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How Commercial Real Estate Developers Can Profit from Forward-Looking Strategies

INSIDE
Small Cells
A Small Solution to a Big Problem

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ON THE COVER
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Cover Design By Brian Parks

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And that's no small news.
TECHNOLOGY

**LTE-A is on the fast track.** Huawei has successfully completed an LTE-A Category 6 connectivity test with download speeds reaching 300 Mbps. The Chinese infrastructure, device, and chip manufacturer worked with Qualcomm, and used the Qualcomm Gobi 9×35 LTE modem. Huawei said that during the test it was able to support up to 40-megahertz wide-band carrier aggregation. Carrier aggregation refers to the combination of different spectrum bands to increase speed and throughput. Category 6 has the potential to double the data rates of Category 4 LTE-A carrier aggregation solutions.

**AT&T’s LTE Chicago network recently got a power boost.** Ma Bell is the first carrier in the U.S. to use a new LTE-Advanced technique called carrier aggregation to bond together two 4G networks, the end result being a big boost in speed to the device. The new network configuration has gone live in several markets but the only specific city identified was Chicago. While the network is live and had a great field test, the reality is that, for now, only a handful of its customers can actually take advantage of it.

**WI-FI BEAT**

**Wytec International** has raised the bar of the future of Wi-Fi with the first complete, low-cost, powerful and quick to deploy Wi-Fi solution, the advanced LPN-16. It is housed in a NEMA 4X rated design that encases state-of-the-art components for multiple services including data offload, HetNet compatibility, and multi-frequency transmission. It is a fast deploy, small cell node with multiple mounting options that create countless deployment scenarios.

**Smith Micro Software** launched a Wi-Fi “concierge NetWise SmartSpot 3.0” app for iOS and Android devices. The solution address these challenges by seamlessly authenticating users on preferred Wi-Fi networks. Even when the device’s Wi-Fi radio is turned off, the app will provide location and directions to preferred, owned or partner hotspots by using maps with geo-fencing technology. The Android version of the app can turn the Wi-Fi radio on and off as needed to conserve battery life. “Wi-Fi as an ‘offload network’ is an outdated concept,” said Sunil Marolia, vice president, product management at Smith Micro. “Consumers are increasingly choosing Wi-Fi first for mobile connectivity due to the high cost of cellular data and rapid growth of hotspots.” However, issues such as high battery drain, complicated login, questionable security and unpredictable quality are trademarks of challenges impeding adoption.

DEPLOYMENTS

A small cell solution has been deployed at Corning Community College, improving data performance and network coverage on campus. Corning is a two-year college located in Corning, N.Y. It is the first college campus in the nation to deploy outdoor small cell technology from Verizon Wireless. The recently installed small cell units will increase 4G LTE coverage in high-trafficked areas on campus, improving both data performance and indoor coverage.

CALENDAR

**LTE World Summit**
June 23–25, 2014, Amsterdam, RAI, Netherlands
lteconference.com

**Small Cells Global Congress/Wi-Fi World Summit**
Sept 23 – 24, 2014, Barcelona, Spain
smallcellsevent.com

**Small Cells Americas, Co-located with Carrier Wi-Fi Americas**
December 1-3, 2014, Dallas. TX, USA
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FROM THE EDITOR

This Month’s Column Topic: Things That Worry Me

A few days ago I got wind of a story where someone had managed to hack into a baby monitor connected to a home network. As the story goes, an Ohio couple was awakened, in the middle of the night, to the sound of a man screaming “wake up baby!”

The mother was connected to the baby monitor via her smart phone, which streams the camera feed from the monitor on the baby’s crib, via an unsecured or weakly secured wireless link. Someone had hacked their picocell, and hijacked the wireless baby monitor in their daughter’s room. They were watching the couple’s little girl sleep — scary stuff!

Another incident of hijacking devices occurred last holiday season when there were reports of a malicious “worm” that was spreading on the Internet. It was specifically coded to attack embedded devices, like the camera running Linux — devices that are part of thousands of small cells everywhere.

The worm is called Linux.Darlloz and was mainly transferring between PC systems but was capable of attacking a range of small, Internet-enabled devices, as well. When analyzed by Symantec’s anti-virus team, they found variants of it that could attack chip architectures used in devices like home routers, set-top boxes, and security cameras — core objects of the evolving Internet of things (IoT). The worm exploits a known Hypertext Preprocessor (PHP) vulnerability, which allowed malicious code to be executed on exposed systems, using specially formatted query strings.

Another instance of IoT hacking also occurred during the last year’s holiday season. A security firm by the name of Proofpoint found that 100,000+ typical low-end consumer appliances; TVs and refrigerators, mainly running a variant of Linux, were sending email solicitations for fake pharmaceuticals. Email recipients who clicked on the links would run a worm that exposed the computer to hostile software designed to steal sensitive data. Again, more core objects of the IoT and all devices connected to small cell networks.

These are just the latest in an alarmingly increasing number of reports of systems being invaded. When it comes down to it, this was a classic example of how weak small cell security is. Yes, this was a picocell in a home, probably the lowest priority on the food chain, but the fact is that much of the technology and protocols that are implemented in picocells are replicated in other small cells. So, if someone can hijack the baby monitor in a bedroom, it stands to reason that they can hijack the camera that keeps an eye on the ATM, and steal card numbers and pin codes. Or, how about the cameras that monitor bank lines, license bureaus, or…well you get the picture.

This is just the tip of the iceberg when it comes to examples of the potential security holes that exist in the fog of the IoT and land of small cells. Some are just a violation of your space, others have the potential to be much more disastrous.

As the IoT takes shape and everything and everyone becomes a virtual wireless object on that platform, the wireless industry needs to take the lead in plugging security holes — especially when everybody else is saying “not my job.” —eworthman@aglmediagroup.com
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PUBLISHER’S COMMENTARY

This Month’s Column Topic: Is 40,000 a Magic Number?

40,000 micro/small sites — that is the one number I clearly remember from this month’s Wireless Infrastructure Show, in Orlando. That number has been around for some time now. It was first published by AT&T as the number of small cell sites that were to be deployed by them in 2014. Then, AT&T said it will be by the end of 2015. Now it has morphed into the number that needs to be deployed in the next couple of years.

Well, that may be a number people like to say more than a number they have thought through. I’ve heard that number associated with Sprint’s deployment needs, as well as AT&Ts. I’m sure that neither AT&T nor Sprint just pulled that number out of the air under pressure to get some traction for small cell deployment. So there must be some reasoning behind it.

Turns out there is. It actually makes some sense because when you sit at a map and take some of the metrics we all know from our time in the industry, it becomes a realistic, or at least a plausible number of small sites to be added, over the next couple few years, based upon coverage plans for these carriers. This first iteration of small cell sites are going to be the ones that are used to close the gaps, and make the network more pervasive. They are also going to be the public beta test, of sorts. If it all goes according to design, they have a home run, if not, well, at least it won’t be any worse than it was before the deployment, and small cells don’t get a black eye.

The reason for the ambiguity in hard data is that there has been some fluidity in the technology affecting the small cell rollout. One major factor is the deployment of LTE technology, which is both a competitor and a component of small cells. Another is carrier aggregation.

