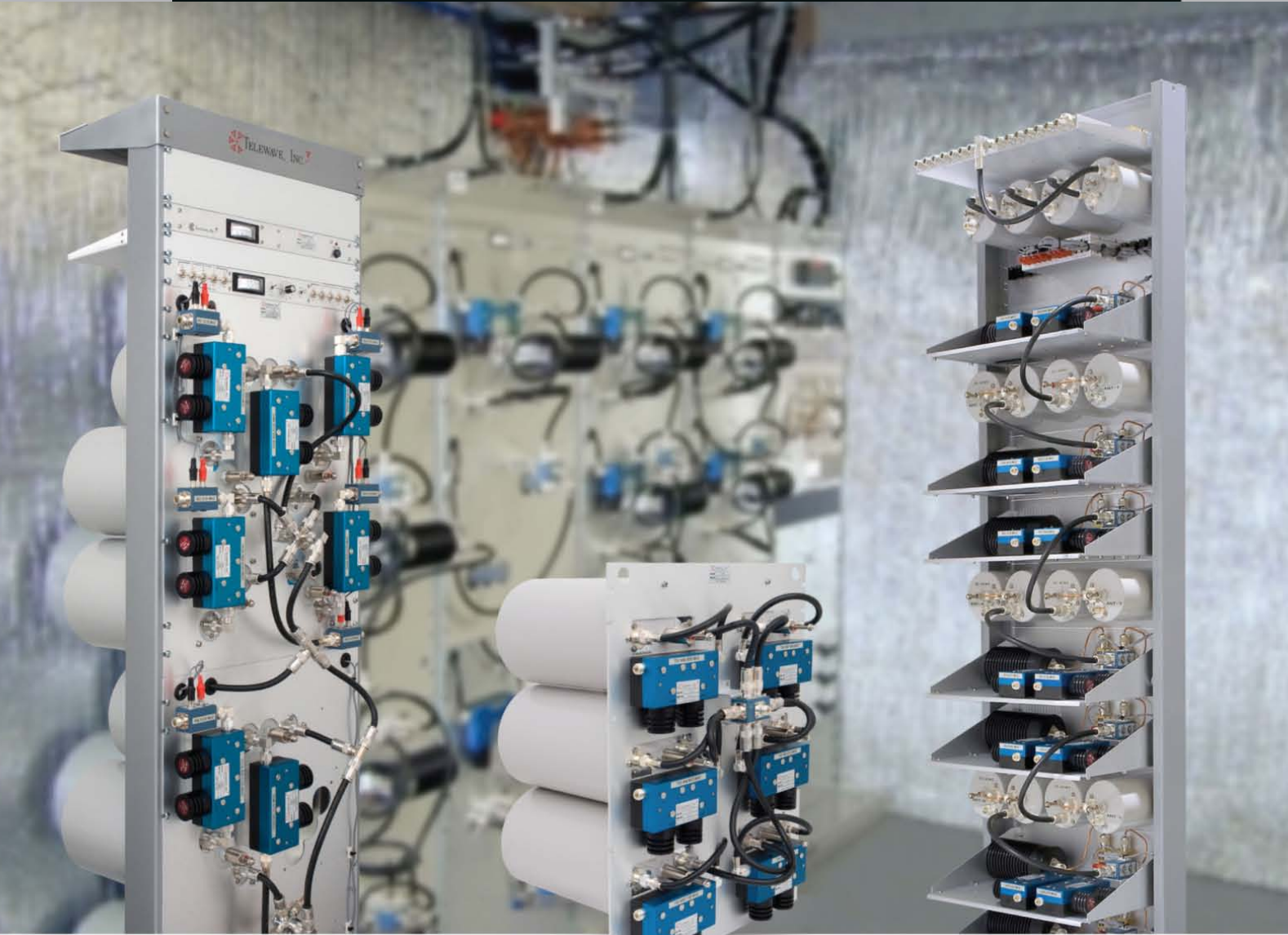
Wireless State of Mind

Small Cell Releases

NATE Participation

PRODUCT SHOWCASE

Lighting & Monitoring

agl-mag.com   A BIBY PUBLISHING, LLC PUBLICATION

October 2013   Vol. 10, No. 9

20

Features

Departments

on the cover

Hughey & Phillips provided this image of the company's Horizon LED L864/L865 light installed in Urbana, Ohio, to mark an aircraft obstruction to warn pilots of its height and placement.

Cover design by Scott Dolash.

Interested in advertising with *AGL*'s magazine, website or e-newsletters or sponsoring AGL Regional Conferences? Visit *www.agl-mag.com/advertise* for information.

editorial comment

Boulders Are Rolling

Last month in this space we called attention to one of the smallest cellular operators, Dumont Telephone. This month, the boulders — the giants of the wireless industry — are rolling around.

Verizon Communications announced its intention to spend $130 billion in cash and stock to buy Vodafone Group's 45 percent stake in Verizon Wireless. "I think there is going to be a burst of rocket fuel in the Verizon engine as a result of this transaction," Lowell McAdam, chief executive of Verizon, told Reuters. Macquarie Analyst Kevin Smithen told Reuters that Verizon may have paid too high a price at a time when growth is slowing in the U.S. wireless industry, and smaller rivals are competing aggressively on price. Reflecting the increase in debt stemming from the deal, Moody's Investors Service downgraded Verizon's debt rating.

Transaction size may be a matter of perspective, or comparison, and absent a $130 billion deal between Verizon and Vodaphone, the transaction valued at $4.8 billion for American Tower to buy the parent of Global Tower Partners would have topped the list. For $3.3 billion in cash and stock plus the assumption of $1.5 billion in debt, American will acquire Global's 15,700 towers and thousands of rooftop management contracts, adding to the 56,000 towers American already owns.

It's a round trip in a way. Global's chief executive, Marc Ganzi, started Global in 2003 by acquiring 187 towers from American. And that transaction topped another from American a few weeks before in which it agreed to spend $811 million to buy 4,500 towers in Brazil and Mexico from NII Holdings.

American appears to remain in the running as a possible buyer for AT&T's 15,000 towers, although Reuters reported that JP Morgan analyst Phillip Cusak said he expected Crown Castle International to make that deal instead.

All this comes as American shakes off a negative view expressed by Muddy Waters Research. The investment research company has dogged American since issuing a research report in July that criticized the company's acquisition of Latin American properties. The Global acquisition is "astoundingly expensive," a statement issued by Muddy Waters said. "We're more skeptical than ever."

Troubled

As bad as your troubles may seem to be, maybe you're better off with yours and not someone else's. For example, in September, the Greater Mumbai Municipal Corporation began dismantling nearly 1,800 illegal wireless telecommunications towers in Mumbai, India. A story in the *Mumbai Mirror* explains that the municipal corporation established a tower policy, and having a policy clears the way for the local government to take enforcement action, including dismantling towers, when the wireless facilities do not comply with the policy.

Municipal Commissioner Sitraram Kunte is quoted in an August *Mumbai Mirror* story as saying, "The new policy will be implemented with retrospective effect, which means it will cover all 4,500 mobile towers on rooftops in the city. Of these, we have identified 3,620 as illegal. However, since some of the unauthorized towers are part of a case filed against the municipal corporation by mobile operators, we will next month start the process of bringing down the rest."

Here in the United States you may have difficulty obtaining approval to build towers in the first place, but at least it's extremely rare that authorities in the United States force owners to take them down. ∎

By Don Bishop, Executive Editor
dbishop@agl-mag.com

Old Friends Are New Friends. Again.

The $4.8 billion purchase of Global Tower Partners' assets by American Tower is an exciting indication that the industry is alive and well. Well, heck, anyone can look at the stock prices and know the publically traded firms are alive and well. Global Tower Partners has always been known as being a little aggressive on deals — and why not?

The companies in the middle continue to do well, buying up numbers of smaller deals that feed into the larger companies. The market for deals is alive and well. At each level, documentation, diligence, financial stability and creditworthiness of the tenants receive more and more scrutiny. Eventually, at the end of the sausage factory, are the institutional-quality investments — those ready for American Tower, our real estate investment trust friends with a tower habit. Soon we'll be adding Crown Castle International to the list of tower companies that have converted into real estate investment trusts. SBA Communications: Are you guys going to stay true to the cowboy spirit of the industry and fight the bankers off? I hope so, if only for the fun of having someone out there still enjoying the industry, and taking the fun deals, not always the most conservative deals.

As I write this, I'm going home after the Chicago AGL Regional Conference. I could not be more thrilled than to have had the opportunity to introduce Jonathan Adelstein, president and CEO of PCIA – The Wireless Infrastructure Association, as the luncheon keynote

By Rich Biby, Publisher
rbiby@agl-mag.com

Photograph courtesy of mikefosterphotography.com

speaker. PCIA has just published a study, "Broadband Infrastructure: A Catalyst for GDP and Job Growth 2013–2017." Jonathan presented some amazing statistics about the economic effect of the wireless infrastructure industry on the U.S. economy. The report is available at *www.pcia.com*. I can't thank PCIA and Jonathan enough for choosing our Chicago event to share the results of this study and for his participation and very generous contribution of time to our event. It was a true highlight of what we've been doing at *AGL* for three years. Thank you, Jonathan. Thank you, PCIA.

I received some education from our financial friends about the negative effect rising interest rates could have on the industry. Plenty of new towers will continue to be built — that won't change. However, the stock prices could fall as capital becomes more difficult to find or more expensive to obtain. Smaller tower companies could have a more difficult time making the numbers work. Instead of needing $x/month in rent to make a site profitable, tower companies may need $x + $200, and that may be a little beyond the carriers' comfort point. Regardless, equilibrium can always be found; however, it will only be after some short-term surprises. In the end, carriers need towers, and we need carriers, so we'll find a way to get along.

Regarding the sale of Global Tower Partners, it was only a matter of time, because an investment of that nature normally is liquidated after a certain period or after certain goals are met. The only real suspense, which actually did not last long, was who was going to be the acquirer. I'm not sure the money was with American Tower on this; however, they have the resources, and the geographical coverage makes sense. Our hat's off to all of the great

folks at Global Tower Partners who have worked their tails off for years to develop the portfolio, and to American Tower for another great addition to their coverage.

Well, back to my little old side of the house — just an RF/regulatory engineer in a publisher's role. My latest excitement on that side deals with one of the oldest topics in the industry — AM detuning. Yes, it is difficult to go from talking about billion-dollar deals to talking about AM radio stations, but this is the best segue I have. For years, anyone constructing a new antenna support structure or changing an existing one has had to conduct a series of before-construction and after-construction measurements to reveal whether a nearby AM radio station's directional transmission characteristics were perturbated by the construction or change, and then to mitigate any adverse effect.

Back in the old days, AM stations used to maintain and care for their radiation patterns, and nearby construction could cause problems for the station. However, everything changes, and now the ability to predict the radiation pattern of the station is a matter of routine mathematics. It now is possible to predict and document changes in the radiation pattern caused by modest changes to nearby cellular towers and by the construction of additional nearby cellular towers. After almost 10 years of proposed rule changes to allow desktop analysis of effects to AM stations, the FCC has changed the rules, creating a new rule under Part 1 of its regulations (which applies to all FCC licensees) and eliminating many poorly worded and inconsistent rule sections that applied to particular licensees. The new rules allow computer modeling, rather than requiring expensive and time-consuming (sometimes construction-delaying) field measurements to be made. ■

Smartphone Saturation Calls for Creative Operator Approaches

By Eva Weidinger and Ronan de Renesse

Smartphone penetration in the United States and Europe is high and continues to grow, but the non-smartphone user base is still significant and will be challenging for operators to convert. Our recent *Connected Consumer Survey 2013* of mobile users in the United States and Europe highlights the striking differences between smartphone and non-smartphone users. Operators need to develop new marketing strategies and pricing models to persuade their non-smartphone users to upgrade to smartphones. For more information, see our research report, "The Connected Consumer Survey 2013: Smartphones, Mobile Data Access and Monetisation."

Smartphone saturation

According to our recent survey of 6,600 consumers in the United States, the UK, France, Germany, Poland and Spain, 52 percent of respondents with a mobile handset had a smartphone, making smartphones the dominant device category on operators' networks. However, the smartphone share of new handsets (purchased in the last six months) appears to be declining in France and Spain, which are the markets where overall smartphone adoption is the highest. This could be an early indicator of market saturation.

The emergence of cheaper smartphones (as well as attractive subsidies from operators for new contract subscribers) has driven smartphone adoption in younger age groups. The percentage of respondents aged 18 to 24 who owned or regularly used a smartphone increased from 64 percent in October 2011 to 77 percent in October 2012. Operators will need to focus on older user segments if they are to increase smartphone penetration because we
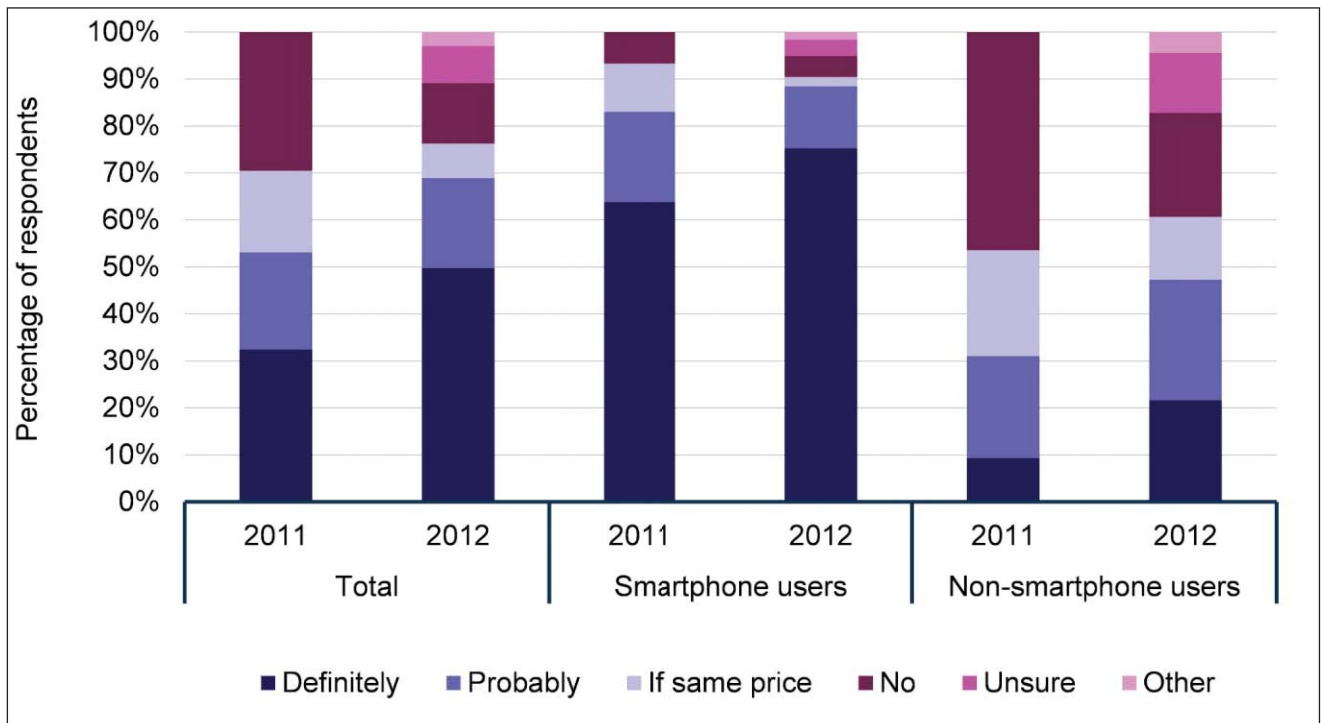
Figure 1. The propensity to buy a smartphone as the next mobile device, 2011 and 2012. Source: Analysys Mason, 2013.

Cost effective
RF Safety in the palm of your hands

✓ **Pinpoint and monitor active and idle antennas**
✓ **Single button, easy operation**
✓ **Loud audio warning in case of overexposure**
✓ **Frequency coverage 380 MHz - 2.7GHz**
✓ **Wide level indicator range, 5% to 250%**

The fieldSENSE personal RF monitor is designed specifically for the mobile industry. It's a cost effective solution ideal for all personnel working in the vicinity of transmitting cellular antennas.

Certified to IEC 61000-6-4, IEC 6100-6-2, IEC 60950-1

Measures in accordance with ICNIRP (1998)
FCC (NCRP) OET65 (1997)
Canada Safety Code 6 (2009)
IEEE C95.1 (2005)

Calibration Certified by ACRBR

field:SENSE

250%
160%
100%
65%
40%
15%
5%

380MHz - 2.7GHz

field:SENSE
Personal RF Monitor

fieldsense.com

Available through the following retailers:

LBA   TALLEY   GME Supply Co   MIDWEST UNLIMITED   SITE PRO 1

research

believe that the youth market is rapidly approaching saturation.