And, there is the integration of smart technology into these platforms. For example, no longer is RF planning something that needs to be considered in network deployment; the network is smart enough to figure it all out for you.

However, the idea of reducing a macro site’s coverage area while adding a number of small sites toward (not at) the edge offers a persuasive argument vs. cell splitting, when it comes to improving coverage — namely frequency reuse efficiency. The smaller the site, the more efficient the frequency reuse is. This is an ideal scenario for small cell installations.

Thusly, adding say, five to seven small cell sites about 2/3’s of the way in from the edge of a macro sites coverage area, improves the coverage for that macrocell, and the QoS for the user. In urban areas, it is a bit more of a free for all but the theory is still solid.

And, as far as carrier aggregation goes, this technology — aggregating spectrum across multiple bands — is going to be the next place carriers turn for more throughput to customers. It will be interesting to see how this shakes out against, or complementary to, small cells.

In any event, the times they are a changin’ sang Bob Dylan. Wonder if he had any inkling of what the changin’ really was going to be, fifty years later. —rbiby@aglmediagroup.com

“```This first iteration of small cell sites are going to be the ones that are used to close the gaps, and make the network more pervasive.”```
It is safe to say that there’s never been a time in the modern wireless industry’s existence that is as multifarious as today. For the average user, all they need to know is that if they have “4G”, they’re good. For everyone in the industry, the plot thickens to pea soup, as there have never been so many technologies emerging, competing, and often simultaneously complementing each other.

Start with Wi-Fi. It is nearly ubiquitous — homes, work, coffee shops, malls, stadiums, etc. But, it is, generally, a pain in the neck as you have to log in and authenticate yourself from hotspot to hotspot. Even if you regularly frequent the same places your credentials are typically time-limited so you’ll have to go through the whole process every time you show up.

Fortunately, that’s rapidly changing for the better, thanks to Hotspot 2.0, also referred to as HS2 and Wi-Fi Certified Passpoint. Supposedly, once fully deployed, it will let users roam across Hotspot 2-compliant hotspots without having to re-authenticate or log in again. It is also much more secure than discrete Wi-Fi hotspots, as any network compliant HS2 must offer the latest standard in Wi-Fi security (WPA2).

Interestingly, Wi-Fi is rapidly moving further from what it was originally conceived to be, creating a parallel universe of wireless connectivity that will ultimately blanket broad swaths of the U.S., delivering coverage indoors and outdoors.

One might think Wi-Fi on this scale would directly compete with carrier wireless. Except that carriers, telcos, and cable MSOs are the ones building out the Wi-Fi networks. This is because it allows wireless carriers to offload traffic from their already overburdened networks onto Wi-Fi infrastructure that in many cases has already been bought and paid for by someone else. And, they are less expensive to deploy than alternatives such as fiber (where it’s available) and point-to-point microwave links.

Carriers like this “carrier-grade” Wi-Fi because it offers coverage to areas where macro cell coverage is either poor or can’t reach. However, that’s also the option of RF distribution systems, commonly referred to as distributed antenna systems (DAS) that bring carrier wireless service both indoors and outdoors and are increasingly integrating Wi-Fi as well. It will be interesting to see how this eventually shakes out.

One scenario sees carrier wireless moving from 4G to “4.5G” with LTE-Advanced, carrier Wi-Fi becoming a nationwide service complete with roaming. But from another direction, that looks a lot like carrier wireless with more coverage gaps, small cells, and RF distribution systems that are sometimes separate and sometimes integrated and often serve the same needs — interesting.

The common denominator, is the Wi-Fi hotspot. The numbers don’t lie. Nearly a half million hotspots have been deployed by carriers, telcos, and cable MSOs throughout the U.S. With Hotspot 2.0 we’ll be able to hop off the carrier wireless network onto Wi-Fi (while wireless carriers dance with joy).

There is also a huge pot of money to be made with Hotspot 2.0, as it may offer massive opportunities for advertising revenue and location-based services — potential revenue streams for everyone from wireless carriers down to mom-and-pop shops who can actually become revenue-sharing partners. How all of these technologies will ultimately work together remains to be seen, but if nothing else it will certainly keep things interesting.

Barry Manz is president of Manz Communications, Inc., a technical media relations agency. He is a contributing editor for the Journal of Electronic Defense, editor of Military Microwave Digest, co-founder of MilCOTS Digest magazine, and was editor in chief of Microwaves & RF magazine. He can be reached at manzcom@gmail.com.
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FEATURES

TESTING WI-FI FUNCTIONALITY IN MEDICAL DEVICES
By Laird Technologies

Hospitals present challenges to reliable Wi-Fi connectivity and many medical device applications require secure and persistent network connections. To ensure reliable functionality, a Wi-Fi radio that is embedded in a medical device must be tested thoroughly. But where, and how?

TESTING FOR KEY REQUIREMENTS

Wi-Fi access in a hospital serves different sets of users and applications. Patients and guests use Wi-Fi networks for convenient Internet access from smart phones, tablets, and laptops. Clinicians and administrators use Wi-Fi to gain access to hospital networks from personal computing devices such as smartphones or from hospital-managed computing devices such as workstations on wheels and tablet computers. And increasingly, computing devices are sharing the hospital Wi-Fi airwaves with wireless medical devices.

Medical devices place stringent requirements on Wi-Fi connections in hospitals. Since many medical devices run applications that require a persistent network connection, it is imperative that Wi-Fi radios embedded in those medical devices are reliable. For a medical device, a disruption of even a tenth of a second (100 milliseconds) can cause a failure in the transmission of a continuous stream of data that might be critical to a patient’s care. Radio frequency (RF) transmissions between the medical device and an access point (AP), may be absorbed by lead walls or human bodies, redirected by metal objects and surfaces, or disrupted by sources of RF interference that can be found throughout a hospital.

In addition to the RF performance of a Wi-Fi radio, there are several other key requirements that are crucial to Wi-Fi functionality. Those include interoperability, security, and mobility. Let’s examine some of the items that must be tested in order to support these key requirements.

RF PERFORMANCE

Testing the RF characteristics of a Wi-Fi radio includes testing the radio’s compliance with various regulatory requirements, its range, and its ability to handle RF interference. This becomes even more important with the roll out of the small cell infrastructure, where both stand-alone Wi-Fi and Wi-Fi integrated with small cells must coexist. Figure 1 shows typical Wi-Fi access points and how they can overlap. The problem becomes even more exacerbated when the cells are mobile, which is often the case with medical equipment.

INTEROPERABILITY WITH WI-FI INFRASTRUCTURES

For a client device such as a medical device, the Wi-Fi CERTIFIED™ seal signifies that the device interoperates with Wi-Fi infrastructures that also carry the seal. According to the Wi-Fi Alliance, a client device earns the Wi-Fi CERTIFIED seal if it passes tests “in numerous configurations and with a diverse sampling of [Wi-Fi CERTIFIED infrastructure] equipment... that operates in the same frequency band.” The seal, however, does not offer sufficient evidence that a medical device will work well with a particular hospital’s specific Wi-Fi infrastructure, even if both carry the seal. There are two major concerns when it comes to interoperability; security and mobility. There are others, but they are usually subsets of these two.
SECURITY

Before allowing medical devices to connect to hospital networks using Wi-Fi, those responsible for information security must be confident that the Wi-Fi networks and the medical devices that use them will protect sensitive information, including electronic medical records (EMRs) that are transmitted over Wi-Fi or stored on the networks.

MOBILITY

Providing a persistent Wi-Fi connection for a stationary medical device can be difficult in a typical hospital. As mentioned earlier, Wi-Fi RF transmissions between the device and an AP may be absorbed by lead walls or human bodies, redirected by metal objects and surfaces, or disrupted by sources of RF interference. A mobile device not only has to deal with the same RF attenuation as a stationary one, but also has to assess which AP it should lock on to. It also must be able to constantly assess signal strength and be able to find the strongest Wi-Fi AP when roaming within the structure. Figure 2 details a high-level overview of the evaluation process a device would use to ensure it always has the best connection.

TESTING CHALLENGES

To determine how a Wi-Fi radio embedded in a medical device will perform in a particular hospital setting, the most obvious place to test is in that specific hospital. RF propagation characteristics, AP coverage patterns, infrastructure devices and software versions, client device mix, and other Wi-Fi characteristics of a hospital usually are unique to that hospital.

It may not be viable, however, to conduct thorough medical device Wi-Fi tests in a hospital. Because medical devices provide patient care, they operate in areas of the hospital where patients receive care. Patient care is, of course, the main function of hospitals, and hospitals are averse to introducing risk into patient care areas. Most hospitals view Wi-Fi testing as an activity that introduces risk, so that activity is forbidden or tightly restricted in patient care areas.

Even when Wi-Fi testing is allowed in a hospital, it is most likely that no one on the hospital’s staff would have the time and expertise to conduct thorough tests on each medical device. The maker of a medical device may have both, but conducting Wi-Fi tests in every single hospital that is a potential customer is a daunting proposition, even for the largest medical device manufacturers.

That being said, it becomes fairly obvious that conducting tests in real hospitals can be difficult or impossible. In real life, medical device makers will conduct tests in more accessible environments that are meant to simulate a hospital. APs in an office building, warehouse, or other structures can be deployed and configured to have coverage patterns similar to those seen in a portion of a hospital. Medical devices then can be tested in that “hospital-like” environment.

However, simulated sites present distinct challenges. The first is that the environment must simulate the hospital as close as possible. Hospitals have conditions that vary much more widely than those of office building, malls, stadiums and the like. Specialized locations such as x-ray areas, ER’s isolation units, oncology departments, ocular and audiology, etc. can have vastly different impediments to Wi-Fi cells. Thusly, challenges of testing in a “hospital-like” environment include deploying and configuring APs from different manufacturers and (2) simulating the RF characteristics of a hospital.

For the most accurate results, wireless functionality should be tested on a variety of infrastructures from different providers. For each brand of wireless infrastructure, the test site must perform a complete site survey. This is both costly and time-consuming. Furthermore, other characteristics of hospitals are difficult to recreate, such...
as lead walls, interference from a variety of devices, and people constantly walking around. It is difficult to recreate all of these characteristics in a "hospital-like" environment.

THE LAB

In a controlled lab environment, it is possible to simulate many of the RF characteristics of a hospital, such as materials that absorb RF transmissions, materials that reflect RF transmissions, interference from other Wi-Fi clients, and other sources of RF interference. One key advantage of a lab is that you can use APs and other Wi-Fi infrastructure gear from different vendors without having to mount all the APs in the ceiling.

To simulate, effectively, "real world" conditions, a test lab requires specialized test equipment:

- **A Packet Analyzer** (also known as a packet sniffer). This is used to intercept and log, or packet capture, traffic passing over a network. A packet analyzer is an extremely versatile test tool that can be used to monitor the conditions of the test environment, attempt to read and decode traffic in the environment, and identify the effects of interference on the tested device.

- **A Shield Room.** A shield room is used to protect precision equipment from the influence of external magnetic fields or electromagnetic signals that might interfere with the testing of a device.

- **An Attenuator.** This is used to simulate the effects of signal blockers. It is an electronic device that reduces the power of a signal without appreciably distorting its waveform. An attenuator is effectively the opposite of an amplifier, though the two work by different methods. While an amplifier provides gain, an attenuator provides loss, or gain of less than 1 (Figure 3).

In a typical roaming test to determine whether the Wi-Fi radio can maintain connectivity, the test is done by physically moving the client device so it must jump from AP to AP. In a lab environment, test engineers can recreate the process of roaming. Using an attenuator to increase and decrease the wireless signal from a stationary AP, a lab can trick the client device into thinking it is actually moving closer or further away from the AP, causing it to roam. Testing in a lab can be difficult and expensive, but when set up properly it is the most efficient and thorough way to test Wi-Fi.

HOW TO TEST

Reference Client vs. Medical Device

There are several differences between performing Wi-Fi testing on the actual customer medical device in contrast to performing Wi-Fi testing on a generic reference client device.

A physical characteristic of two such unique devices that can possibly lead to different RF performance is the antenna. Both the antenna selection and physical placement of the antenna within the device, can impact RF performance. Every type of antenna has different characteristics, such as unique gain and propagation patterns. If the customer’s device contains an antenna that is different than the tested device, with different characteristics, the RF performance will likely be different. The physical placement of the antenna within the two devices might also impact performance. Different physical locations of the antenna within each of the devices can produce different RF interference patterns.
Other parts of the wireless device can cause another problem known as multipath propagation. Multipath propagation occurs when a single radio transmission encounters a reflective material (such as metal) and transforms into multiple transmissions in the same way that a sound wave can echo when it encounters reflective objects. Multipath propagation typically reduces the performance of 802.11a, 802.11b, and 802.11g-compliant devices that support only single spatial streams because duplicate transmissions can be perceived by the receiver as original transmissions (which must be processed and discarded). Antenna placement or material composition in either the reference client or the actual device may cause multipath propagation in one device but not the other.

Taking all of these issues into consideration, it is most ideal for medical device manufacturers to make sure that their wireless module providers are able to test their specific end device, as opposed to a reference client device.

TESTING RF PERFORMANCE
Range testing in a simulated hospital, industrial, or warehouse setting is typically done in an open-air environment to determine the maximum possible range of the wireless radio. This is not the best method since it is difficult to replicate the potential RF interference that may occur in a real hospital. RF range and interference testing should be done in a lab with the ability to automate and simulate different scenarios.

TESTING INTEROPERABILITY
Testing Wi-Fi interoperability in a real hospital is next to impossible. It only allows for a glimpse of the functionality of one specific wireless infrastructure from one vendor, such as Cisco, Aruba, or others, with one controller software version, and APs with one specific firmware version. It is also difficult for medical device providers to do interoperability testing on their own because it would be costly to obtain infrastructure from every possible vendor. It is less difficult to do interoperability testing in a lab setting. Labs can more easily set up common infrastructure configurations with the most popular firmware and software versions to complete testing.