Non-smartphones

Forty percent of non-smartphone users indicated that their next handset will not necessarily be a smartphone, even if prices come down. Overall, the propensity of mobile respondents to buy a smartphone continues to increase. Nearly half of our mobile-using consumer survey respondents in this year's Connected Consumer Survey said they would definitely opt for a smartphone for their next handset purchase, compared with just over 30 percent last year (see Figure 1). We also looked specifically at the 48 percent of respondents who do not use a smartphone. A substantial share of these non-smartphone users — 40 percent — indicated that they do not plan to (or are unsure whether they will) purchase a smartphone next time they acquire a device, even if a smartphone costs the same as a non-smartphone.

Price was less frequently cited as a barrier to purchasing a smartphone in this year's survey, compared with last year's results. This is partly because of the wider availability of low-end smartphones and a larger pool of old smartphone models to choose from — for example, the iPhone 4 and Samsung Galaxy S III.

Of those respondents who do not own a smartphone, the majority (61 percent) were on prepaid or SIM-only subscriptions, compared with only 36 percent of smartphone users. Those who do not own a smartphone are also generally older — 50 percent of the non-smartphone users were older than 55, while only 17 percent of smartphone users were in this age group.

The significant differences in demographics and purchasing habits between smartphone users and non-users present a challenge for service providers looking to upgrade the remaining non-smartphone customers. Handset subsidies do not serve as an incentive in the prepaid and SIM-only market. App-focused marketing campaigns that appeal to younger users will not necessarily be useful in targeting the non-smartphone users, many of whom

are older than 55. Device-leasing plans such as Vodafone Red Hot, which target lower-end customers who want the latest, hottest smartphones, may not be particularly interesting for an older demographic. Our survey shows that 42 percent of non-smartphone re-

> **Operators still need to educate non-smartphone users — particularly older ones — about the benefits of owning a smartphone and about how mobile data tariffs are structured in order to avoid bill shock.**

spondents have had their handset for more than 2 years, compared with 7 percent of smartphone respondents.

Creative promotion

Operators must get creative about promoting smartphones to the remaining lower-end and older subscriber base. A high share of non-smartphone users on prepaid or SIM-only subscriptions are likely to be attracted by low-end packages that are usually not available

on smartphone tariffs. Operators still need to educate non-smartphone users — particularly older ones — about the benefits of owning a smartphone and about how mobile data tariffs are structured in order to avoid bill shock. Recent innovative operator approaches include offering pay-as-you-go SIM customers the chance to purchase packages of more data than the token amounts that were previously available. This could encourage more prepaid subscribers to adopt low-end smartphones in order to make best use of the data.

Non-smartphone users continue to attach a lot of value to voice and messaging services, which operators must consider when trying to promote smartphones to these consumers. For example, pre-loaded over-the-top communications or social networking apps could be used as an incentive, whether provided by the operator or by a third-party player. Operators may also be able to persuade non-smartphone users to upgrade to a smartphone by providing rewards in the form of free voice and messaging credits. ■

Eva Weidinger is a research analyst with Analysys Mason. Her email address is *eva.weidinger@analysysmason.com*. Ronan de Renesse is a principal analyst with Analysys Mason. His email address is *ronan.derenesse@analysysmason.com*. Analysys Mason is a global consultancy and research company specializing in telecommunications, media and technology.

AT&T Towers

Expansive needs call for an expanded portfolio.

With greater, wider demand for anytime, anywhere wireless coverage, our expanded portfolio, featuring AT&T Neutral Host DAS, tower and rooftop coverage, offers you more ways to meet the challenges you face. And with end-to-end support from our specialist, we make the entire process quick and easy.

Visit att.com/towers to get started.

NATE Seeks Participation by All Industry Stakeholders

By the AGL Staff

The National Association of Tower Erectors board of directors named Pat Cipov, president of Cipov Enterprises, Sumter, S.C., as NATE chairwoman. She replaces Jim Coleman, who stepped down as the association's chairman after assuming new responsibilities as senior vice president of a services division resulting from Sabre Industries' acquisition of Midwest Underground Technology. Last year, Midwest acquired Coleman's company, Southern Broadcast Services.

AGL: Congratulations on your appointment as the first woman to head the NATE board of directors.

Cipov: I am truly humbled and honored to serve NATE in any way I can, and I look forward to continuing to work hard every day to ensure that safety remains the top priority in the industry. NATE is fortunate to have women serving in leadership roles on our standing committees and at the board level.

AGL: Tell me about your career and why tower safety has become important to you.

Cipov: I began to work in the tower industry in 1978 when I joined my brother's company in Sumter, S.C., just

I will continue the efforts of our association to create a culture of safety throughout the industry.

east of Columbia. I've done it all. I've worked in the field, climbing towers. I graduated to being the hoist operator and then when our business became stable enough, I graduated to working only in the office. We build and maintain communications towers for utilities, emergency services and Motorola service shops. We have very good customers, some of whom we have had since 1978.

Our company, Cipov Enterprises, is a small company (as are many NATE member companies) with 10 employees. We opted against doing cell tower work so we could remain small in order to maintain our commitment to our customers and stand behind our work.

When Cipov Enterprises started, we had no formal training in safety. I first learned of safety and industry best practices when I started getting involved with NATE. I have continued my quest for knowledge every day since. Learning about industry safety never ends. It is an ongoing process.

AGL: What would you like to accomplish as chairwoman of NATE?

Cipov: I will continue the efforts of our association to create a culture of safety throughout the industry. This includes continuing to establish and strengthen relationships and our ongoing dialogue with all stakeholders involved in our diverse industry; including the tower owners, wireless carriers, equipment manufacturers, engineers, public safety officials and utility providers. This also includes continuing to work with NATE member companies and their elevated workers to ensure that they have access to the appropriate safety resources in order to ensure that work is being conducted in a safe manner on tower sites.
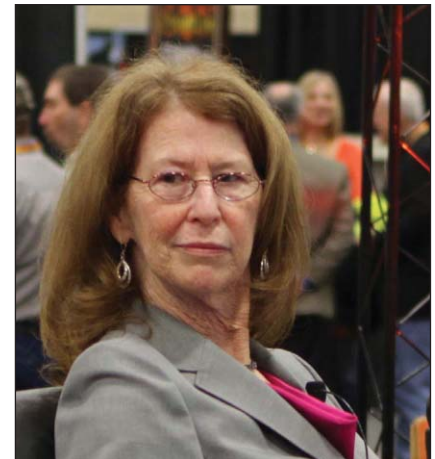
Pat Cipov at the NATE conference in 2013.

AGL: Education and training are important to developing safety awareness. How is the association getting the word out?

Cipov: Individually and collectively, NATE continues to seize any and all opportunities to foster a culture of safety throughout the industry. For example, NATE has increased its presence at industry trade shows and state wireless association events in order to get our safety message out to a diverse group of industry stakeholders. Conversations via all outlets must be repeated over and over. The message cannot be communicated just once.
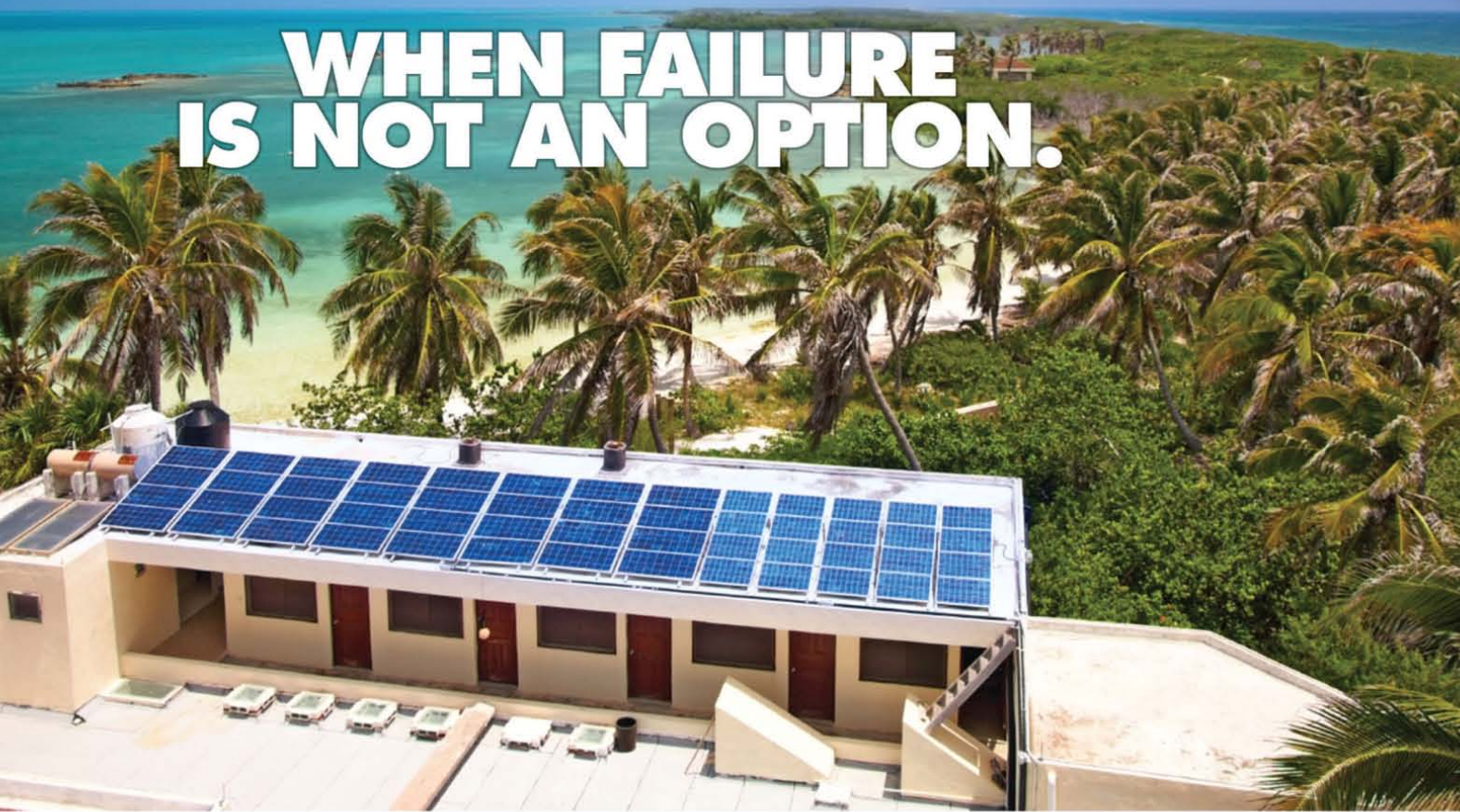
The association is also in the process of developing a website feature called the NATE Exchange. The NATE Exchange will be a convenient, consumer-driven, one-stop-shop platform for tower construction companies to gain access to the most sophisticated and up-to-date training courses offered by training companies in the industry. We

questions and answers

are excited about this project and feel that it will enhance the return on investment of a NATE membership.

AGL: What is the philosophy behind the new name of the NATE conference, "NATE Unite"? How will it be different from previous NATE conferences?

Cipov: NATE has done a great job through the years hosting one of the premier conferences and expositions in the broadcast and telecommunications tower industry. This year, the association made the decision to rebrand the show from a marketing and promotional standpoint. The NATE Unite name and theme reflects both the strong bond that NATE members share and the association's continued efforts in seeking to bring all of the industry stakeholders (tower construction firms, wireless carriers, tower owners, public safety officials, utility companies and equipment manufacturers) together in one location to promote safety, participate in educa-

tional panel sessions and provide exhibiting and networking opportunities.

We are very excited about the upcoming NATE Unite 2014 Conference, Feb. 24−27, in San Diego. The association is in the process of finalizing the schedule

---

Many NATE members choose to go above and beyond the requisite level of safety requirements and the minimum OSHA requirements.

---

and we are excited about the new program offerings and events that will be held at the gathering.

AGL: Do you have any plans for

further developing NATE's relationship with the Occupational Safety and Health Administration?

Cipov: NATE continues to work with OSHA. The association's Legislative and Regulatory Committee meets with officials from OSHA in Washington on a quarterly basis. NATE once had a national partnership with OSHA, which was not renewed in 2009. NATE proceeded by creating its own internal Star Initiative Program to fill the void of the lost partnership. Many NATE members choose to go above and beyond the requisite level of safety requirements and the minimum OSHA requirements. The Star Initiative allows members the opportunity to demonstrate a higher level of commitment to achieving safe work environments within their respective companies. ∎

J. Sharpe Smith, contributing editor to *AGL* and editor of the *AGL Bulletin* email newsletter, conducted the interview. Photography by Don Bishop.

safety

Injured Climber Struggles to Pay Hospital Bills

By J. Sharpe Smith

Todd Hansel, 29, of Sidney, Neb., survived a fall from a cell tower he was helping construct near Dike, Iowa. That's the good news. However, as a result of his 50-foot fall, he was seriously injured and hospitalized for days. And worse yet, he has large hospital bills that he cannot pay.

Hansel was working as an independent contractor for Pegasus Tower Inc. of Calico Rock, Ark., so he will get no help from his employer in paying the $200,000 in hospital bills accumulated so far in treating his injuries, which include multiple broken bones and torn ligaments in his ankle, three compression fractures in the vertebrae in his lower back and several cracked ribs near his solar plexus. Pegasus Tower Inc. is not affiliated with the similarly named Pegasus Tower Company LLC of North Tazewell, Va., an antenna-site marketing, acquisition, leasing, management and construction company.

Surgery

Hansel has had reconstructive ankle surgery, where a plate and screws were inserted to stabilize the joint. Because he has no insurance, every trip to the hospital goes through the emergency room, costing thousands of dollars per visit.

"Now I am broke and almost homeless," Hansel said. "My employer's advice was for me to file for Social Security disability, but I can't because all of my injuries will heal."

When the accident occurred on July 17, Hansel was working with two others who only spoke broken English. They were stacking a tower with a gin pole and crane when there was a miscommunication concerning the adjustment of the J bolts on a ladder that Hansel was standing on. The ladder came loose at the top, swung out and broke away from the tower. Both Hansel and the ladder then fell nearly 50 feet to the ground, according to Hansel.

"The ladder got hung up on parts of the tower, which slowed down the fall enough so that the impact did not kill me," Hansel said. "On a scale of one to 10, the pain was about a 17."

Hansel said he was wearing a harness but was given only one lanyard, so his only tie off point was to the ladder.

To pay his hospital bills, Hansel said he intends to sue Pegasus Tower, claiming that he was an employee of the company and thus would be eligible for workers' compensation.

On its website, the Internal Revenue Service advises as follows: "Under common-law rules, anyone who performs services for you is your employee *if you can control what will be done and how it will done.* This is so even when you give the employee freedom of action. What matters is that you have the right to control the details of how the services are performed." [Emphasis in the original]

Hansel is looking for work in the tower industry again, but he said his doctors told him he will need three months more of recovery, time he will spend with cousins in Oklahoma. He has two and a half years of experience mounting and installing antennas and radio heads, RF sweeping and PIM testing. Hansel had only been with Pegasus Tower for two weeks. Before that, he was with Midwest Underground Technologies, and before that he worked for Capital Tower & Communications.

"As soon as my ankle heals, I want to climb again," Hansel said. "I am pretty good on top for upgrades and installations."

OSHA, which is investigating the incident, is no stranger to Pegasus Tower.

On June 14, 2004, OSHA conducted an inspection at Pegasus' construction of a 1,300-foot communications tower for the NBC news station in Madison, Wis., levying several fines involved with the unapproved use of a hoist to lift a load and a worker together, the use of nonstandard rigging and failure to enforce the use of hard hats.

Proper fall protection

In 2001, the agency inspected Pegasus' Channel 23 tower erection site in Akron, Ohio, and issued citations for violations including failure to protect employees from a 400-foot fall when employees used a dual-drum hoist line to access their workstations at the top of the tower. The $24,600 penalty was later reduced to $16,500.