TESTING SECURITY
Security tests must ensure that the radio consistently connects to an AP, passes data to the network at expected data rates, receives data from the network at expected data rates, and seamlessly roams from one AP to another. These tests should work regardless of the Wi-Fi infrastructure and the authentication server on the network.

TESTING MOBILITY
Two ways that wireless module providers can test embedded Wi-Fi radios for connectivity, and roaming are by using automated tests and by doing “walk around” tests. Walk around tests are done with a complete infrastructure network set up and an engineer physically walks around with the wireless device. One specific walk around test is an edge of coverage test. In this test, the wireless device is walked outside of the network and then moved back into the network to ensure that the radio stays connected to the edge of the network and then reconnects as soon as the radio is back in range. This test simulates operation in a challenging environment.

In addition to this test, companies can also perform a catastrophic roam test in order to simulate a challenging environment. In a typical “smooth” roam test, the client device experiences gradually decreasing signal strength. In contrast with a smooth roam test, in a catastrophic roam test the client quickly loses connectivity with its associated access point. This test evaluates the time it takes for the Wi-Fi radio to roam and reconnect to an AP. In an ideal situation, the radio will quickly connect to the original AP or a new AP without a break in the data transfer. These and all other roaming and connectivity tests should be done with all possible radio settings to ensure that the radio roams and stays connected in a variety of roam environments.

RECOMMENDATIONS
Since it is difficult for medical device manufacturers to perform their own Wi-Fi performance testing, they should choose embedded Wi-Fi radios from manufacturers who employ a skilled test team that utilizes a state-of-the-art test lab and has developed proven methods by which to test Wi-Fi radios for use in challenging environments.

Laird is a global technology business focused on enabling wireless communication and smart systems, and providing components and systems that protect electronics. Wireless Systems solutions include antenna systems, embedded wireless modules, telematics products and wireless automation and control solutions. Laird PLC is listed and headquartered in London, and employs over 9,000 people in more than 58 facilities located in 18 countries. For more info, visit lairdtech.com
THE CONNECT

BY BOB BUTCHIO IN CONJUNCTION WITH CORNING OPTICAL COMMUNICATIONS
HOW COMMERCIAL REAL ESTATE DEVELOPERS CAN PROFIT FROM FORWARD-LOOKING STRATEGIES

The golden rule of real estate is changing. The industries’ long-term, steadfast unshakable mantra, location, location, location, is being shaken at its foundation. According to the real estate’s top experts, the industry now has a new mantra. It is “location, location, connectivity.”
There’s no mystery to it; ABI Research’s latest data shows that there are more than 10 billion wirelessly connected devices in the market today, with over 30 billion devices expected by 2020. Moreover, thanks to the proliferation of mobile work applications and bring-your-own-device (BYOD) policies, experts now believe 70 to 80 percent of the world’s mobile usage is happening in-doors, often inside commercial properties.

But thanks to that unprecedented, unrelenting rise in wireless data traffic, today’s outdoor networks can barely handle the data demand; they’re overloaded by outside traffic, while at the same time powerless, due to signal loss caused by building materials on the inside. This puts a tremendous strain on in-building networks, and makes delivering any form of wireless communication (especially cellular or Wi-Fi) less reliable, more expensive, and ever more complex.

Fortunately, commercial real estate developers can profit from this unpleasant reality by making decisions, today, that will alleviate the access, bandwidth, and throughput issues of tomorrow.

In this white paper, Corning and RF Connect will analyze the ins and outs of “future-ready” data networks from a developer's perspective — including methods for choosing the right components, selecting the right sources, and ensuring future service readiness for maximum profitability and return on investment (ROI).

DATA: THE FOURTH UTILITY

According to Intel, 10 billion applications have been downloaded from iTunes, 200,000 text messages are sent every second, and 35 hours of video are uploaded to YouTube every minute.

There’s no end in sight; not only is our extraordinary demand for person-to-person data communications likely to continue unabated, but we’re on the verge of a Renaissance in what Cisco calls the “Internet of Everything.”

Think, for example, of office security cameras (equipped with real-time analytics) alerting a building’s security manager that they’ve detected a threat. That’s digital information, sent wirelessly, via the Internet to an individual’s smart device. And it’s a massive amount of digital information, too. According to Cisco, if you’re streaming video to a local area network (LAN) file server or storage unit, a single camera might need 11 Mbps of bandwidth; with five cameras, it could take 53 Mbps.

What’s more, data is increasingly being driven by machine-to-machine (M2M) communications, without any human involvement whatsoever. Think, for instance,
of that same security camera communicating, autonomously, with a building’s HVAC system to aid with the detection of water leaks. Or consider that camera using motion detection software to determine a room’s occupancy level, then sending that information to the HVAC system to help make real-time heating and cooling decisions.

All told, companies like Bosh estimate that more than six billion “things” will be connected to the Internet by 2015. Already, with a myriad of digital, wireless, and IP-based systems taking root, many of which are now central to the operation of commercial buildings, broadband data has become an unofficial “fourth utility,” as crucial as electricity, water and gas.

To real estate strategists like James Carlini, “the need for [data infrastructure today] is as important to commerce and urban development as the need for good roads, bridges, and public transportation.” In fact, according to a recent report from Deloitte, attracting tenants and buyers is requiring the “commercial real estate industry to fundamentally, change [its] business practices, including re-designing existing space to suit new tenant demands and the growing use of automation.”

Today’s building occupants are demanding wireless data and cellular communications without restriction, every time, at full speed, and with the dependability of a landline. But beyond that, they’re demanding to work with the newest available applications and devices, which means a need for ever-increasing bandwidth.

Traditionally, real estate developers and management companies have addressed this need for bandwidth reactively. As technology evolves, they attempt to “catch up” with the building infrastructure by creating multiple parallel networks that in many cases demand higher capacity than the existing cable structure can provide.

Operating like this, by perpetually adding new networks and running new cabling—is a tremendously expensive and unsustainable practice. Tomorrow’s tenants will demand a much more scalable bandwidth infrastructure, and developers will need an inexpensive and efficient way to meet this crucial requirement.

Fortunately, the solution is not uncharted. Gas, water, and electricity are all purchased and installed based on specifications intended to last the lifetime of a commercial building. If we consider data access to be a true “fourth utility,” why wouldn’t we design and budget its infrastructure in the same way?

BUILDING FOR THE FUTURE — ALL FIBER

So what does a future-ready data network actually look like? For starters, we know that in-building communications networks have undergone substantial changes over the past decade. Most businesses have transitioned from twisted pair, copper voice lines to either voice over Internet protocol (VoIP) connections or cellular service. For security personnel, we’ve seen a shift from two-way radios to IP cameras and closed circuits. And thanks to growing trends like BYOD, secure remote email access, and Web-based tools for asset tracking and conferencing, more and more wire line services have been replaced by wireless.

In this emerging world of all-digital, all-wireless communications, it’s safe to say that copper cabling, though it has served us well over the years, is very quickly running out of the capacity to support our soaring bandwidth needs.