A Sept. 30, 2002, decision in the Channel 23 case rendered by the Occupational Safety and Health Review Commission cited information provided by OSHA Compliance Officer Daniel Pubal. The document said Pubal expressed concern that Pegasus was not in compliance and that he advised that he expected the use of full body harnesses and double or split lanyards, unless they wanted to use nets. "After a number of visits, the compliance officer believed that Pegasus was not going to get the harnesses and he brought up posting an imminent danger sign with the site owner," the decision reads. "The site owner then put pressure on Pegasus to get the proper fall protection, after which compliance was achieved." ■

Optical Time Domain Reflectometers

Anritsu | Since 1895

Light it Up
with Confidence

© 2013 Anritsu Company

ACCESS Master™ **MT9083x2**
with Fiber Visualizer

Our New Enhanced All-in-one OTDR

The ACCESS Master™ MT9083x2 enhanced model now features a 7-inch widescreen TFT-LCD display for both indoors and outdoors, enhanced battery operation time (up to 12 hours), increased operating temperature range (−10° to +50°C) and new short-cut function keys weighing in at only 5.7 pounds.

Other Features:
> Up to 46dB dynamic range
> < 1m dead zones
> Up to 150,000 data points
> Supports single mode and multimode fibers
> PON testing up to 1x128 splits
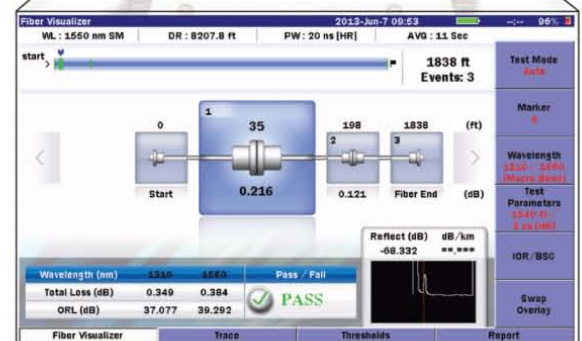
NEW Easy to use Software
The latest MT9083 version now includes **Fiber Visualizer** – designed to simplify. It features one-button fault locate function that automatically selects testing parameters to ensure correct setup and provide a simple, graphic summary of the fiber under test within seconds.

Find out more at: www.talleycom.com/Anritsu and download our **FREE APPLICATION NOTE: Fiber Optic Testing Simplified.**

Or call **1-800-949-7079** and speak to one of our Talley sales experts.

TALLEY®
You Connect the World. We Make it Easy.

/∧nritsu
Discover What's Possible™

construction

Antenna Mounts Can Be Victims of Carriers' Need for Speed

By J. Sharpe Smith

As carriers rush to deploy LTE base station equipment, including antennas, what waste results from this haste? One thing that keeps coming up is neglected antenna mounts. John Paleski, president, Subcarrier Communications, said that as the messengers bearing bad news, tower companies are put into a position of conflict with carriers when they discover new mounts are needed after a job is begun.

"You have to fight with carriers, because they don't want to [swap out antenna mounts]. They have a certain schedule [for LTE deployment] and they want to maintain it at any cost," he said. "The major reason for [the mounting issue] is when we are putting four TMAs [tower-mounted amplifiers] per sector, some mounts can handle it, but if it is one of the early angle-iron mounts that were only intended to handle a couple of antennas per sector, there is no way that it's going to support more than that."

Paleski related an incident the previous week where the tower company was put in the uncomfortable position of telling its boss, the carrier, that an LTE upgrade could not be made as intended because the mounts supplied for the installation were woefully inadequate.

"We notified the carrier that, in our judgment, the tower mounts were not adequate to support the new antennas and the new TMAs, but we were directed to finish the installation," he said.

As the Subcarrier crews progressed further and started to put the antennas and TMAs up, the antenna mount started to bow out and collapse in the center by a few inches, according to Paleski.

"The crews could see the metal stress caused by the increased weight. The angle-iron mounts were never designed for this type of load," he said.

So, again, the carrier was called and notified of stress issue on the mounts, but the carrier's representative replied that installation should be completed. Subsequently, three-quarters of the way through the installation, Paleski pulled his crews from the job, risking the ire of the carrier.

"I called the carrier personally and told them that from the ground, I could see the mounts bending, and there wasn't any wind," he said. "I told them this tower needs new mounts. These mounts will never do. They were not happy," he said.

Several days later, the carrier sent an engineer to the site who came to the conclusion that only one of the three sector mounts needed to be replaced.

"I couldn't believe what I was hearing," Paleski said. "I was exasperated. All the mounts were identical. The only reason one looked worse was that it had more equipment on it. I told the engineer they all need to be replaced, so he reformatted his letter and told the carrier to replace all the mounts."

Higher prices

Because the antennas, TMAs and old mounts had to be removed from the tower before the installation could begin again, the price tag nearly quadrupled.

Antenna mounts are the wild card of LTE deployment. Carriers do not have any documentation on what mounts have been deployed on towers because they were installed by third parties, according to Paleski, and that information was never transferred to a database.

"Some mounts are adequate; some are woefully inadequate," he said. "We quote these jobs, but have no idea what we will be faced with when we get there. It becomes incumbent on us to tell the carrier whether the mounts are adequate."

Instead of relying on the judgment of tower crews, who may not have a structural engineer on staff, carriers need to send a crew to each site to independently verify the mounts on the towers before the bidding process begins, Paleski said.

"Mount information should be included in the plans that we receive, so we will know before a tower crew is dispatched whether the mounts need to be replaced or not," he said. "As a result, the carrier could specify whether the mount needed to be replaced, and we could price our services accordingly." ■

AGL Photo / Don Bishop

www.agl-mag.com

Black & Veatch Angles for Public Safety Projects

By the AGL Staff

As proposed, the nationwide 700-MHz broadband public safety network that the First Responder Network Authority (FirstNet) wants to build promises to bring together companies from the different areas of the wireless industry, including cellular carriers, utilities and public safety entities. In one of the first of such alliances, wireless engineering giant Black & Veatch is teaming with public safety insider The Digital Decision (TDD).

Together, Black & Veatch and TDD will offer governance, planning, network design, financial modeling, program management and implementation services to state and local governments, said Paul Miller, Black & Veatch vice president of telecommunications.

The Middle Class Tax Relief and Job Creation Act of 2012 created FirstNet as an independent authority within the National Telecommunications and Information Administration to establish a single, nationwide, interoperable public safety broadband network. Congress earmarked $7 billion for network deployment, along with $135 million for new state and local grants administered by NTIA.

The development of a nationwide public safety network is a daunting goal that requires unprecedented cooperation among various state and local first responder organizations, not to mention cellular carriers, utilities and equipment vendors.

"The initial money, $7 billion, earmarked for this project will not fund an all-new build out for public safety," Miller said. "[Public safety] will have to leverage existing assets, maybe from the carriers and utilities or other entities in addition to what they already have."

Along with infrastructure-sharing, public safety may achieve advantages in sharing the 700-MHz D-block spectrum with cellular carriers and utilities, especially in rural areas. Partnerships between government and private entities are being studied as a possibility.

"The key is providing priority access for public safety communications," Miller said. "They will want and need that. Will that be tolerable for carriers and utilities?"

Black & Veatch brings to the partnership a focus on the other side of the planning process — making an inventory of public safety communications infrastructure assets and analyzing how public safety communications can best be transitioned to an LTE broadband network.

"Initially, we will need to perform conceptual design, some planning and estimating of what it will take to get them from what they have today to the FirstNet nationwide broadband network," Miller said. "We are trying to leverage our nationwide footprint that we have achieved through working with the carriers. Also, we have experience and skills designing and implementing robust, hardened networks with utilities and public safety."

Network benefits

With states having the choice whether to opt in or out of the FirstNet, one of the first orders of business will be to convince them of the benefits of being part of the network. States and their local partners will need to be informed about financial, regulatory and general network factors. TDD has experience developing and negotiating statewide public safety broadband network governance models for the state of New York and its 57 counties, and for Louisiana and the cities of Baton Rouge and New Orleans.

"TDD has helped different entities, including states, set up agreements and memorandums of understanding that will support interoperable networks," Miller said. "They have that background, and we felt that was a gap for us at Black & Veatch. With FirstNet's near-term focus on the state planning process, we felt like we needed a teammate that had that experience from putting organizations together, the governance models and outreach. TDD is known for those activities. We thought it was a good team to put together." ■

AGL Photo / Don Bishop
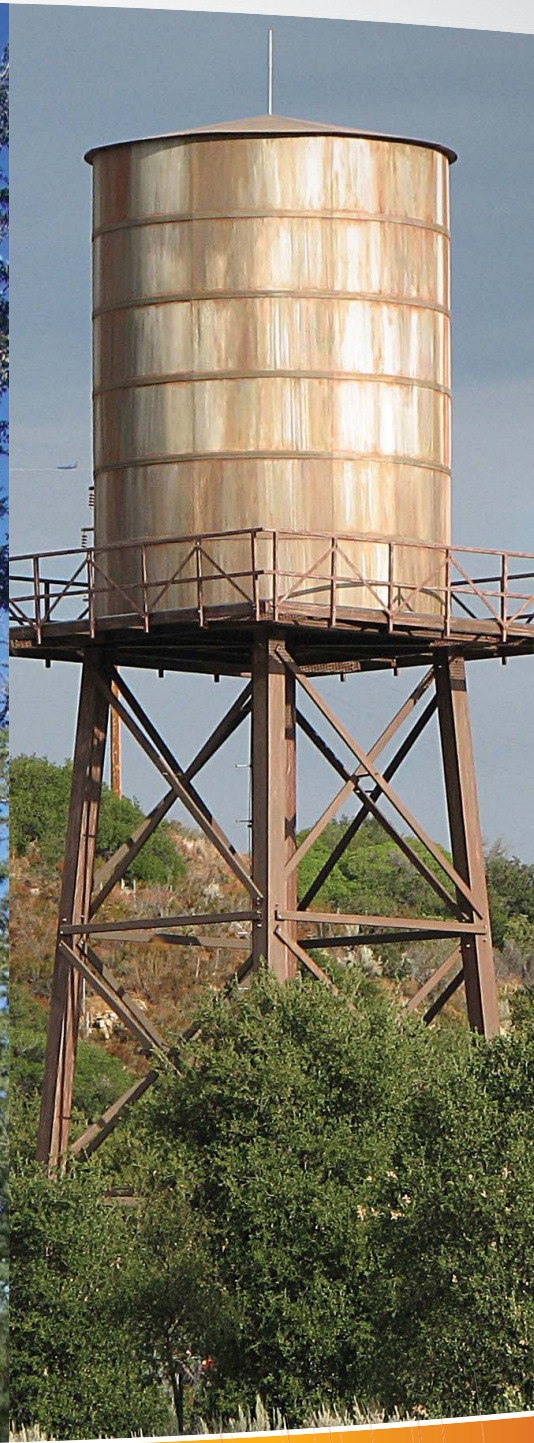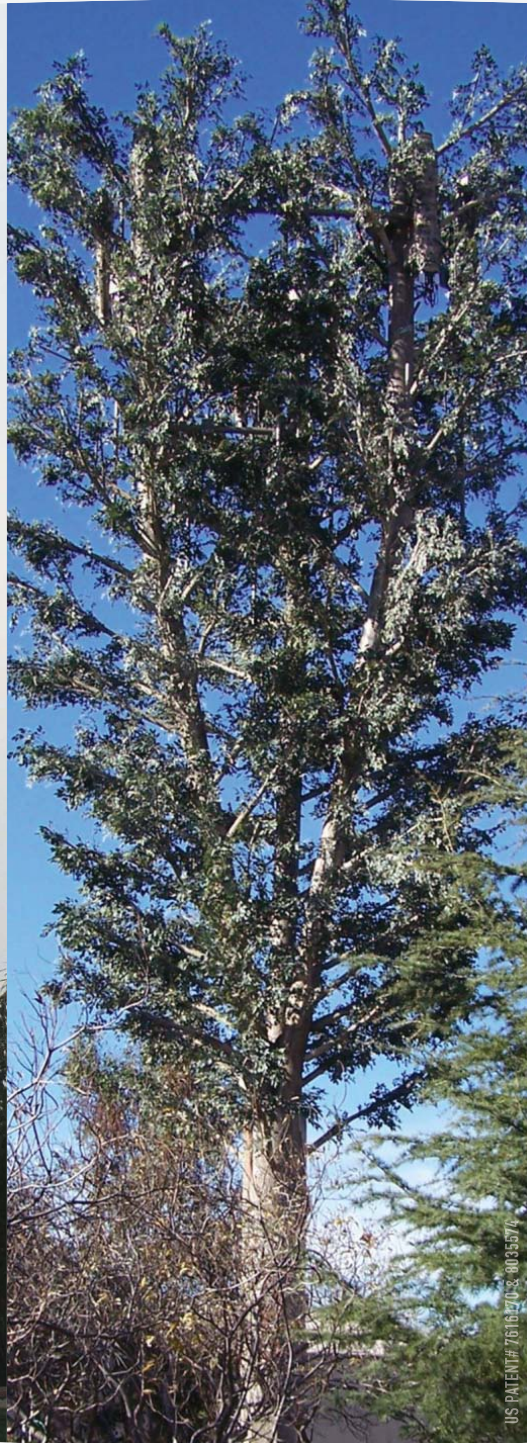
Wireless Infrastructure Concealment Systems

Solar Communications International's products are the ideal choice for integrating wireless infrastructure into the community character. The SCI Patented MonoEucalyptus is designed for 4G/LTE equipment capacity and serviceability. No other monotree comes close!

SOLAR COMMUNICATIONS INTERNATIONAL

FOR INFORMATION ABOUT OUR CONCEALMENT SYSTEMS, PLEASE CONTACT US AT:

619.243.2750

8885 Rio San Diego Drive
Suite 207
San Diego, CA 92108

www.RFTransparent.com

Small Cell Forum Releases Help Mobile Network Operators

Releases for home, enterprise and public access/metro are intended to stimulate innovation with small cells and the proliferation of small-cell deployment among mobile network operators worldwide.

By Gordon Mansfield

Speaking at the Tower & Small Cell Summit in Las Vegas, the chairman of the Small Cell Forum, Gordon Mansfield, delivered the keynote address. Here are his remarks, edited for length and style.

Small cells give mobile network operators the opportunity to improve coverage, capacity and radio-frequency spectrum efficiency. With spectrum constraints that U.S. wireless carriers have, they must get more out of their spectrum. The way to do that is to shrink cells. Small cells give a big capacity uplift in a particular area. Using smaller power nodes at a greater density enables new applications. Great coverage and penetration with small nodes give carriers more ability for triangulation and location-type functionality, which opens the door for new applications. These apply in the home with femtocells, in the office with enterprise cells and with metro cells and rural deployments.

Figure 1 shows traffic offload for UMTS small cells. The metrics for LTE and other technologies may differ. What the UMTS study shows is that four ideally placed small cells within a macro cell can increase the amount of traffic handled by 56 percent. It doesn't take many small cells if they are ideally placed. They must be placed where the

traffic is greatest to obtain significant benefits.

Figure 2 shows the user experience with small cells in an ideal environment and the aggregate of macro users and small-cell users combined. With four small cells, median throughput increases by 315 percent. Meanwhile, taking some traffic and offloading it

onto the small cells also improves the performance of the macro. Thus, when it comes to small cells, it's not just about small cells or macro cells. It's about small cells and macro cells and the inherent benefits of both.