Rather, at this point in time, we must look to fiber; only all-fiber (passive optical LAN) infrastructures have the capacity for unlimited bandwidth. And while fiber is already the industry’s standard for intrabuilding riser cabling, today’s forward-looking commercial developers are taking the next logical step—installing fiber in the horizontal. As data traffic increases, the copper cabling used in horizontal networking will become an infrastructure’s primary “choke point.” Hence, the shift from copper to fiber in the horizontal will
be a crucial component of future-ready network planning. For years, the knock on fiber has been its perceived cost. However, in today’s business climate, tenants and developers are increasingly finding that fiber actually reduces their costs over time. Not only are the prices of fiber cable components, and hardware steadily decreasing, but most fiber installations now cost less to install and to maintain, suffer less downtime, and require less networking hardware than copper cabling systems. At one-tenth the size and weight of copper, fiber allows for a much cleaner, simpler cabling infrastructure. (What’s more, the availability of pre-terminated fiber cables can drastically reduce both installation costs and deployment times.)

Most importantly, fiber’s virtually unlimited bandwidth (capable of carrying 65,000 times more information than unshielded twisted pair copper cables) makes a fiber-based system future-ready, which eliminates the brutal costs of continuous rip-and-replace upgrade cycles.

BUILDING FOR THE FUTURE — CONVERGENCE
Another way the forward-looking network reduces costs and improves performance is through convergence, extending the core network to support multiple in-building applications, including cellular (via cost-effective Distributed Antenna Systems), Wi-Fi, and other IP-based services.

Already, there are hundreds of systems and applications that buildings must support (public safety, security, building automation, WI-FI, LAN, DAS, and PON, to name but a few) with more arising frequently. Through convergence, developers can save capital expenditures (CAPEX) and operational expenditures (OPEX) by eliminating the need for parallel network structures. Instead of managing an unwieldy set of separate networks, the single converged infrastructure transports all of a building’s voice, video, and data with the convenience of a one-stop shop.

Moreover, that shop must be fully equipped. For too long, network planners have neglected to provide fast, reliable cellular service throughout an office building’s dense, labyrinthine interior. Perhaps yesterday’s tenants were willing to forego in-building cellular service; rest assured, today’s tenants will demand it. With the number of cellular devices expected to exceed the world’s population some time in 2014, sophisticated tenants can no longer abide the potential for missed calls, opportunities, or revenue.

Fortunately, robust cellular service through cost-effective distributed antenna system (DAS) technology, once reserved only for large-scale public venues — is now available to everyone. And with new converged solutions and shared cost models, in-building cellular voice and data service needn’t be complex or costly.

SELECTING A SOURCE
An additional cost driver for commercial real estate developers is the number of subcontractors (and the amount of specialized labor) needed to complete an in-building networking project. Having a single-source integrator — instead of hiring separate consultants, low-voltage contractors and cable contractors can reduce time, cost and project delivery risk. However, when it comes to choosing an integrator with the requisite expertise, commercial developers should consider several criteria.

First, and foremost, the integrator should be highly familiar with fiber-based networking solutions that can deliver a truly future-ready infrastructure. Second, the integrator should have experience fielding converged solutions that support multiple services and applications, and that can easily be modified (via telecom closet or head-end in the building) to adjust or add services.

Next, the integrator should be familiar architecting solutions that can provide flexibility to tenants when they inevitably change floor plans or the locations of services. In-building wireless implementations are multifaceted and complex, with multiple stakeholders and a myriad of details. At a minimum, these projects require a well-coordinated effort, performed by experienced RF engineers with specialized tools, analytics, testing and problem solving methodologies.

Finally, an integrator must be able to deal effectively with wireless carriers — negotiating, coordinating, scheduling secure design approval and rebroadcast rights, and getting the system tested and commissioned to the carrier’s satisfaction.

COMMANDING A PREMIUM
With the commercial real estate industry anticipating continued market improvements to rent and occupancy levels, as well as asset prices, transactions and capital availability, now is the perfect time for investing in future profitability. As such, developers will be examining projects carefully to ensure their potential for return, with a special
emphasis on building assets—particularly in major metropolitan markets that are seeing prices move closer to 2007 peaks, ensuring that those assets are competitively positioned to command appropriate premiums.

Network infrastructure planning, designed for the future, not the present, will be essential to this pursuit, and successful developers must be forward thinking in their efforts to attract sophisticated future tenants and buyers. More specifically, commercial developers can benefit from taking the specific actions outlined in this article. They are:

- Treating data access as a core utility, and choosing a data infrastructure based on specifications intended to last the lifetime of the commercial building.
- Creating future-ready bandwidth capabilities by choosing fiber in the horizontal, instead of copper.
- Creating future-ready service capabilities, including robust cellular service, by efficiently converging networks and applications.
- Choosing a single-source integrator with expertise in fiber, convergence, in-building networks, and other areas beyond basic networking.

THE BOTTOM LINE
Overall, commercial developers must be wary of cheap imitators — focusing on long-term profits instead of short-term savings. And they must be creative in achieving new future-ready solutions and intelligent infrastructures and amenities, supporting the next generation of devices, services, and networks. Done strategically, today's infrastructure planning can be tomorrow’s profit.

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SMALL CELLS:
A SMALL SOLUTION TO A BIG PROBLEM

By Ashley Brotherton

Only in Sci-Fi would someone have predicted smartphones 50 years ago. Only futuristic minds could think of something as wild as people carrying around handheld phones-turned computers in their pockets.


“Communications will become sight-sound that you will see, as well as hear, the person you telephone,” wrote Asimov. “The screen can be used not only to see the people you call but also for studying documents and photographs and reading passages from books.” But he only scraped the surface. Not even Sci-Fi could fully envision the capabilities of today’s smartphones, or how our lives would be centered on such devices.

Americans are obsessed with smartphones. On average, Americans check their phones 150 times a day for everything ranging from updating a status on Facebook to emailing a co-worker to playing a game of solitaire.

To keep up with America’s constant need to be connected, cell phone makers continue to develop data-hungry phones that demand faster connections and impeccable service. The smartphone boom catapulted the amount of data used on the carriers’ spectrum, and it doesn’t seem to be slowing down.

Industry experts have said that mobile data traffic is projected to grow as much as tenfold by 2019. Considering that mobile networks in North America are already filled to 80 percent capacity, if these predictions are accurate, the networks will implode. But there is a solution: small cells.

Small cells have ignited a spark in the wireless industry. These low-powered access nodes can add capacity, among other things, to high-density areas, helping off-load stressed macro sites. They best serve in places where a lot of people are on their phones at once: stadiums, universities, neighborhoods, etc.

Small cell, with their small footprint and low power, can be installed just about anywhere. However, there is still a bit of a stigma, the not in my backyard (NIMBY) attitude, that needs to be overcome. There is progress being made to address that and if the industry educates the public properly, the zoning procedures could be streamlined into a smooth and efficient process that could make small cell deployments as quick and efficient as mobile cell phone vans. There is little doubt that, as small cells evolve, forward-thinking industry leaders will innovate to solve complexities that small cells still face.

SITE SELECTION: SMALL, SPECIFIC, STEALTH

Small cells’ tiny nature makes them an easy fit almost anywhere: poles, indoor and outdoor walls, benches, etc. They only need a footprint of about four feet by four feet and less than thirty feet of height to mount the antenna. Small cells’ low signal power output of two watts or less, makes them completely safe within the proximity of people or animals.