In the marketplace, 98 percent of mobile operators agree that small cells are key to the future of mobile
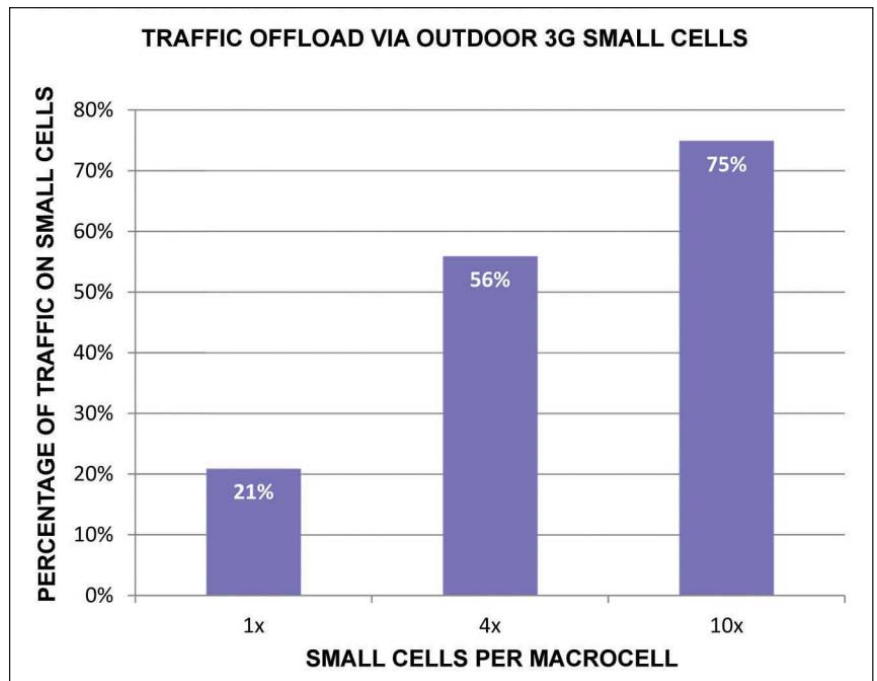

Figure 1. Ideally placed small cells within a macro cell can increase the amount of traffic handled by as much as 56 percent with as few as four small cells. They must be placed where the traffic is greatest to obtain significant benefits.
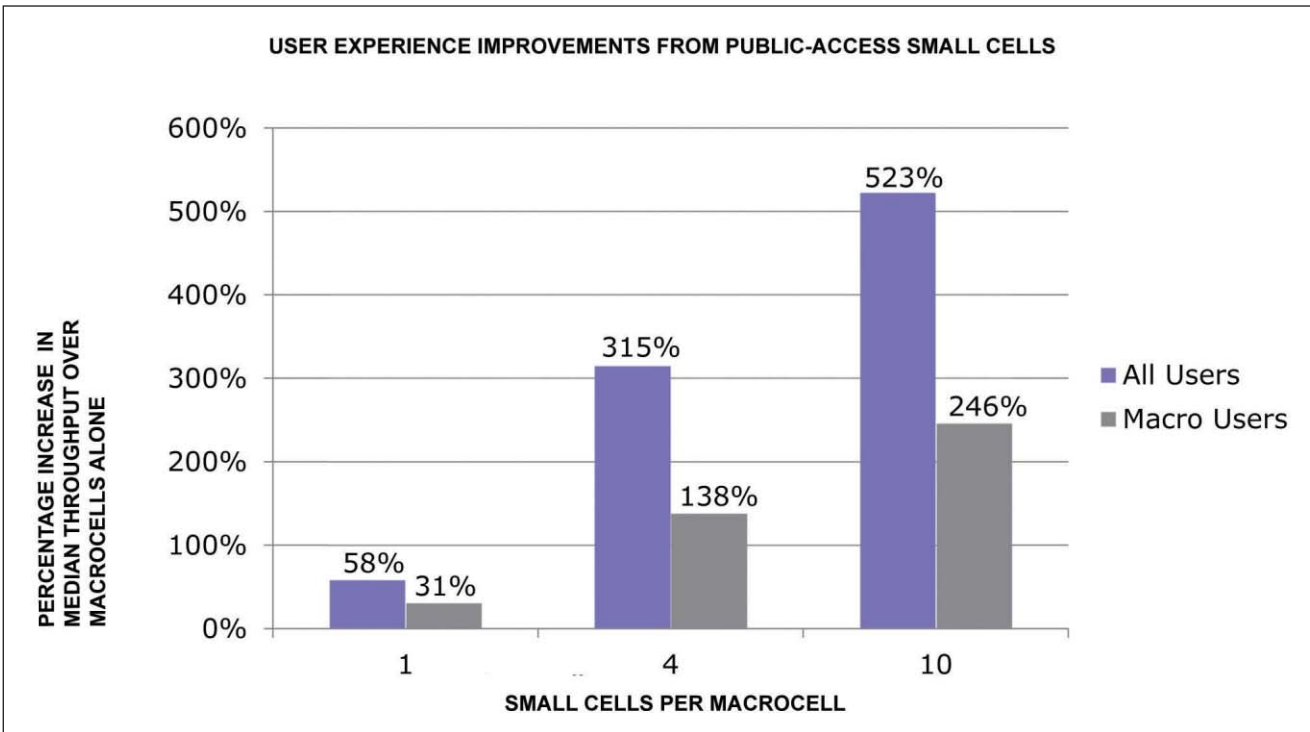
Figure 2. Public-access small cells improve the user experience. With four small cells, median throughput increases by 315 percent. Meanwhile, taking some traffic and offloading it onto the small cells also improves the performance of the macro.
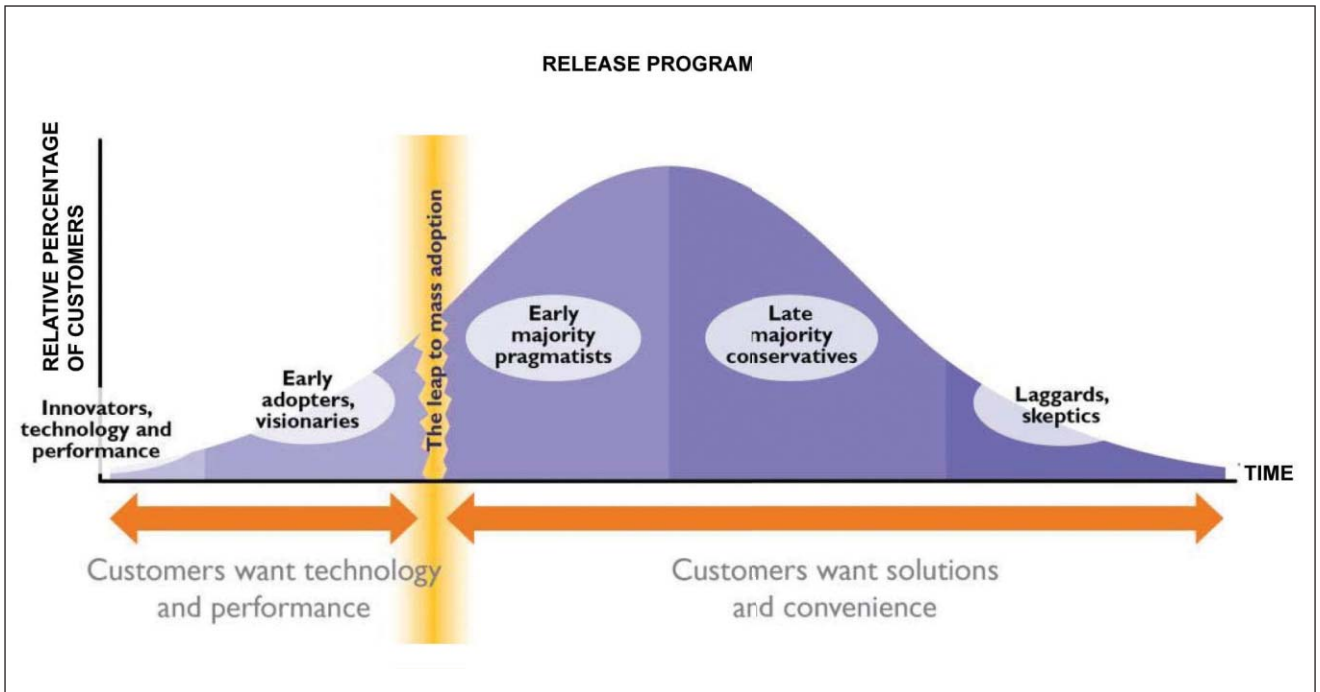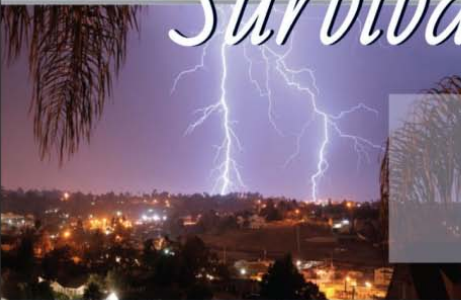
small cells

Figure 3. The Small Cell Forum's Release Program is intended to collect information in the early stages of deployment and offer it in an easy to understand format for mobile network operators. Small cell development begins with innovators, followed by early adopters such as AT&T, Vodafone and Sprint. Next come the early major pragmatists, then the late majority conservatives and finally the laggards and skeptics.

networks. Maybe the 2 percent who haven't said so weren't asked the right question. There's not one operator I talked with anywhere around the world who doesn't have some view that small cells are necessary for the future of their networks.

Nine out of 10 operator groups by revenue are deploying small cells. A significant portion is femtocells. Operators are getting beyond the focus on residential and enterprise and starting to focus on in-building enterprise in public areas. Although 98 percent of operators say small-cell technology is important, only 50 pioneering companies have been aggressive in deploying this technology. Is the operator community not clear on how, why and what to deploy?

In response, the Small Cell Forums created the Release Program. At the far left in Figure 3 are the innovators, where it all starts. Many innovative companies started by creating small-cell technology, followed by early adopters such as AT&T, Vodafone and Sprint that started deploying femto technology and exploring small-cell capabilities.

Next come the early major pragmatists, then the late majority conservatives and finally the laggards

and skeptics. The Release Program is intended to collect information in the early stages of deployment and offer it in an easy to understand format for other operators. How does this work? How can they deploy? How can they do it in a cost-effective way? That's the intention behind the release program.

The release program is the Small Cell Forum's how-to guide intended to accelerate commercial deployments of

small cells. It encompasses residential, enterprise, metro and rural deployments. An operator can go into the release program, pull multiple documents and see what other operators have done. It gives vendors a data resource that details what's been done, what's worked and what hasn't to help them ensure they are developing products based on mobile operator requirements and successful roll out experiences. The Forum

Small Cell Forum

The Small Cell Forum was founded in 2007. It's an independent, inclusive and international body that involves all aspects of the ecosystem for small cells. The membership is made up of 67 operators covering 3 billion mobile subscribers (roughly just under half of the world's total) and 75 small-cell technology providers. Members include access point providers, DAS providers, core network providers, and self-organizing network (SON) solutions and chipset manufacturers. The Forum is focused on the licensed aspects of small-cell technology. Although Wi-Fi integration is an important aspect of small-cell technology, the Forum doesn't focus on Wi-Fi independently as a stand-alone technology.

What is a release?

A how-to guide to accelerate commercial deployments of small cells, encompassing residential, enterprise, metro and rural use cases.

For operators: All you need to know for small-cell deployment.

For vendors: Support to develop products based on mobile operator requirements and successful roll out experiences.

The work of the Forum:

- Stimulate investment
- Identify barriers
- Profile features
- Capture operator requirements
- Share learnings
- Gather ecosystem
- Organise plugfests
- Market updates

SCF Release

- Compliance certification
- Maintenance
- Standards
- VOLUME
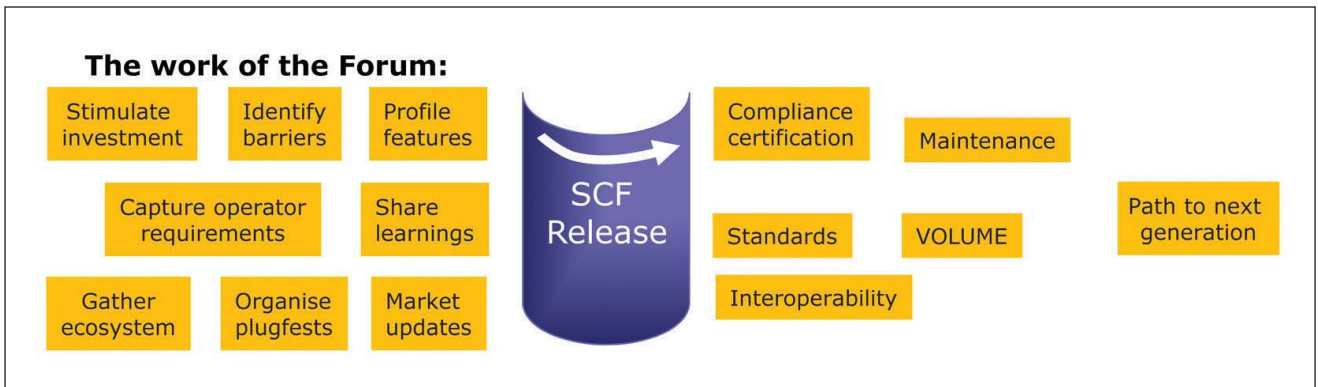- Interoperability
- Path to next generation

Figure 4. A Small Cell Forum release is a how-to guide intended to accelerate commercial deployments of small cells. It encompasses residential, enterprise, metro and rural deployments. An operator can go into the release program, pull multiple documents and see what other operators have done. It gives vendors a data resource that details what's been done, what's worked and what hasn't, to help them ensure they are developing products based on mobile operator requirements and successful roll out experiences.

starts by simulating the investment, obtaining the operator requirements, and building and gathering the ecosystem. Then the release is ready. We start some of the early, shared learning and some of the early capabilities so others can take it forward (see Figure 4).

The first release program, SCF 1, was introduced at the Mobile World Congress. Because the Small Cell Forum started as the Femto Forum, it had a wealth of documents focused on the home.

The releases are broken down by themes (see Figure 5). The next theme that the Forum is working on is enterprise. We're also working on content for enterprise and then public access, metro. Those next two releases are coming out over the next 12 months. We don't wait for all of the material to come together for a theme before we publish documentation.

With public access, backhaul often is cited as a barrier. The first release
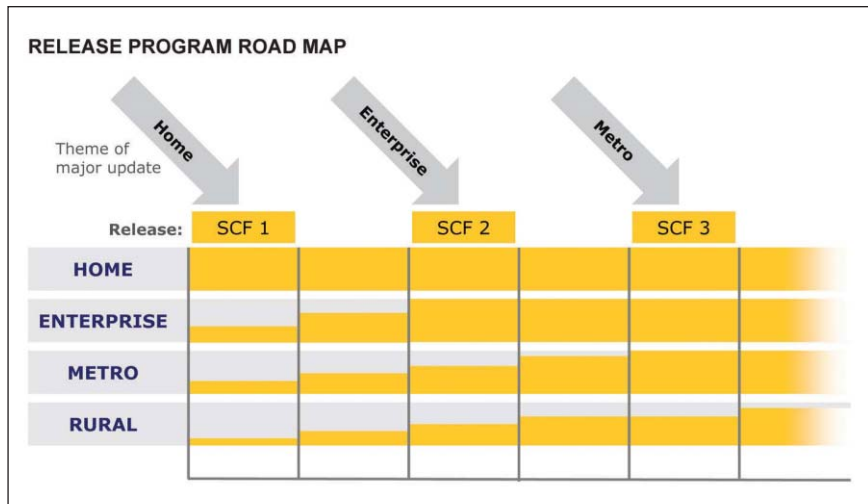
Figure 5. The first release program, SCF 1, was introduced at the Mobile World Congress. Releases are broken down by themes. The next theme is enterprise, to be followed by public access, metro. The next two releases are coming out over the next 12 months.

includes a white paper that covers the various wireless and wired alternatives for backhaul.

The Forum also has published "Integrated Small Cells" as part of the first release, and it continues to work with the Wireless Broadband Alliance to ensure the interaction and integration between cellular and unlicensed Wi-Fi is expanded.

October 2013

OPERATOR SURVEY

WHAT FACTOR IS MOST LIKELY TO AFFECT PUBLIC ACCESS SMALL CELL DEPLOYMENT?

- OTHER 5.0%
- ABILITY TO SELF-OPTIMIZE (SON) 14.6%
- ABILITY TO COEXIST WITH EXISTING MACRO CELLS 24.9%
- ABILITY TO MANAGE INTERFERENCE 13.0%
- COMPATIBILITY BETWEEN DIFFERENT VENDOR EQUIPMENT 13.8%
- BACKHAUL 28.7%

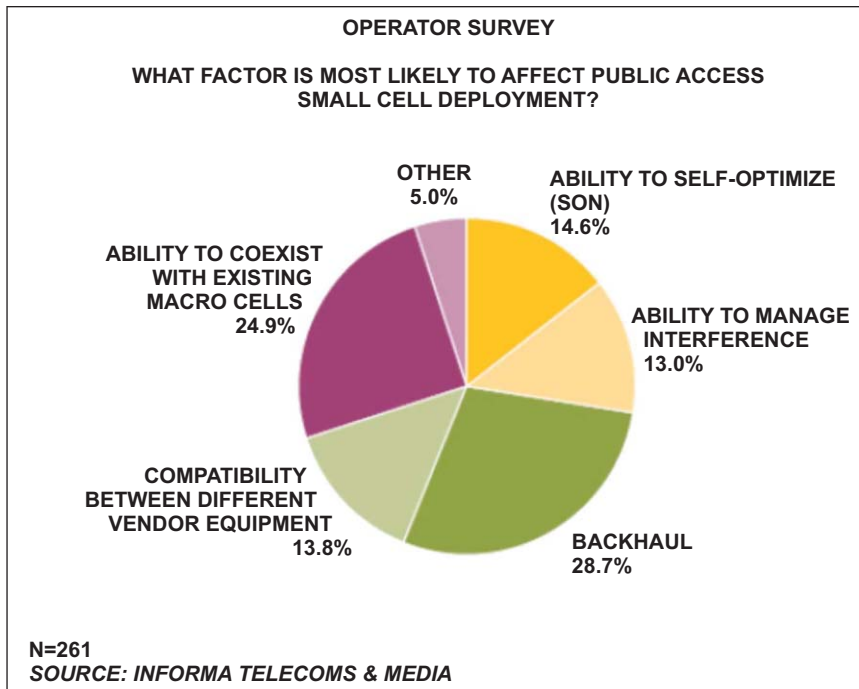N=261
SOURCE: INFORMA TELECOMS & MEDIA

Figure 6. A survey of mobile network operators indicates the factors most likely to affect public-access small-cell deployment. The ability to coexist with existing macro cells, compatibility among vendors and the ability to manage interference and self-organizing networks are interrelated.