Good thing, because accurate placement is crucial for small cells. Mounting the antenna at the wrong angle could curb any signal from reaching a cell phone. Site selection for small cells must be spot on for the antenna to be effective. A well-placed small cell can off-load about 70 cell phone users from the macro-site, adding much needed capacity to the network.

Their small size makes it easy to conceal the antenna, with passers-by not even noticing the addition. With paint and inconspicuous stealth, small cells can easily blend into its surroundings. What passers-by will notice...
is how quickly they can upload a picture to Flickr or how fast an email is delivered.

**ZONING: EDUCATION IS KEY**

There is no consistent story when it comes to zoning small cells. Some municipalities treat small cells just as they would a traditional antenna, while others treat the low-powered nodes as Distributed Antenna Systems (DAS). They can be seen as different processes, depending on where you are. Some municipalities even exempt small cells, and let the setup process walk the permit through with no questions asked.

Streamlining the process over the next few years is key to the success of small cells. The only way to get everyone on the same page is by education; the pros — and the cons — of small cells, to municipalities and the public.

By educating the public about small cells’ low power having no health risks, their ability to be stealthed into their surroundings and the improved cell service, then the permitting process can go smoother for all parties involved.

**COMPLEXITIES: BACKHAUL SOLUTIONS**

To ensure the long-term success of small cells, the industry needs to figure out how to efficiently get backhaul to the antennas, which can sometimes take up more room than the actual small cell. Even if a small cell can fit on a pole, where is the backhaul supposed to fit? If you need to rent two spaces from a landlord, is it still cost effective? These are issues that the industry is working on as we speak.

**CONCLUSION: INNOVATION**

Phones are just the start of the wireless revolution. The demand for tablets, netbooks and the like to be connected 24/7 is growing as fast as smartphones. Plus with the innovations to add wireless coverage to everyday, household items, who knows what technology we will see in the year 2064.

As the need for capacity grows, so will the need for small cells and the technology that goes along with them. With trial and error and a little innovation from the wireless industry, small cells will truly be the biggest thing in wireless.

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EXTENDING SMALL CELL CAPACITY WITH RF LENS TECHNOLOGY

RF LENS TECHNOLOGY OFFERS PLANNERS MORE OPTIONS WHEN CAPACITY IS REQUIRED. NO LONGER ARE THE CHOICES JUST TO ADD A MACRO CELL OR BUNCH OF SMALL CELLS.

It often seems there is a binary choice for RF planners between making macrocells even more spectrally efficient versus deploying large numbers of small cells. Techniques such as sector splitting can add extra capacity to macrocells, but are insufficient to meet growing demand. Small cells add enormous amounts of capacity, but can’t always be positioned exactly where required. In some cases, prospective small cell sites are either too costly or simply not feasible. A better solution is to expand the capacity of small cells via multi-sectorization technology. This article looks at how that can be accomplished using a Luneberg lens based antenna solutions.

Multi-sector small cell base stations can be deployed in dense urban areas or sites associated with very large concentrations of people (e.g. stadiums, city centers, outdoor music festivals, etc.). To date, LTE, the standard solution, is demonstrating very good performance with up to 15 sectors deployed at a single macro base station site. However, LTE multi-sectoring cannot always supply the needed bandwidth. Therefore, combining multi-sectors with small cell technology promises to become a very cost effective method of delivering multi-gigabit throughput for these challenging conditions.

OUTDOOR URBAN SMALL CELLS

The total cost of an outdoor urban small cell is much higher than indoor small cells. Factors include site acquisition, greater difficulty to gain site access, providing power and backhaul, plus coping with the environmental temperature and weather variations.

Therefore, there is a considerable incentive to make each small cell as productive as possible, with operators looking ideally for tri-mode products that deliver 3G/ LTE and Wi-Fi at multiple frequencies. Today these are all single sector (i.e. transmitting the same signal in all directions). One current approach, from Huawei, includes beam-forming capability in their Atomcell, so that the coverage footprint need not be the same in all directions (i.e. not circular). This helps system efficiency by reducing interference with neighboring cells, especially macrocells. Alcatel–Lucent’s Metrocells can also be positioned to direct the signal away from the macrocell (zone exclusion). But it isn’t true multi-sectoring.

A more inclusive step would be to add a multi-sector antenna array to a small cell location. Each sector would be connected to a separate small cell radio board, sharing a common high-capacity backhaul link. The RF lens-based antenna would need to be the size of surrounding street furniture; size will vary with frequency bands supported (i.e. higher frequency means smaller size).

An example of such a footprint antenna could handle up to 9 sectors of low-band and 18 sectors of high-band, each providing both 3G and LTE service at different frequencies. If we assume even distribution of users, this would represent a capacity increase of more than 12 times and easily providing in excess of 1 Gbps throughput.

The physical format of such an installation would be much bigger than a typical small cell but considerably smaller than an equivalent macro base station deployment. The range and capacity would be phenomenal – several Gbps overall. Imagine covering a street square or busy transport hub such as a railway platform or concourse with just one or two of these.

ENTERPRISE SMALL CELLS

The relatively low cost of an indoor enterprise small cell suggests that in most cases, it is likely to be cheaper to install one or two additional small cells where capacity is required. It is the more challenging situations, where very high-capacity density is required, or where additional cells can’t be physically located, that this technology could be more appropriate. Indoor stadiums, conference centers, and places with very high footfall might be most relevant.

Using a multi-beam antenna solution also provides the ability to exclude coverage by switching off one, or more of the beams, if desired. This option is valuable to help with load balancing and optimization. Candidate sites for small cell deployment that require zone exclusion for either load balancing or integration optimization will work...
best with a multi-beam antenna solution. Lunberg lens based multi-beam antennas are designed for exactly such applications because they provide very narrow beams to minimize the adverse effect of excluding too wide of an area due to wide beam antenna use.

**PHYSICAL CONFIGURATION**

As is the case with antennas, in general, the Luneburg lens antenna’s size is closely related to the frequencies used and the number of sectors required. Most small cells will be operating between 1.7 GHz and 2.7 GHz, which makes the antenna size more manageable. Weight can be a factor; however, because, at these frequencies, each sector contributes slightly less than 3 kg. to the total weight.

An example of this is the Matsing 4-beam antenna with 360 degree coverage in a pylon shaped enclosure, which can be driven from any small cell radio with external antenna capability. This weighs less than 20 kg, hence can still be pole mounted. A much more complex 45-sector unit weighs less than 120 kg., so one can observe a general relationship between sectors and weight from this example. Figures 1 and 2 show the highly symmetrical radiating pattern from the Luneberg Lens-based antenna and both low and high frequencies.

**INTEGRATING INTO THE NETWORK**

Sectorization is not a new concept for the mobile radio industry. Implementing it with small cells follows the same principles as for macrocells. With such small sector sizes, however, the installation would want to avoid areas with fast moving traffic that generates large numbers of handovers. There would also be more reliance on self-organizing network (SON) technology to configure the neighbor lists and other parameters, and optimize handovers, coverage, and capacity. With the addition of a switching matrix, it is possible to vary the sector count with demand, which will become more viable with the evolution of SON systems. As well, by varying sector count to match network demand at each site, pooled resources such as backhaul can be better utilized. Figure 3 is a typical deployment of a roadside small cell using the Luneberg Lens.

A single RF lens antenna is radio technology agnostic, and works well with 3G, LTE, LTE-A and/or TDD mode. Refarming of spectrum between 3G and LTE doesn’t require new hardware or parts, and may be possible remotely if the small cells support it.

**LTE** — A features many enhancements, including augmentation that will require antenna solutions with a very wide band performance. Lunberg lens dielectric
material performs well up to a cutoff frequency of 10 GHz, meaning all existing frequency bands are supported through single lens.

While the small cell industry is generally trying to de-skill and simplify small cell installation to enable mass rollout and deployment, this technique is one that will require RF experts. It’s intended for those special cases of super-high capacity where experts will choose the best approach from each situation — choosing between the technologies of larger numbers of small cells, multi-sector small cells, macrocells and/or distributed antenna systems (DAS). RF planning tools will be essential in these scenarios. Standard installation and commissioning practices can be used onsite. There is nothing out of the ordinary required to make it work. Once commissioned, the use of SON software is important to fine tune and improve overall performance, making the most of both coverage and capacity.

CONCLUSION

With small cells evolving into widespread deployment over the next couple of years, it may be some time before we see many combined with RF lens technology. However, this does illustrate one direction the industry could take to extend small cell capacity further and meet longer-term future data capacity demands. This is particularly useful in the more challenging locations, where traditional approaches may be too costly or constrained.

Written by David Chambers with credit to Tony DeMacro of Matsing for elaboration and edits. Matsing is an innovator of RF Lens based solutions for communication and antenna measurements using patented metamaterials and manufacturing processes. For more info, visit matsing.com

FIGURE 3 — STREET-MOUNTED SMALL CELL INTEGRATING THE MATSING SMALL CELL ANTENNA.
## MAY 2011

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REPORT: $10B MARKET FOR SMALL CELLS IN 2018

Mobile Experts have released a 94-page market study that provides detailed analysis of small cells and low-power base stations. This market study reveals insight into how the mobile infrastructure market is changing to address a need for concentrated mobile traffic in multiple scenarios. The study includes analysis on multiple types of small cells, from pico to metro, including cells that utilize a traditional radio access network (RAN) architecture. In addition, the study includes detailed analysis of low-power remote radio head (RRH) applications, which are expected to enable Cloud RAN (C-RAN) functionality in the indoor environment.

Resources include more than 30 mobile operators and 40 suppliers from which data was collected, for this market study. By collecting detailed shipment and deployment information, we are able to present a forecast with specific data by region, by frequency band, by mode, by application type, and many other dimensions.

SMALL CELL EQUIPMENT MARKET REPORT

Transparency Market Research has a report out that includes a detailed market survey, and analysis trends on the Small Cell Equipment Market. This report includes a basic overview of the industry, including definitions, applications, and global market industry structure. The report presents numerous metrics on how small cell architecture deploys significant commercial and performance benefits for 3G and 4G networks, which is expected to drive the market to a great extent in the near future. Continued aggressive growth in data traffic fueled by an increase in the sale of smartphones, video and multimedia applications, web-based communications, and machine-to-machine (M2M) devices is creating an urgent need for faster and efficient networks. To that end, small cell architecture offers 2.5 times the user data rate of pure macro cell environments, providing a mean data rate of 10 Mbps per user. Small cells are expected to play a significant role in easing capacity issues in cellular networks under a variety of conditions, both temporary and permanent.

CHANGING OF THE GUARD AT CTIA

Wireless trade association CTIA announced that industry veteran and former Federal Communications Commission Meredith Attwell Baker will take the reins of the trade group effective June 2. Baker will replace retiring CTIA President and CEO Steve Largent. Baker previously served as a commissioner at the FCC, from 2009 to 2011. It is believed by some that Baker will help the slide CTIA has felt over the past several years. Baker noted plans to bring a new focus for the trade organization.

TURFING VENDOR WIRELESS COMMUNICATIONS MARKET SHARES, STRATEGIES, AND FORECASTS

WinterGreen Research announces that it has published a new study — Turfing Vendor Wireless Communications: Market Shares, Strategy, and Forecasts, Worldwide, 2014 to 2020. The report discusses how worldwide markets are poised to achieve significant growth as the Turfing Vendor Wireless Communications are used to further build out, and support the implementation of small cells. The biggest potential shift in turfing vendor markets will come after the end of the forecast period when Google begins to offer 3G speed free Internet connectivity worldwide. This will come from its Loon project that uses balloons launched at 22,000 feet above the earth, guided by upper air winds, implementing a new telecom bandwidth.
On a cold January morning, Angelina and her family woke to a fire that within hours had destroyed their home. The American Red Cross was there with shoes, warm clothes and shelter that allowed her family to stay together. Your donations help the Red Cross respond to a home fire like Angelina’s every 9 minutes.

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American Red Cross
On September 26, 2013, the Federal Communications Commission (FCC) adopted a Notice of Proposed Rulemaking (NPRM) seeking ways to “promote deployment of infrastructure that is necessary to provide the public with advanced wireless broadband services.” The NPRM solicited public comment on whether changes to various FCC rules and regulations should be made.

For DAS and small cell deployment, several questions were raised:

- Should DAS and small cells be exempt from the FCC’s environmental review under the federal National Environmental Policy Act (“NEPA”)?

- Should historic preservation regulations under the 1966 National Historic Preservation Act (NHPA), as amended, be updated to account for distributed antenna systems (DAS) and small cells?

- Should the FCC’s Shot Clock apply to DAS and small cells?

- If the Shot Clock applies, should an application be “deemed granted” if a local government does not act on a DAS or small cell application by the end of the applicable Shot Clock period?

In statements issued with the NPRM, two FCC Commissioners referred to wireless infrastructure as the “unsung hero” in the ongoing mobile broadband revolution. And, in remarks made at February’s Mobile World Congress, FCC Chairman Thomas Wheeler stated, “[we] can’t have high-speed broadband without high-speed deployment.”

These statements follow recent federal regulatory and legislative relief for wireless infrastructure deployment, such as Section 6409 of the 2012 Middle Class Tax Relief Act (Section 6409), the Shot Clock, and the FCC’s 2011 Pole Attachment Order. Notwithstanding these improvements to the legal landscape, in issuing the NPRM, the FCC acknowledged that more needs to be done.

The FCC specifically requested comment on a proposal made by the HetNet Forum and Personal Communications Industry Association (PCIA) suggesting that categorical exclusion from review under NEPA and NHPA should be based on the size of the DAS or small cell installation. Installations that are within a specified size (based on a maximum cubic volume of equipment) would qualify for exemption. The Association of American Railroads agrees with the PCIA/HetNet Forum approach because the exclusion would be based on the size of the equipment, not the type of technology. It wants the approach to apply to Positive Train Control installations. The Utilities Telecom Council (UTC) also supports the PCIA/HetNet Forum recommendation.