AT&T has deployed 3G femtocells, marketed as 3G micro cells. It offers five-bar indoor coverage supporting four users in residences. It's meant to be simple out of the box. With these volumes, it has to be simple. The common user has to be able to plug it in, and it has to work. Femtocells have to integrate with key carrier billing, RF planning and regulatory systems. There can be no interference.

It would not be surprising to see capabilities that originated in the residence being applied to other uses to find simpler ways to install small cells in a public way as well. AT&T announced that as part of its Velocity IP program, it intends to deploy 40,000 public-access small cells over the next three years. They are low power, less than 5 watts, and are intended to cover small, targeted areas. No one should think that AT&T is replacing its macro network with small cells. That's not practical, but enhancing the macro coverage in a targeted way is highly practical. Some will be indoors and some will be outdoors on buildings and utility poles.

As part of the Velocity IP program, AT&T is also committed to building 1,000 distributed antenna system (DAS) networks. Some use cases are more ideally suited for small cells, and some for DAS. From a low-volume, single-carrier perspective, small cells make better economic sense, and DAS is more useful in a neutral-host venue with a dense population. Over time, small cells will use neutral-host capabilities. Some vendors are working on neutral-host capabilities for small cells. It always comes down to the economics of the build versus the technical capabilities to be delivered.

AT&T's small-cell strategy has integrated Wi-Fi as a component to make it carrier-grade Wi-Fi. The company wants its network to be able to move traffic to Wi-Fi or the cellular interface based on applications, conditions and other factors based on policy functions. The result won't necessarily be the open-access widely seen today. It will be carrier-grade to support steering that traffic between Wi-Fi and cellular based in a variety of conditions.

Operators

A survey of operators indicates the factors most likely to affect public-access small-cell deployment (see Figure 6). The ability to coexist with existing macro cells, compatibility among vendors and the ability to manage interference and self-organizing networks are interrelated. Compatibility among products from different equipment vendors may mean the ability to coexist with the macro network. The ability to manage interference is all about the ability to coexist with macro networks. It would be difficult to find anyone who believes the ability for small cells to coexist with the macro network can be achieved without SONs. In response, the Small Cell Forum has completed a new round of operator requirements more focused on public access.

Most people think about small cells as being a capacity play for an urban environment, yet some good deployment activity is going on in rural areas. Small cells aren't just about capacity; they can be used in a cost-effective way in small villages.

In North America, all mobile network operators are deploying LTE or soon will be, and small cells have a place with LTE.

Timing and synchronization for small cells pose a problem, but work is being done to overcome it.

When small cells are deployed on light posts, the sides of buildings and bus stands, the form factor has to be aesthetically appealing. Municipalities are not likely to allow operators to put big hunks of metal wherever they want.

When it comes to multiple-standard radio resource management and X2 interoperability, many people say small cells will only achieve compatibility with the macro network if they are made by the same vendor as the macro. But that is not necessarily true.

Self-organizing networks are crucial for integrating small cells with the macro network, and a lot of work has been done to create standards in that area.

It's important to integrate the small cells with the Wi-Fi enterprise architecture, security and regulations, and tie it all together to make sure it works.

The work in progress is leading to open, multi-technology. It's intended to address what network operators say is most likely to affect their small-cell deployments. Bearing in mind that 98 percent of operators say that small cells are important, the Small Cell Forum wants to help with the development of a full ecosystem of small-cell support. The key benefits include improved coverage, greater capacity, spectrum efficiency and new applications. The Forum is delivering a release plan to support commercial deployments for residential, enterprise, metro, rural and other uses. ■

Gordon Mansfield is chairman of the Small Cell Forum and assistant vice president of small-cell solutions at AT&T. He spoke at the Tower & Small Cell Summit in Las Vegas on May 22, 2013. The graphics in this article are from, or are based on, images provided by the Small Cell Forum. More information and white papers are available from the Forum at *www.smallcellforum.org*.

state legislation

Are You in a Wireless State (of Mind)?

States that have implemented legislation to streamline wireless facility siting should be commended for their forward-thinking attitude toward the infrastructure that will power future growth.

By Jonathan M. Campbell

The race to ubiquitous 4G is on, fueled by staggering capital investment in network infrastructure driven by equally staggering consumer demand. Just as water takes the path of least resistance, investment flows naturally to where it can make the most impact. Perhaps this is why over the first half of 2013, many state legislatures took up bills that help ensure that every cent possible of wireless capital investment is properly applied toward the deployment of next-generation networks. State legislators are doubling down on wireless' economic, social and public safety benefits on behalf of their constituents. The recent spate of state wireless siting legislation shows that the hard work of

re-evaluating legacy regulations is not borne by the federal government alone.

The pace of regulatory change over the past year and a half appears to mark an inflection point in wireless broadband deployment, and particularly infrastructure deployment. In early 2012, Congress passed the Middle Class Tax Relief and Job Creation Act of 2012 (TRA), which includes a section codifying the ability of wireless broadband companies to attach their equipment to existing structures regardless of local zoning laws. This change to federal policy was designed to promote both commercial broadband deployment and public safety communications applications, and the breadth of its impact was perceived by

many in the industry and local governments as the ultimate expression of congressional intent to promote infrastructure deployment. Yet, that has not made state governments shy to jump on the bandwagon. In 2012, within a matter of months after the TRA's passage, Michigan and Pennsylvania both passed legislation based on the principles of, and compatible with, the TRA, recognizing that it has a direct and positive impact on their state economies.

In 2013, five more states have agreed with Michigan and Pennsylvania; several have substantially reformed wireless infrastructure siting from the ground up. For example, Wisconsin's AB 40 establishes a holistic wireless facility siting policy that streamlines, among other things, the application process for new facilities, collocations, *and* modifications of existing facilities. Others have more modest (but no less effective) goals. Connecticut HB 6360 provides a presumption of public need for personal wireless services. In our daily use of wireless services, we all know this to be true, but codifying such an assumption is a major step in removing regulatory hurdles.

These bills share common elements that strike at the heart of the regulatory and practical barriers to facility siting. Most of them address collocation

in some fashion, acknowledging the TRA but also going further to shorten the deadlines by which local governments must respond to collocation applications. Many are forward looking, planning for non-traditional wireless facilities such as small cells and distributed antenna systems inside buildings, on utility poles and light standards. A few even outline in considerable detail what local governments may or may not consider in evaluating applications for all types of wireless facilities.

States that have implemented legislation to streamline wireless facility siting should be commended for their forward-thinking attitude toward the infrastructure that, like the highway and electrical systems before it, will power future growth. To give their states a head start in the network deployment race, legislators should consider bills that:

- Define how local jurisdictions review applications for wireless infrastructure while respecting local jurisdictions' zoning authority
- Apply administrative (i.e., ministerial) review processes to collocations and modifications of facilities that take advantage of placement on non-traditional support structures commonly used for wireless facilities (water towers, rooftops, etc.)
- Rationalize consultant review fees to provide business and technical justifications for the deployment because it is a foregone conclusion at this stage that more and better wireless broadband is needed to promote national, state, and local consumer, public safety, business, health, and education goals (especially in light of the streamlining effect of the TRA)

California is an excellent example of what states should not strive for. In an egregious example of investment-stifling regulation, a permit for a wireless facility can be limited to a term of only 10 years. At the end of that term, local authorities can require radical modifications to the facility, including decreasing the tower's height or removing the facility altogether. Putting aside the havoc that wreaks on network design, such a policy creates uncertainty for investment. It hardly allows for 4G deployment, let alone generations of technology to come.

Ultimately, any proposed legislation should strive for predictability in the application process through clear instructions and deadlines, and communicate that wireless infrastructure is as important as power grids, road systems and other traditional infrastructure that already benefit from clarity in the regulatory process.

Even the most tailored legislation can have a profound effect on network deployment, and like the states mentioned, it's high time that policymakers kick the tires on their regulatory regime to ensure that they aren't riding in the slow lane. ∎

Jonathan M. Campbell is director of government affairs at PCIA – The Wireless Infrastructure Association.

OCTOBER

AGL TOWER OF THE MONTH
www.agl-mag.com

TOWER OWNER
SBA Communications

MANUFACTURER
Sabre Industries

HEIGHT
184 feet

YEAR BUILT
2006

TENANTS
Three

TOWER TYPE
Monopole

LOCATION
Spring Valley, Wis.

Putting the "Super" Back in Supervisor

OSHA's attempt to make hourly employees supervisors should put employers on notice to provide training to identify potential hazards on the jobsite or take steps to avoid inadvertently allowing hourly employees to give directions to one another.

By Mark A. Lies II and Kerry M. Mohan

In order to establish a violation, the U.S. Occupational Safety and Health Administration (OSHA) must prove a critical element, that is, employer knowledge, which is typically shown with evidence that a supervisor or foreman "knew or should have known" of the violation. Because employers know (and so does OSHA) that supervisors cannot possibly be present at every location all the time to observe employee conduct, OSHA has attempted to expand employer knowledge by claiming that hourly employees are "supervisors" under the Occupational Safety and Health Act simply because one hourly employee may temporarily direct one of his or her less-senior co-workers, even if this hourly employee lacks any authority to hire, fire or discipline the other employees. Based on this interpretation, OSHA has increasingly begun to claim that an hourly employee is a temporary "supervisor" in every instance in which two employees are working together because one is able to tell the other what to do.

The following information addresses OSHA's increasing attempt to claim hourly employees as supervisors to issue more citations, and how it may conflict with a recent Supreme Court decision limiting who "supervisors" may be under Title VII of the Civil Rights Act of 1964 involving the Equal Employment Opportunity Commission, another entity within the U.S. Department of Labor.

Employer knowledge

The Occupational Safety and Health Act and regulations promulgated by OSHA do not impose strict liability. Employers are not liable under the Act or a particular OSHA standard simply because a violative condition exists or an accident has occurred. An OSHA citation can only be upheld if OSHA proves that the employer either knew, or, with the exercise of reasonable diligence, could have known of the presence of the violative condition. Because many employers are corporations, it may be difficult to determine what a corporation "knows." Case law involving OSHA citations, therefore, has established a general rule that the actual or constructive knowledge of an employer's foreman or supervisor can be imputed to the employer. In other words, if OSHA

AGL Photo / Don Bishop

www.agl-mag.com

safety

can prove that a supervisor or foreman knew or, with the exercise of reasonable diligence, could have known that a violative condition exists, OSHA can satisfy the employer knowledge element of its burden of proof in a contested case.

Who is a supervisor or foreman?

According to OSHA Review Commission precedent, "[a]n employee who has been delegated authority over other employees, even if only temporarily, is considered to be a supervisor for purposes of imputing knowledge to an employer." *M.C. Dean, Inc.*, 23 O.S.H. Cas. (BNA) 1800, 1803 (O.S.H.R.C. 2011); *Diamond Installations Inc.*, 21 O.S.H. Cas. (BNA) 1688, 1690 (O.S.H.R.C. 2006). Thus, it is not the employee's title or compensation structure that controls whether (s)he is a supervisor, but whether, in substance, the employee is empowered to direct other employees on behalf of the employer.

Under this broad rule, even hourly employees assigned to be a "lead" for a day could be considered part of management for purposes of imputing knowledge to the employer. Such was the case for M.C. Dean. On August 17, 2009, a journeymen electrician from Dean fell through a skylight on a warehouse roof and suffered fatal injuries. Following this accident, OSHA cited Dean, alleging that Dean also failed to properly guard the skylight.

Dean argued that because all of its three journeyman electricians working at the site were hourly employees, the company could have had no knowledge of any potentially hazardous condition that they encountered on the roof, and the OSHA citation should be vacated.

> **Case law involving OSHA citations has established a general rule that the actual or constructive knowledge of an employer's foreman or supervisor can be imputed to the employer.**

The administrative law judge rejected the company's argument, finding that one of the hourly journeyman electricians was, in fact, a "supervisor." The judge found that the journeyman electrician in question had been assigned as the "lead" for the day of the accident and had been delegated the ability to control the method and manner in which he performed the assigned tasks, as well as the ability to assign tasks to the other journeymen. Ultimately, the judge found that Dean had delegated supervisory authority to the journeyman electrician for the day of the accident, and that his knowledge of the potentially hazardous condition

Providing the telecommunications industry with a single turnkey solution.

Contact Sabre today for all your project needs.
800-369-6690 | www.SabreIndustries.com

Sabre Industries™

MUTI
Sabre Industries Telecom Services

safety

was properly imputed to the employer.

Dean appealed the decisions of the administrative law judge and the OSHA Review Commission to the U.S. Court of Appeals for the 11th Circuit. The appeals court upheld the OSHA Review Commission's decision, finding that the "lead" had sufficient supervisory authority to qualify as a supervisor. *M.C. Dean, Inc. v. Secretary of Labor*, 505 Fed. Appx. 929, 934-35 (11th Cir. 2013). The appeals court also found that, even though the "lead" employee lacked the ability to hire, fire, or discipline other employees that was not dispositive as to his supervisory status.

"Supervisors" under Title VII

OSHA's increasing attempt to claim hourly employees as supervisors may run in conflict with a recent Supreme Court decision in *Vance v. Ball State Univ.*, 2013 U.S. LEXIS 4703 (U.S. June 24, 2013). In *Vance,* the Supreme Court addressed the issue of who can be considered a "supervisor" under Title VII, which prohibits employers from discriminating and harassing employees based on race, sex and several other characteristics. Under Title VII, an employer can be held strictly liable for a supervisor's harassment of a subordinate. Thus, an employer's ability to defend itself from a harassment claim can rest on whether the alleged harasser is or is not a supervisor.

In *Vance*, the Supreme Court found that the term "supervisor" encompasses only management-level employees who have the ability to effect "a significant change in employment status, such as hiring, firing, failing to promote, reassignment with significantly different responsibilities,

> ## OSHA's increasing attempt to claim hourly employees as supervisors may run in conflict with a recent Supreme Court decision.

or a decision causing a significant change of benefits." In so holding, the Supreme Court expressly rejected the EEOC's definition of "supervisor" and held that "supervisor" status is equated with the ability to exercise "significant direction over another's daily work."

OSHA's interpretation

Although the *Vance* decision addressed a different statute than the Occupational Safety and Health Act, the Supreme Court's logic seemingly applies to OSHA. Similar to the EEOC in *Vance*, OSHA attempts to make hourly employees supervisors on the mere fact they may direct or assign less-senior employees, even if such

safety

employee has no authority to hire, fire or discipline the other employees. The Supreme Court, however, affirmatively rejected the EEOC's approach, which raises the question whether the Supreme Court would strike down OSHA's definition of "supervisor." But until more employers challenge OSHA's approach to federal circuit courts (and potentially the Supreme Court), the question of who is a "supervisor" for OSHA will remain unclear.

Implications of OSHA's attempt

Particularly troubling about OSHA's claim that hourly employees can be considered "supervisors" is that it may act differently during the inspection. Under existing case authority, the employer has a right to be present for interviews of management representatives, but not for hourly employee interviews. Thus, during the inspection, OSHA may claim that an employee is

hourly to prevent the employer from being present during the interview, but then later claim that the employee was a supervisor based on what (s)he said during that exact same interview.

This conduct by OSHA during its inspection is an example of the difficult quandary into which OSHA can place an employer on deciding how to respond.

► On the one hand, if the "lead" employee is an hourly employee, he would have the right to be voluntarily interviewed by the OSHA inspector in private (although any employee has the right to have another individual of their selection present for the interview), but his knowledge of an alleged hazard could not be imputed to the employer.

► On the other hand, if the "lead" employee is a management employee, his knowledge could be imputed to the employer, but his interview would have to be held in the presence of

counsel or another management representative at the employer's election.

Thus, employers must be aware that they cannot rely on an inspector's representation that a particular employee will not be considered as part of management during the interview process and the employer may have to assert its rights or they are waived.

Accordingly, it is recommended that all employers carefully evaluate the degree to which they delegate authority to a shift "lead," "field supervisor" or other hourly employees and consider the following:

● In assigning a shift "lead" who is an hourly employee, ensure that the individual is fully trained to inspect the worksite and identify potentially hazardous conditions and report any such conditions immediately to management. On construction sites, this individual would be the "competent person."

● Consider alternatives to assigning

safety

a shift "lead," such as assigning a management point person to direct the method and manner of the work with input from field personnel as the job progresses.

- When assigning a shift "lead" who is an hourly employee, delegate specifically rather than broadly. Instead of giving the "lead" person a general instruction to "get the job done safely," give specific instructions as to the method and manner in which the job is to be done, i.e., specific practices to be followed or equipment to be used to limit the assertion that the employee has general supervisory authority.

- In the event of an OSHA inspection, ensure that the inspector is immediately directed to a management point person instead of the informal shift "lead." If the OSHA inspector remotely infers or somehow states that a shift "lead" is a supervisor, then the employer

should insist on having legal counsel, another management representative or both present during any interviews with the "lead." Ask OSHA to commit to its position in writing, and if the inspector will not do so, which is likely, then the employer must memorialize in writing what the inspector represented.

- If OSHA considers an hourly employee to be a member of management, legal counsel, another management representative or both have the right to attend the employee's interview. If the inspector refuses to permit legal counsel or other members of management to attend the interview, the employer may refuse to allow the interview to proceed until legal counsel is consulted or the OSHA area director is called to address the issue.

- If the employer decides to allow the interview to proceed, notify

the inspector in writing that the interview is being allowed "under protest" and that the employer will object to the introduction of any evidence obtained during the interview.

If the employer carefully assesses the status and responsibilities of each of its employees prior to an OSHA interview and asserts its rights to be present at the interview, if warranted, the employer can avoid a potential waiver of its rights and the prospect of an unrepresented employee making binding admissions of legal liability during an OSHA interview. ∎

Mark A. Lies II is a partner in the Seyfarth Shaw law firm Chicago office. His email address is _mlies@seyfarth.com._ Kerry M. Mohan is an associate with the firm in the Chicago office. His email address is _kmohan@seyfarth.com._

Do Higher Interest Rates Lead To Lower Tower Valuations?

Tower Valuations Remained Strong During The First Half of 2013.

Thanks to the strong fundamentals of wireless and towers, the availability of low-cost debt, a limited supply of towers for sale and a large pool of tower buyers, valuations for tower assets during the first half of 2013 were at all-time highs. Given the rush by many sellers to complete transactions prior to the end of 2012, a supply-demand imbalance developed (many well-financed tower buyers and few assets for sale) in early 2013, leading to a further increase in tower valuations.

What Does The Rest of 2013 Hold For Tower Owners and Tower Valuations?

Media Venture Partners ("MVP") believes the single most likely risk factor that could impact tower valuations in the near-term is rising interest rates. Although there are other risk factors such as wireless consolidation or a slowdown of network builds by the carriers, a low-interest rate environment has helped fuel the attractive prices paid by both public and private tower buyers. Despite treasury notes and mortgage rates increasing slightly over the last several months, MVP believes tower companies with long-term, low-cost debt facilities will be able to continue to offer similar prices for tower assets in the foreseeable future. Continued hikes in interest rates in the U.S. even greater than the increase of nearly 1% since May, however, could result in a drop in tower values by tower buyers.

What Are Your Best Options? *What Are Your Towers Worth?*

Contact MVP for a confidential discussion about your towers. No hyperbole and no scare tactics. Simply a straightforward perspective from a professional and experienced intermediary in the tower industry. We've been representing tower owners for nearly 16 years and we'll continue to be a trusted advisor for tower owners for many years to come.

Select 2012 and 2013 transactions:

AMERICAN TOWER®	Milestone	PEGASUS TOWER		CAPITAL
has bought the broadcast facility at the John Hancock Center, Chicago	has sold 21 towers in Virginia to CROWN CASTLE	has sold certain tower assets to SBA	has sold one broadcast tower in Massachusetts to K2 TOWERS	has sold certain tower assets to GRAIN MANAGEMENT

Since 1997, MVP has completed more than 120 tower and 80 wireless and spectrum transactions with an aggregate value of more than $2 billion. The firm's professional staff offers strategic counsel and financial advisory services related to M&A, private equity and debt capital placements, financial restructurings, valuations and appraisals.

MVP

MEDIA VENTURE PARTNERS
Telecom • Media • Technology

For a confidential discussion or more information,
Call 415.391.4877 or visit www.mediaventurepartners.com

San Francisco | Boulder | Kansas City | Boston

Securities and Advisory Services are offered through Financial Telesis Inc., Member SIPC/FINRA.

tower loading

Structural Stresses Add New Complexity To LTE Rollouts

As cell towers are burdened with more and more antennas and radios, it is imperative that reinforcements be properly engineered and installed to support the extra weight.

By Stephen C. King

Mobile service providers and their suppliers have become increasingly creative in the perpetual quest to meet customer demand. Emerging strategies to boost capacity include deploying heterogeneous networks, cloud radio access network (C-RAN) technology, self-organizing networks (SONs) and macro cell-site densification.

Macro cell-site densification is the most common among today's networks. More and more radios and antennas are being installed at macro cell sites as providers migrate to fiber-to-the-antenna (FTTA) architectures to support advanced LTE/4G services. This is especially problematic on towers. The tower environment is now jam-packed with cables, active equipment and supporting infrastructure. Some unfortunate side effects of tower densification are expanded equipment congestion, increased weight and additional wind loading.

Overloaded towers have become increasingly common and are a serious concern in the industry as they pose a risk to both safety and service reliability. Tower loading poses a threat to the safety of the tower hands who must move around the densely placed equipment. Beyond the potential risk to life and limb, equipment overlays, if designed improperly, can lead to impaired equipment performance and decreased reliability, ultimately affecting subscribers.

Suppliers have responded by developing products and methods to shrink the hardware footprint on the tower, thus helping to reduce tower congestion and its associated risks.
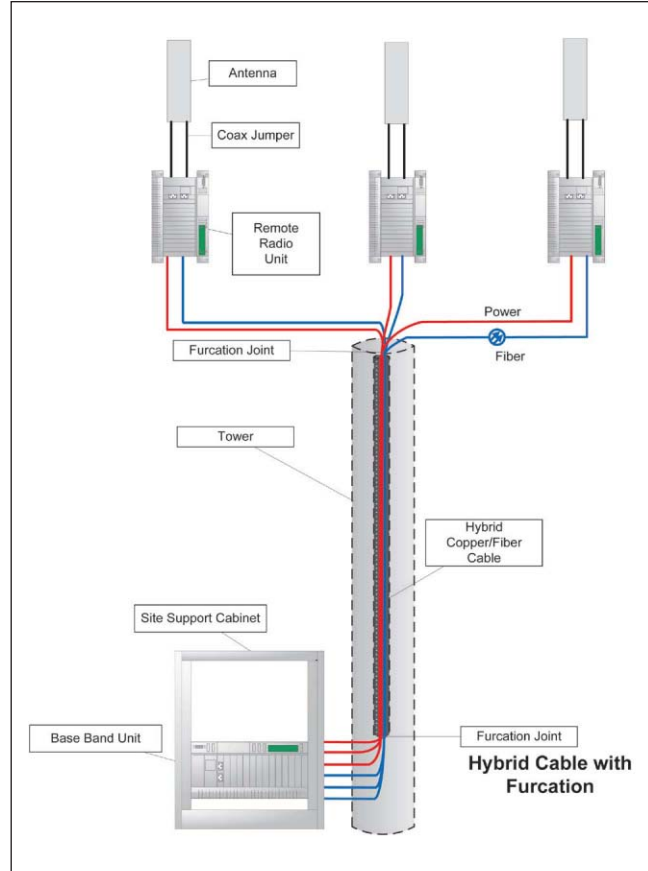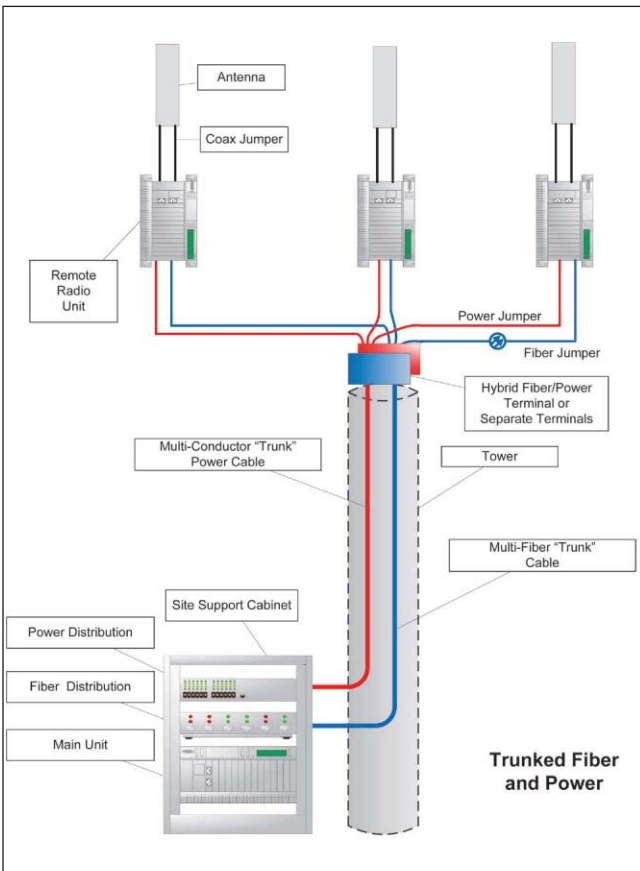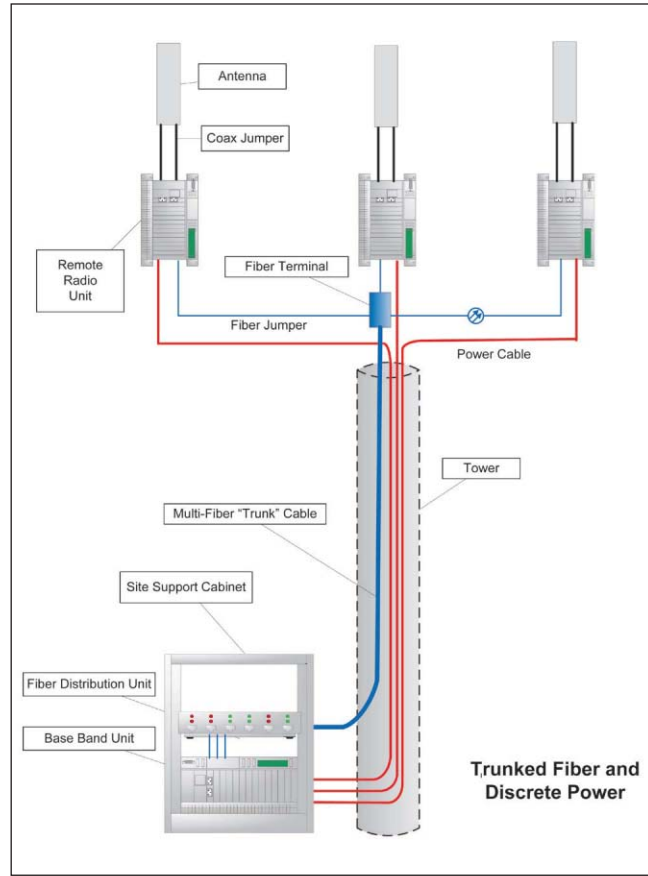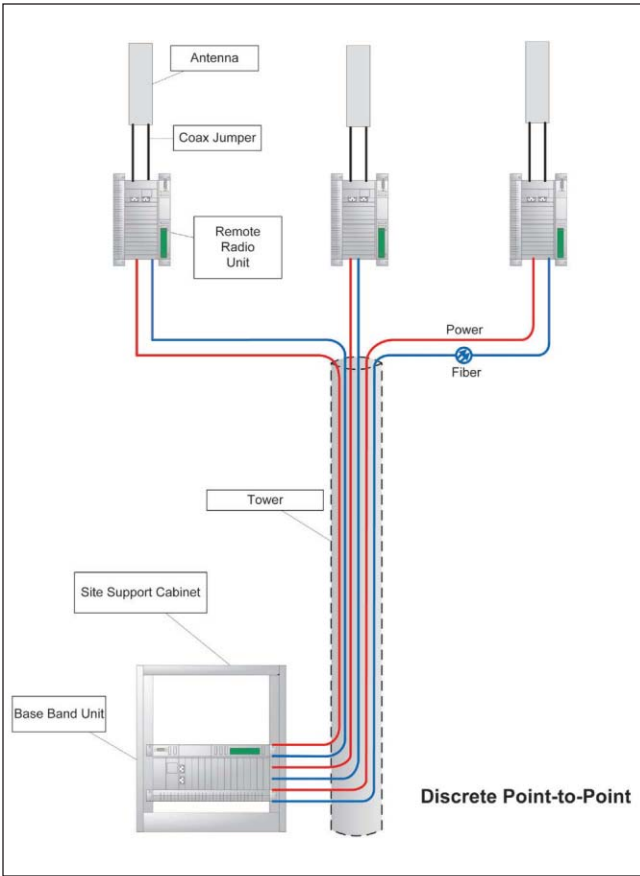
Growing pains

Many of the cell towers standing today were not originally built for today's tower-mounted equipment. The traditional 1G and 2G tower generally supported three to six antennas (one or two per 120-degree sector) while the radios were stationed on the ground. Now, with FTTA systems, radios have moved up the tower, with one or two 40-plus-pound remote radio units (RRUs) serving each sector. Compounding the issue, some providers are subsectoring, configuring four to six sectors per macro cell site with as many as 12 RRUs and their accompanying antennas. Additional radio and antenna supports, jacketed cables, weatherproofing devices and cable management systems are also required to support the new infrastructure.

All this new equipment adds weight and increases the effective projected area of the equipment on the tower, increasing wind load. If the tower is not reinforced properly, weight and wind can cause vibration and sway,

stressing equipment-mounting bolts and fasteners. Obviously, loose or falling equipment poses a risk to safety and service reliability, but service can be affected even if equipment does not entirely detach from the tower. For instance, a loose antenna mount can lead to aperiodic motion, which can in turn lead to passive intermodulation (PIM) distortion and degraded signal quality, negatively affecting customers.

Properly designed and mounted radio and antenna supports can improve safety and service reliability. A structural design engineer is usually engaged to ensure that the structure is properly reinforced to meet local tower loading standards. However, the engineer's analysis may not take into account the effect on thermal spacing requirements for tower-mounted radios. In order to increase stability, radios are placed as close to the tower centerline as possible. However, closely spaced radios can restrict the air flow needed for passive cooling. When radios overheat, performance is degraded and short-term thermal shutdowns can occur, requiring equipment removal and replacement for

Facing page: Four variations of structured cabling methods used to minimize tower loading, keep workers safe and ensure reliable service.