The FCC received about 300 sets of comments in response to the NPRM. Not surprisingly, most municipal and state commenters believe that further easing of regulatory burdens for deployment of DAS and small cells (and traditional macrocell sites as well) should be limited, or is a bad idea. Many commenters who addressed DAS and small cells specifically commented on the NEPA and NHPA exemption issues.

For example, the City of West Palm Beach, FL, believes that the proposal to streamline NEPA and NHPA rules for DAS and small cell applications by categorically excluding them from FCC review is not objectionable in concept but should
be refined to still require review for attachments to water tanks. It argues, as do other municipal commenters, that attachments to water tanks could contaminate the water supply during construction. This is highly unlikely. Wireless facility attachments to water tanks are common. Water tank operators have every incentive to, and in fact do, take substantial precautions to protect the integrity of their water supply by limiting the means and methods for installation of these attachments. Often, attachments are not made to the tank itself. Instead, they are made to the tank legs or top; or, if made to the tank itself, attachment is made when the tank is empty.

The City of Chicago supports the FCC’s efforts to facilitate improved wireless broadband access, and it generally supports the FCC’s motivation to streamline deployment “where consensus among stakeholders can agree that improvements can be made.” Chicago has approved many DAS and small cell projects in the past. It strongly supports making such deployment easier “when safe and in the public interest,” so long as the city maintains control over when and how deployments are made on city-owned property. In that regard, the city asks that installations on its property be treated similarly to installations on private property and not subject to a “deemed granted” rule under the Shot Clock.

Like Chicago, the City of San Antonio, TX, noted that it has previously approved projects involving DAS and small cell solutions. However, the city argued that broadening NEPA and NHPA exemptions fails to consider the “full potential impacts of widespread DAS and small cell deployment.” Although San Antonio agreed that mounting antennas on existing towers and buildings often is preferable from an environmental and aesthetic perspective, it said that is not always the case. By broadly defining Section 6409 to cover applications for facilities on non-tower structures or to pre-empt local historic preservation or environmental review, structures like utility poles would be exempt from review. As a result, the city claimed, there could be “significant historical preservation and environmental issues,” such as leaking fuel from diesel generators that could enter aquifers.

In consolidated comments from a group of cities, including the cities of Alexandria, VA; Arlington, TX; Bellevue, WA; Boston, MA; Los Angeles, CA; and others, it was suggested that no further regulatory changes are needed, although the FCC was encouraged to foster collaboration between the industry and municipal governments to develop best practices.

The City of Saint Paul, MN, provided photo simulations to show why DAS and small cell deployment should not be exempt from NEPA or NHPA review. It included a photograph of the Minnesota State Capital in front of which is located a typical streetlight pole. Extending above the top of the pole is a macrocell installation — a three-sector, twelve antenna array. In addition, a photo simulation of a “stub” tower atop the roof of a two-story townhouse containing three macrocell arrays is included. It is difficult to imagine how these fanciful examples could be constructed from an engineering perspective.

Structurally, the poles could not support the equipment shown.

In at least one case, a municipal commenter seemed fully supportive of streamlining deployment. The State of Wyoming County Commissioner’s Association stated that the “biggest concern among its members was the lack of cellular coverage” in rural counties that contain or abut large portions of public/federal lands.

The FCC should be applauded for considering further rule changes to promote faster deployment of wireless broadband infrastructure. Encouraging more industry-government collaboration is a good idea but, by itself, will not result in meaningful change. The FCC should adopt rule changes to permit exemption of DAS and small cell installations from NEPA and NHPA review using a “volume approach” like the one suggested by the HetNet Forum and PCIA.

It should also confirm that the Shot Clock applies to DAS and small cell installations, and it should add a “deemed granted” rule under the Shot Clock. Further streamlining rules for deployment will allow the unsung hero to continue supporting the broadband revolution.

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REGULATORY UPDATE

WIA COMMENT ON THE FCC SPECTRUM SHARING AT 3.5 GHz NPRM

Recently, the FCC released a Further Notice of Proposed Rulemaking (NPRM). It addresses the 3.5 GHz band. The FCC proposed new rules that would allow spectrum sharing in the 3.5 GHz band, an action that would allow the government and wireless users to most efficiently utilize this limited resource.

Upon the FCC release, the Wireless Innovation Alliance (WIA) released its own statement commenting on the action. The WIA feels this is an important step forward and commends the Commission’s leadership and commitment to the crucial role unlicensed spectrum plays in our nation’s wireless future. Opening the 3.5 GHz band would not only promote shared small cell use and rural broadband deployment, but it will benefit countless stakeholders, including public safety, small businesses, educators, and consumers through improved wireless broadband access.

THE FCC TAKES THE NEXT STEPS IN THE EXPANSION OF RURAL BROADBAND

The Federal Communications Commission has begun implementing the next phase of its program for expanding robust broadband in rural America, the Connect America Fund. Phase I of the Fund has already invested over $438 million to deploy broadband service to 1.6 million previously unserved Americans. Phase I also invested $300 million to expand advanced mobile wireless service and nearly $50 million for better mobile voice and broadband on Tribal lands.

Phase II will result in a nearly 70% increase in annual support for broadband and voice service in areas served by the nation’s largest traditional local providers – known as “price cap” carriers. The effort will expand broadband access to an additional 5 million Americans who are currently unable to benefit from the opportunities of 21st century communications. Over five years, Phase II will provide nearly $9 billion to further expand broadband in rural areas. Today’s actions build on the FCC’s experience implementing the 2011 reforms of universal service support for voice and broadband in rural areas that created the Connect America Fund.

However, since there has been rapid private sector expansion of 4G LTE mobile broadband service since 2011, the Commission is exploring whether to retarget Mobility Fund Phase II support to ensure the continued deployment and preservation of 4G LTE mobile broadband service and preservation of mobile voice and broadband service in areas that otherwise would not have such service through marketplace forces.

The concept of targeting subsidies for broadband and voice service to pockets of rural America where they are needed most is central to the FCC’s 2011 reforms. Later this year, “price cap” carriers will be given the opportunity to accept Connect America Fund support in high-cost areas based on detailed local cost estimates, calculated by a cost model. Incumbent carriers must choose to accept or decline the offer of support for all entire high-cost locations they serve in a given state; if they decline, the subsidies will be made available to other providers, awarded through a Phase II competitive bidding process.

To help ensure the success of the competitive bidding process, the Report and Order streamlines the process for allowing non-traditional providers, such as cable operators, satellite providers, and electric cooperatives, to become eligible for support. We expect these changes to benefit consumers living in the nation’s most remote and difficult to reach areas by increasing flexibility for parties who wish to provide service in these regions.

Today’s action also takes several steps to improve the climate for broadband investment in areas served by smaller incumbent carriers known as “rate-of-return” carriers. First, the item modifies or eliminates rules established in the 2011 reforms that are not serving their intended purpose. Second, in a Further Notice of Proposed Rulemaking, the item proposes to establish a Connect America Fund for rate-of-return carriers and seeks comment on how to do so within the current budget for the program, and how to provide rate-of-return carriers with a way to transition to new forms of support.
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