Discrete Point-to-Point

Trunked Fiber and Discrete Power

Trunked Fiber and Power

Hybrid Cable with Furcation

October 2013

45

tower loading
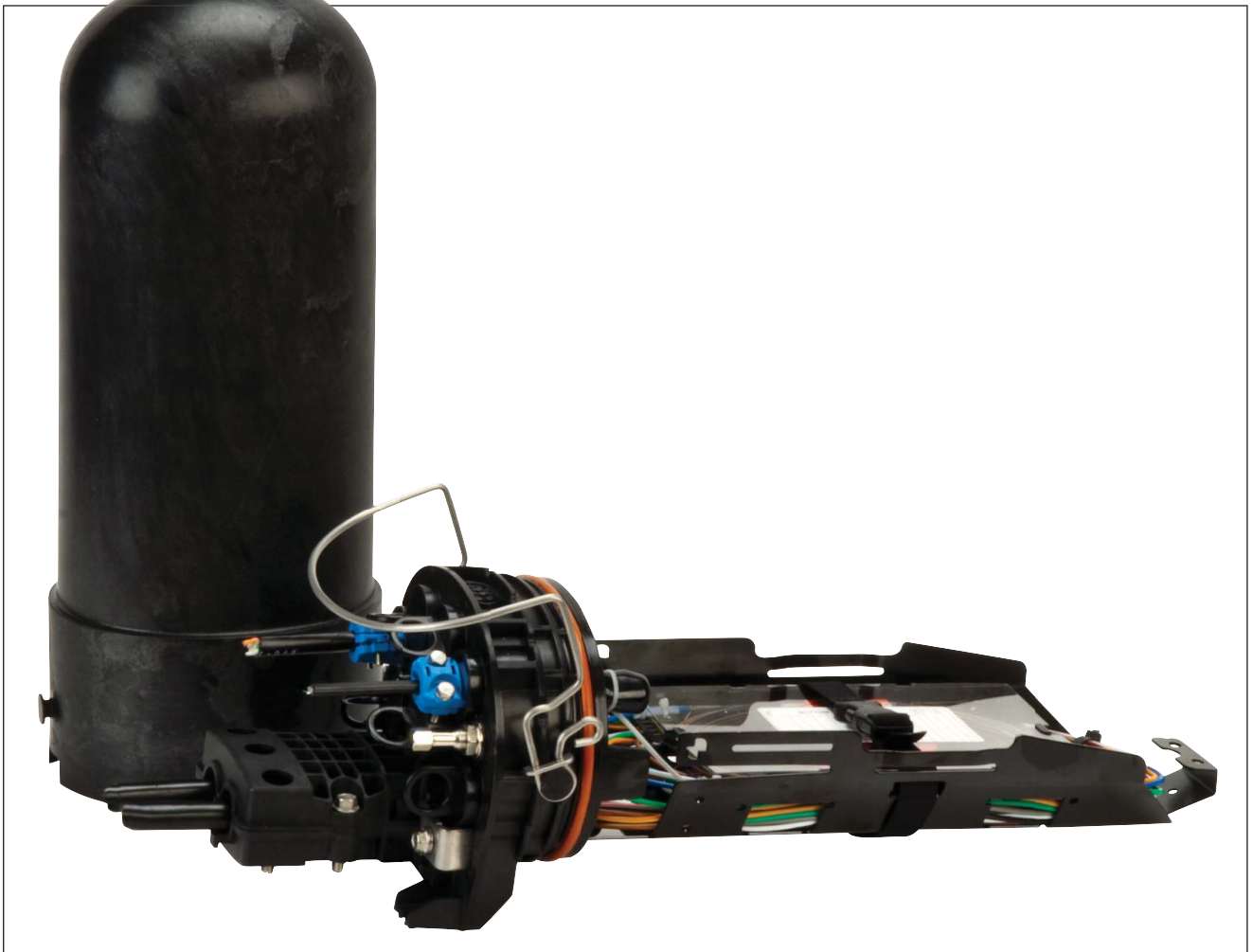
The 3M Communications Marketing Division's model CMD 14378 splice enclosure protects fiber-optic splices from the elements while providing fast and easy no-cost reentry.

repairs. When these radios are returned to the manufacturer for repair, a "no trouble found" diagnosis is common because the passive cooling impediments are no longer present.

New technology could make things worse. Emerging active antenna systems (AASs) integrate the RRU and the antenna. While theoretically this leads to less equipment on the tower, it also potentially imposes new loading issues. When separate, the antenna can be placed outboard from the RRU, allowing the RRU to be located close to the tower centerline. The antenna is then placed far enough out to mitigate any interference effects from the steel and permitting maximum separation. In the AAS world, the moment of the combined weight is placed farther out on the support structure, creating more

stress on the tower.

There is no getting around the fact that new equipment needs to be properly mounted and the tower reinforced under the direction of a qualified engineer in order to minimize the risks associated with tower loading. During that process, the radio manufacturer's recommendation for air flow clearance should be taken into consideration in order to minimize interference. But preventive measures don't stop there. Looking beyond the antenna and radio, providers should consider other techniques for reducing weight and effective projected area.

The cabling itself presents an opportunity to reduce tower load. First-generation FTTA architectures used point-to-point fiber and power cables installed separately on the tower. One fiber and one power cable ran directly

from the baseband unit (BBU) to each RRU. Up to a dozen jacketed, reinforced copper power cables and a dozen dual-fiber cables could run up to each separate tier on a multitenant tower, greatly increasing the congestion and loading. As the number of radios grew, this "home run" cabling approach contributed to tower loading considerably.

Structured cabling

Multiple-core trunked fiber cabling, hybrid fiber-power cables or both are now replacing point-to-point cabling. Much like the FTTH network architecture, a multicore cable runs up the tower to a termination point where jacketed dual-fiber jumpers are distributed to each radio. Mobile operators are choosing these structured cabling alternatives because they can provide greater flex-

tower loading

ibility for future enhancements while potentially lowering capital expenditure and labor costs over time. An added benefit, however, is the potential to reduce tower loading in terms of cabling weight and effective projected area.

But there's a catch. Unlike point-to-point cabling, trunked and hybrid feeder cabling methods involve break-out points on the tower where dual-fiber jumpers split out from the cable to connect to each individual RRU. These vulnerable junctures must be managed and protected from weather in order to ensure reliable service. The traditional cable management solution involves a metal or plastic box-like terminal enclosure, which adds to the equipment's effective projected area. Slack storage and robust cable retention can also be problems with these solutions, often requiring additional infrastructure elements on the tower.

Domed terminal solutions provide an alternative that addresses many of the issues associated with more basic cable management methods. The rounded shape decreases the effective projected area compared with boxes. However, not all products are equal. Most domes on the market today require a heavy mounting bracket and cable retention device, which can counteract any savings in weight and footprint. In addition, the sheer physical size of the dome along with its mounting and cable retention bracket limits the locations where it can be placed on the tower.

Reduced wind load

A newer generation of domes uses a smaller, lighter mounting bracket. The terminal's external cable assembly module (ECAM) incorporates a torsion-spring design with a pull-out force of 100 pounds, enabling the use of the low-profile bracket and eliminating the need for external cable retention hardware. Integrated slack storage virtually eliminates the need for a separate housing for excess cable. These features add up to a device that can lower the effective projected area by as much as 40 percent compared with a rectangular enclosure of equivalent volume, helping reduce overall wind load.

As cell towers are burdened with more and more antennas and radios, it is imperative that reinforcements be properly engineered and installed to support the extra weight. But preventing tower loading and its associated risks to safety and service must go beyond the active equipment. The infrastructure supporting that equipment has also increased in footprint. Utilizing structured cabling methods and low-profile cable management systems can contribute to efforts to minimize tower loading, helping to keep tower workers safe and ensuring reliable service. ∎

Stephen C. King is a wireless-applications engineer in the 3M Communication Markets Division.

Your "Mom" DOES work here!

Traditional Method

NEW FCC RULE CHANGE ALLOWS FOR COMPUTER-GENERATED ANALYSIS IN LIEU OF FIELD MEASUREMENTS AT TOWER SITES

The new FCC rule 47 CFR §1.30000 now requires "Moment Method Modeling" (Mom) to assess regulatory compliance at tower sites near Mom-licensed AM stations.

Waterford Consultants has been preparing for this rule change for more than a year, and our team of engineering professionals is prepared to begin conducting Mom evaluations on behalf of our clients immediately.

If you will be performing any of the following work, you will be impacted by 47 CFR §1.30000:

- Construction or alteration of any FCC-licensed communications tower structure (includes tower owners!)
- Installation of any antenna involving public safety, public utility, water tanks and/or smokestacks
- Tower detuning

WATERFORD CONSULTANTS

To learn about these new FCC regulations or to discover how Waterford Consultants can help you with all of your regulatory needs, please contact us at 703.596.1022 or sales@waterfordconsultants.com.

WWW.WATERFORDCONSULTANTS.COM

4 Powerful Reasons to attend the next AGL Conference in Boston, Nov. 5

❶ **Benefit** in a cost effective and convenient setting
❷ **Network** with industry colleagues and leaders
❸ **Understand** the latest network developments
❹ **Learn** with the experts in construction safety

Conference Speakers

David Weisman
President/CEO and Founder
InSite Wireless Group, LLC

Greg Najjar
Director, Custom Network Engineering
Sprint

Additional Speakers

Matt Fallon
Airosmith Development

Jack Smith
AT&T ASG Group

Marty Travers
Black & Veatch

Todd Schlekeway
NATE

Paul Besozzi
Patton Boggs

Pat Troxell-Tant
Solution Seven

AGL Regional Conference
Tuesday, Nov. 5
8:30am – 3:30pm
Register at www.agl-mag.com/events

Boston Marriott Newton
2345 Commonwealth Avenue
Newton, MA 02466
(800) 627-7468

NATE | CLEARFIELD Solving the Fiber Puzzle | CALTROP Construction Services | Anritsu Discover What's Possible™ | TEMPEST TELECOM SOLUTIONS | 123eWireless Integrated Solutions A Diversity Certified Company | STEALTH | Sabre Industries

Tower Tech Session

Monday, Nov. 4 – 3:00pm - 5:00pm
Separate registration and $25 fee required.

Presented by the National Association of Tower Erectors (NATE) and sponsored by Caltrop Construction Services. Join instructor Scott Kisting, Vice President, Mid-west Underground Technology, for a comprehensive two-hour session.

LEARN about hazards associated with performing LTE installations

ACQUIRE the critical understanding of structure overloading, modifications and lack of anchorages

DISCOVER how knowledge and proper training can help, and even save, tower personnel

Meet and greet conference attendees at our networking social
Monday, Nov. 4 - 5:00pm - 7:00pm
Boston Marriott Newton
Sponsored by TE Connectivity

Conference Only $95
Attend the AGL Conference near you and choose from the remaining dates and locations.

Boston – November 5
Boston Marriott Newton

Pleasanton – December 5
Hilton Pleasanton at the Club

distributed antenna systems

Axell's Olympic DAS: One of the Largest Deployments in the World

With 10 million people attending the events over four weeks, the London 2012 Olympics and Paralympics presented one of the biggest wireless signal coverage challenges the mobile world had ever faced.

By Ian Brown

The London 2012 Olympic and Paralympic Games were a defining moment for mobile operators. The challenge of ensuring coverage for millions of smart devices used in dense locations for intense periods of time was enormous. It was compounded by the need to make sure all emergency services communications were reliable at all times.

A unique network infrastructure was required to cope with unprecedented mobile traffic in a location with sparse pre-existing network infrastructure. The following information outlines the solution and explains how a multiple-sector fiber-optic distributed antenna system (DAS) network installation, delivered by Axell Wireless, ensured robust cellular connectivity for all the UK operators both within the main Olympic Park and across the numerous other Olympic venues.

Unprecedented concentration

In the run-up to the London Olympics there were high expectations for every aspect of the delivery of the event. The effect of hundreds of thousands of visitors to London during a condensed period on the transportation and communications infrastructure was of particular concern. Other issues such as security also placed demands on the mobile communications infrastructure.

UK mobile operators needed to handle a compacted and protracted series of loads on their networks, from a variety of devices and from many countries, all with their own roaming requirements — one of the biggest mobile deployment tasks the world has ever seen.

Potential mobile device users by venue

- Aquatics Centre – 17,500
- Beach Volleyball Arena (Whitehall) – 12,000
- Earls Court – 15,000
- Greenwich Park – 23,000
- Handball Arena (Copper Box) – 7,000
- Horse Guards Parade – 15,000
- IBC/MPC Complex – 20,000 journalists
- Millennium Stadium – 74,500
- Olympic Stadium – 80,000
- Ricoh Stadium – 32,000
- Velodrome – 6,000
- Water Polo Arena – 5,000
- St. James Park – 52,000

Total – 359,000

Figure 1. Multiple venues made up the London 2012 Olympic and Paralympic Games. The number of people the DAS would need to serve at the venues came to an estimated 359,000.

Photo 1. Positioned between two waterways on a diamond-shaped island, the London Olympic Stadium was equipped with a distributed antenna system capable of serving mobile wireless users among as many as 80,000 spectators attending events in the stadium.

To create a strategy for dealing effectively with the expected surge in mobile traffic, the Joint Operators' Olympic Group (JOOG) was formed. This group comprised the London Organising Committee of the Olympic and Paralympic Games (LOCOG), all five UK mobile operators, British Telecom and Airwave (the UK's national secure voice network for emergency services radios). Its remit was to ensure robust communications for all attendees and all emergency services personnel and systems across multiple locations for the Olympic events. The locations ranged in size and potential coverage requirements from relatively small venues such as the Velodrome (with 6,000 seats) to midsize venues such as the 12,000-seat beach volleyball arena in Whitehall, London, up to the main Olympic stadium itself, with a capacity of 80,000.

The mass proliferation of smartphone technology drove a number of critical technology requirements for JOOG. At the top of the list was finding a way of handling the maximum anticipated raw capacity across the entire games

and then being able to propagate cellular signals at each individual venue. JOOG had to start from scratch with this deployment, with no legacy infrastructure to build out from. Before

> **At the top of the list was finding a way of handling the maximum anticipated raw capacity across the entire games and then being able to propagate cellular signals at each individual venue.**

the Olympics, this area of London was largely industrial, so no extensive network coverage was in place. Despite its industrial nature, the area was also close to the buzzing heart of London commerce and finance. In this regard, it

was vitally important to avoid Olympic venue mobile traffic having a negative effect on business as usual. Coverage had to be complete and contained.

JOOG understood the considerable challenge of delivering coverage across the entire Olympic Park and associated venues both for the visitors and the emergency services. Figure 1 lists the potential number of users that had to be catered for at each venue. After an intense selection process, which involved visiting many of the world's most challenging communications sites and deployments as well as reviewing technology options, Axell Wireless' fiber-optic distributed antenna systems were selected to propagate capacity and coverage around the various Games sites. JOOG also commissioned Axell to provide service advice and system support for the duration of the Games.

Axell's role was to ensure seamless, uninterrupted, high-level performance, campus and stadia coverage for a series of on-park and off-park venues, enabling every operator to provide high-quality service to every subscriber on every

October 2013

53

distributed antenna systems

Photo 2. One of the smaller venues at the London 2012 Olympic and Paralympic Games was the Velodrome with a capacity to seat 6,000 spectators. The Velodrome hosted indoor track cycling events.

device, smartphone and tablet, 2G and 3G. Technology had to support the 900-MHz, 1800-MHz and 2100-MHz bands, as well as GSM and UMTS 3G services.

The installation of the base station hotel offered the main hub for the solutions. A DAS connected the venues within the Olympic Park into the central base station hotel. Housing a few hundred base stations, the base station hotel at London 2012 broke records in becoming the world's largest-ever installation

trees. Many of the Olympic locations shared such characteristics. Features that are pleasing to the eye can often be less than pleasing to the ear, if poor-quality signaling results in dropped calls and interrupted connections.

Mobile traffic generated from sporting venues has a number of unique characteristics. First, there is a large volume of uplink traffic as spectators rush to post their own pictures and videos on social

media. Second, it has huge peaks and troughs. Third, there are highly specific design considerations caused by the size limitations and crowds at the stadiums themselves. And finally, spectators are static, meaning that coverage has to be delivered for all seating areas at all times, unlike in an area like a shopping mall where visitors simply need to walk away from coverage "not-spots." What's more, a number of spectators watch the

Photo 3. The DAS at the London 2012 Olympic and Paralympic Games called for 300 cellular remotes in one deployment. Axell's MBF-40 range of cellular remotes works in combination with Axell OMU systems. It provides an exceptionally low noise figure that reduces interference transmitted to a base transceiver station, ensures optimum performance and selectivity, and maximizes throughput.

of its kind. Connecting out from the base station hotel, the fiber-optic DAS system propagated cellular coverage for all cellular operators across the park. A similar setup was operated across many Olympic off-park venues. As Figure 1 on page 52 shows, at peak loading more than 300,000 live seats, representing just as many live and connected devices, had to have uninterrupted signal coverage.

Scale of deployment

Achieving high-quality wireless coverage is not a straightforward matter in building, campus and stadia locations because construction materials can shield the buildings from wireless signals. The problem can be made worse by natural obstructions such as large, leafy

distributed antenna systems

> ### Service components provided
>
> - Network Operations Centre Monitoring
> - 24/7 Engineer for Site Support (5-hour response)
> - 24/7 On-site Engineering Support (12-hour rotating shifts)
> - Advance Spares
> - 3rd Line Technical Support
> - RMS Incident Management

Figure 2. On-site and remote monitoring support was critical to ensure continuity of service both to visitors and to emergency services.

events live on mobile devices even as they soak up the atmosphere and ambience at the venue, leading to significant downlink loads as well.

RF propagation

It was central to Axell's role to ensure that mobile operators' wireless capacity and coverage were propagated seamlessly into every location. This was achieved through an infrastructure configuration consisting of a sizable ecosystem of remote units spread across the Olympic estate in direct proportion to the anticipated load at each site, dictated by the seating capacity. The integrated DAS equipment involved in the ecosystem included optical master units (OMUs, or "head ends") with RF over fiber (RFoF) connections to Axell MBF-40 optical remotes (see Photo 3 on page 55). The OMU converts RF signals coming from either BTS or repeater/BDA devices into light for transmission to a remote. At the remote end, the signals are converted back into RF for propagation of coverage in the local area.

Optical remotes

For the large stadium environments, such as the Olympic Stadium and the Millennium Stadium, optical remotes were the most appropriate solution to address the high user densities, optimizing throughput by maximizing the signal-to-interference ratio. In the main Olympic Stadium alone, Axell installed 46 optical remotes.

Among the 300 remotes, other deployment examples include:

Aquatics Centre: 17 sectors supporting 23 remotes

Catering Village: five sectors supporting five remotes

Earls Court: seven sectors supporting 10 remotes

International Broadcast Centre: 16 sectors supporting 26 remotes

Media and Press: nine sectors supporting nine remotes

Millennium Stadium: 37 sectors supporting 65 remotes

Ricoh Arena: 22 sectors supporting 24 remotes

St. James Park: 52 sectors supporting 54 remotes

Optical remotes were ideal from an aesthetic perspective. Given the numbers in which they were deployed at each location, had the cells been obtrusive, they would have had a distinct effect on the look and feel of the venues. They may well have taken on the appearance of telecommunications equipment venues rather than auditoriums. Optical remotes fitted the requirement in this regard because they had a much smaller form factor than individual base stations. In terms of their effectiveness for signal propagation they offer a multiple-operator, multiband solution — many operators, one simple infrastructure. These optical remotes could also be installed near antennas, causing almost no cable loss. High capacity and quality were achieved by sharp cell definition and a powerful, active, fiber-optic DAS system giving comprehensive multiband coverage.

Stadium coverage challenge

The installation in Olympic Stadium was one of the largest-scale, multi-sector, fiber-optic DAS installations in the world. As do traditional buildings with their problems of dense coverage and protracted usage peaks, the Olympic Stadium presented a range of challenges unique to stadiums. The capacity of the Olympic Stadium was
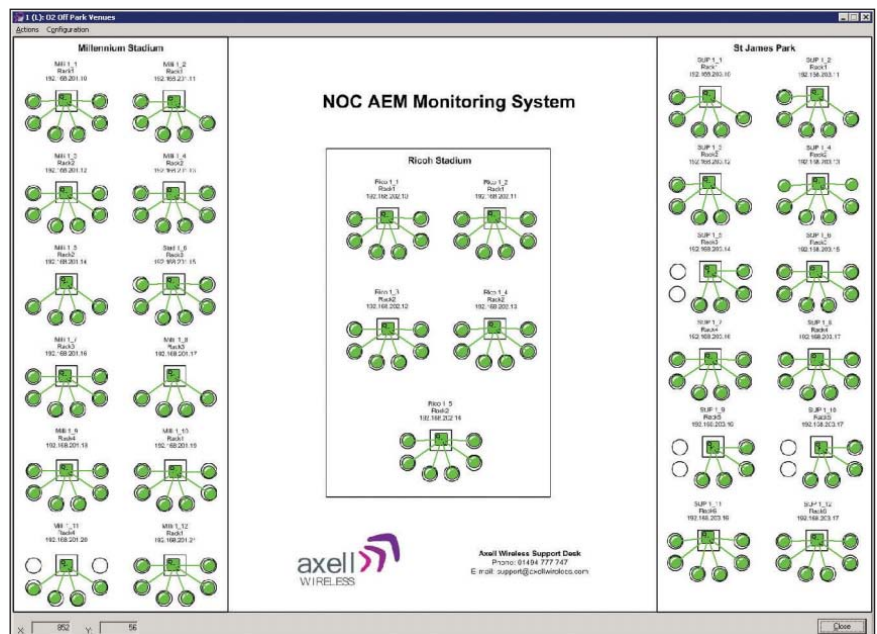

Figure 3. At the network operating center, the company deployed its Axell Element Manager (AEM) network management system to monitor the conditions of all the DAS networks.

80,000, generating peak traffic equivalent to a city with a population of more than 450,000.

Any stadium is a showcase usage scenario where all the problems any mobile operator is likely to encounter all come together at the same time. A high concentration of users is accompanied by high traffic per user. The users do not move much, which means that good coverage has to be provided over the entire area.

EE, the largest mobile network operator in the UK, was the lead mobile operator on the London 2012 Stadium project and provided coverage within the main stadium. Axell Wireless worked with EE to ensure that the fiber-optic DAS system was configured and optimized to support the most common frequencies used by the UK's mobile operators. Effectively, the requirement was to satisfy all the expectations of all the people, all the time.

Monitoring and support

On-site and remote monitoring support was critical to ensure service continuity both to visitors and to emergency services (see Figure 2). Axell's network operations center, based just outside London, provided a real-time performance feed of every aspect of

the performance of the network. With 300 remotes in operation across a wide range of venues, subject to varying conditions as well as demand peaks by venue that frequently coincided, monitoring and stringent service-level agreements were as important as the

> **Any stadium is a showcase usage scenario where all the problems any mobile operator is likely to encounter all come together at the same time. A high concentration of users is accompanied by high traffic per user.**

original installation itself. Axell's monitoring system was linked into the JOOG router and Ethernet switch connected to all optical master units on the park via the base station hotel. From there, fiber-optic links connected all

the venue repeaters so there was total visibility of the entire infrastructure. As a result of this robust support infrastructure, a reliable and consistent level of coverage was achieved for the duration of the games.

A winning performance

The Axell fiber-optic DAS allowed millions of visitors to make uninterrupted calls, browse the Web using smartphones and share updates through social media sites both inside and outside the Olympic venues. Along with delivering cellular connectivity for the general public, an important requirement of the system was that it would support emergency services radio communications. Axell's equipment fulfilled both requirements, supporting cellular and public safety coverage. Apart from the robust communications infrastructure that this facilitated, it also reduced initial deployment and ongoing operational costs. The athletes weren't the only ones achieving peak performance at London 2012. Mobile coverage was right there alongside them, raising its own bar for the future.

A number of key learnings emerged from the project. Planning — understanding the likely data flows — and collaboration are key for the success of a deployment of this magnitude. Another approach that separates success from failure is to first design the system, then have a trial run and finally evolve it to the main deployment. And it's most important to ensure you have plenty of flexibility in your design because you do have to expect the unexpected. ∎

Editor's note: Because it is distributed mostly in the United States, AGL *uses the American spelling of fiber in this article. Axell Wireless is based in the United Kingdom where some spellings differ. The company offers its fiber-optic DAS product under the name "Fibre DAS."*
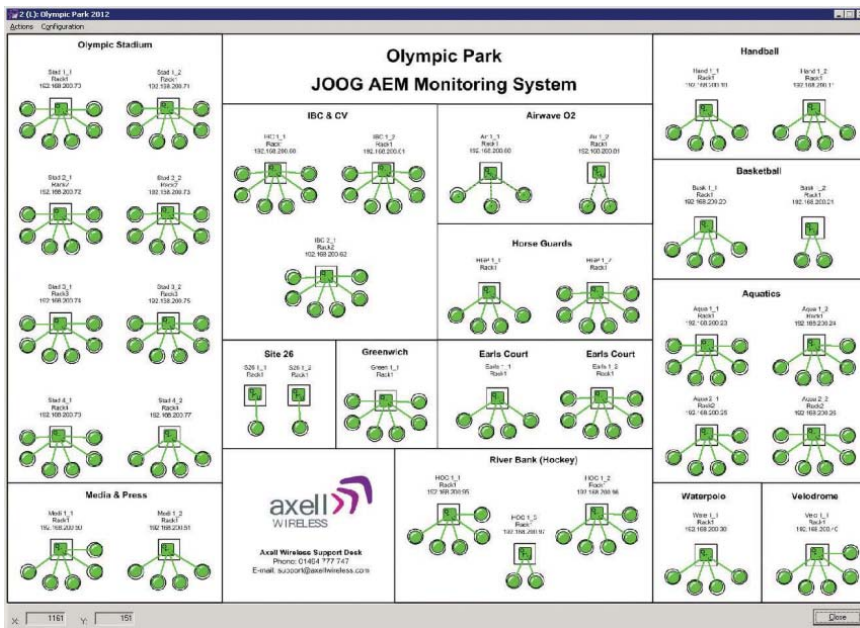

Figure 4. An Axell Element Manager (AEM) network management system monitored DAS networks at a Joint Operators Olympic Group location.

Ian Brown is CEO of Axell Wireless in Chesham, Buckinghamshire, United Kingdom. For more information, visit *www.axellwireless.com.*

product showcase — lighting and monitoring

Code Beacon Lights

American-made TASK-Master code beacon lights from **Lights By H&H** are the solution to alerting air traffic of structures and towers. These lights are bright, dependable and last up to 8,000 hours. The lights use weather-resistant, hard glass envelopes, rugged filament designs to withstand shock and vibration, special lead wire supports, spring-steel arbor, arc-preventing wrapping of lead wires, a built-in reflector disk and a nickel-plated brass base. The lights are suitable for TV and radio broadcasting towers and for other freestanding or building-mounted antenna sites. Their bulbs are designed to minimize bulb change-outs and maintenance costs.
www.lightsbyhh.com

Tower and Obstruction Lighting System

The **SPX** Vanguard LED series is a medium-intensity tower and obstruction lighting system. Available in white, red or dual, the L-864/L-865 system is designed with a surge-suppression rating that can withstand surges up to 20 kA. The system features Wi-Fi, combined flashhead and marker cable, open monitoring protocols and a new L-810 marker design that greatly simplifies installation and maintenance. The series is also avian-protection compliant, and is available with NVG/IR-compatible options.
www.spx.com/en/flash-technology

High-intensity Strobe Lights

Dialight's FAA-certified all-LED Vigilant L-856 high-intensity strobe offers maintenance savings and at least 10 years of worry-free operation. Ruggedized for harsh conditions, the L-856 strobe is designed for operation in an ambient temperature range of −40ºC to +55ºC and is highly resistant to lightning, vibration and shock. With the ability to withstand multiple direct hits, the strobe is one of the toughest obstruction lights on the market. Also available from Dialight is a new line of FAA-certified Vigilant LED aircraft obstruction lighting systems. The obstruction lighting products, from the L-864 red beacon to the L-864/L-865 dual red/white strobe, offer tower operators and owners a lower-power consumption product. The beacons and strobes are the first product line to be tested and verified by Intertek ETL to the 2012 Transport Canada CAR 621 specification.
**www.dialight.com**

Tower Lighting and Monitoring Products

A one-stop solution from **TWR Lighting** is the L450 dual-LED, FAA medium-intensity tower light and TWR/Hark DM900/DM32 remote monitoring systems for tower security and visibility. The L450's advanced optical engineering and LED technology has a power module that allows for a single controller and single cable installation, even with multiple flash heads. This design makes the lights simple to install and rugged for reliable operation under the harshest conditions. The TWR/Hark DM900/DM32 remote monitoring systems are FCC-approved to enable the elimination of quarterly light inspections. These systems are designed to interface with all FAA-approved alarmed lighting systems and additional site equipment such as generators or AC units utilizing contact closures or voltage alarms. Remote monitoring options include CDMA/GPRS wireless modems, Ethernet TCP/IP, satellite, POTS Line and Windows-based software. The advanced features of these devices and systems help to minimize capital costs and, subsequently, the cost of ownership for the tower owner and operator.
www.twrlighting.com
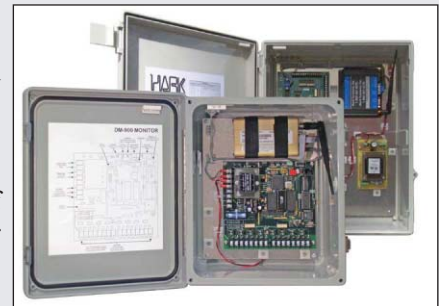
When you join the Wisconsin Wireless Association, you help to make a difference.

Through donations to the General Federation of Women's Club's Wisconsin chapter, the Wisconsin Wireless Association helps to purchase pediatric jump bags for use by Wisconsin ambulances. Pediatric jump bags help to save the lives of small children because medical requirements for small children often differ from those of adults. The right equipment optimizes the care that the responding team is able to provide.

Wisconsin Wireless Association

Promoting awareness

The Wisconsin Wireless Association helps to promote positive awareness about the wireless infrastructure industry by representing the industry at the Municipal Treasurers Association Annual Conference and the League of Wisconsin Municipalities Annual Conference.

The Wisconsin Wireless Association is participating in the Public Service Commission of Wisconsin's development of a statewide broadband plan, "Wisconsin's Playbook for Broadband Progress."

Wisconsin Wireless Association

wisconsinwireless.org

ACTIVITIES

Oct. 16 League of Wisconsin Municipalities in Green Bay

Dec. 5 Holly Jolly Trolley Tour Fundraiser in Milwaukee

A public service ad from *AGL*
Photo courtesy of R&B Fabrications

product showcase — lighting and monitoring

Series 6300 LED Monitor/Controller

Skytec's series 6300 LED lighting monitor and controller has either PEC or manual controls. The device is a universal controller for L-810 and L-864 LED lighting. Each board has two channel outputs rated at 500 watts per channel, and each output can be programmed to flash or remain steady. Additionally, each output has normally open or normally closed dry alarm contacts for customer monitoring at remote locations. Multiple controller boards can be connected via Cat 5 cable for larger systems and can be expanded as needed.

www.skytecinc.com
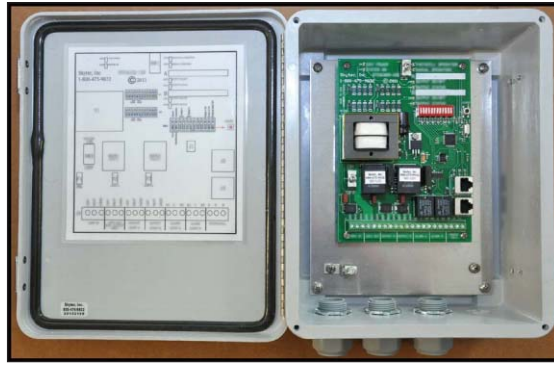
Medium-intensity Red Beacon

For tower and building lighting, **ITL** offers the IFH-1700 medium-intensity red beacon. The device uses LED technology and advanced optics to achieve a compact, energy-efficient, L-864(L) product. The beacon is self-contained and comes ready for installation with a 10-foot cable attached. The IFH-1700 features an aluminum top and base and a clear acrylic cover. The beacon is designed for long-term maintainability with field-replaceable LED boards, a power supply board and a light engine.

www.itl-llc.com

LED Structure Lights

The American-made Horizon LED series of warning lights from **Hughey & Phillips** is for use on new and retrofit structures that require aircraft warning lights. For retrofit applications, the existing cable on the structure can be used for cost savings. The device is available in red (L864), white (L865), and dual (L864/L865) medium-intensity lights. The dual-LED strobe system provides daytime white and nighttime red lights in one compact unit. It features a self-contained power supply with available GPS sync. The day/night sensor simplifies wiring and accepts external signals if desired. Features include advanced LED modules, cutting-edge optics, individual LED monitoring/bypass, active lightning protection, built-in testing and microprocessor control. The units can be serviced and repaired in the field. The unit also monitors the system and provides a normally open or normally closed alarm contact upon any system failure.

www.hugheyandphillips.com

Lighting Monitoring Solution

TowerSentry's TSMS+ is made for lighting systems with alarm outputs. It features a 4G backward-compatible radio that eliminates the need for a telco connection. The system is FCC-approved, so the cost and inconvenience of quarterly tower inspections is eliminated. The unit is in an always-on state with continuous wireless monitoring. The always-on condition warns of impending and intermittent problems before they become disruptive. It has a remote function that allows TowerSentry operators to recycle lighting systems, verify proper mode of operation and verify alarm events received before crews are dispatched. The unit can be configured to communicate via telco, TCP/IP or satellite, according to the customer's preference and service availability. Wireless airtime is included in the monthly monitoring fee.

www.towersentry.com

WIRELESS HISTORY FOUNDATION

2013 Wireless Hall of Fame Dinner

2013 Honorees: Craig Farrill, Kris Rinne, George Schmitt, and Senator Mark Warner

The Fairmont San Jose

Tuesday, October 15, 2013
San Jose, California

Register now at
https://wirelesshistoryfoundation.ticketbud.com/2013-wireless-hall-of-fame-awards

advertiser index

professional directory

Put the power of *AGL* to work for you with a professional card ad. Call Mercy Contreras at **(303) 988-3515.** *mcontreras@agl-mag.com*

YOUR SIGNAL STARTS HERE.®

IN OUR BUSINESS, IT IS ALL ABOUT THE SIGNAL.

Our clients depend on SBA to provide the wireless infrastructure that allows them to transmit the signal to their customers. As their first choice provider of wireless infrastructure solutions, we are continuously setting the standard for customer satisfaction by "Building Better Wireless".

TOWER OWNERSHIP

LEASING

SITE MANAGEMENT

SITE DEVELOPMENT

CONSTRUCTION

TECHNICAL SERVICES

800.487.SITE | sbasite.com

SBA))
Building Better Wireless®