



THE GROWTH OF SMALL CELLS

OPPORTUNITIES FOR ELECTRIC UTILITIES AND TELECOMS BACKGROUND

A relatively new technology, “small cells,” is experiencing significant growth, and, while most of the growth, at least so far, is in metro areas, small cell technology provides opportunities for almost all electric utilities and telecoms, and, it seems, these opportunities will grow in the future.

THE NEED FOR SMALL CELLS

According to AT&T, mobile data volume is growing exponentially, and smart phone sales outnumber PC sales.

According to Verizon Wireless, global mobile data traffic grew 81 percent in 2013. And, in 2013, world-wide mobile data traffic was almost 18 times the size of the entire global Internet in 2000.

And, according to Alcatel-Lucent, mobile broadband connections will triple between 2011 and 2016.

This exponential growth is leading to congested macro networks, causing wireless providers to begin looking around for more tools to supplement the macro network.

POTENTIAL SOLUTIONS

According to ABI Research, 48 percent of mobile data traffic will be offloaded from the macro network by 2015, although no individual technology will dominate in the offloading.

Currently, there are a number of potential technologies and solutions being utilized as a way to help alleviate the congestion triggered by the growth of global mobile data traffic. The most widely-used are:

- Increase the deployment of new macro cells
- Add additional capacity to existing macro cells
- Install Distributed Antenna Systems (DAS)
- Expand the use of Wi-Fi
- Install small cells

SMALL CELLS

As technology allows people to get more connected, more and more cell sites are getting smaller. Giant macro cell towers are no longer the norm, as carriers are increasingly turning to the small cell option.

Small cells are low-power wireless (radio access) access points that provide improved cellular coverage and capacity for homes, enterprises, metropolitan public spaces, and rural public spaces. Depending on the size, they can operate in the licensed or unlicensed spectrum.

The small cell market was created in 2007, when Sprint launched consumer femtocell (discussed below) services as a way to improve customer service.

According to Alcatel-Lucent, mobile operators use small cells to extend their service coverage and/or increase their network capacity. With small cells, mobile operators can offload traffic by as much as 80 percent during peak times.

According to AT&T, small cells offer a number of benefits. They can provide coverage to whitespace buildings and floors, with a smaller footprint and tighter capital expenditures; relieve capacity demand in-building in spectrum-constrained markets; and provide easily deployable temporary capacity or coverage for specific events.

TYPES OF SMALL CELLS

Currently, there are four types of small cells.

MICROCELLS are generally deployed in urban areas, as well as in some rural areas.

METROCELLS are generally deployed in high-density urban hotspots, such as city centers, airports, and shopping malls, as a way to alleviate capacity bottlenecks. However, some are also being installed in rural areas. Metrocells are small, low-powered devices that are placed directly where coverage and capacity are needed. They do not require towers. They can be affixed to lamp posts, utility poles, sign posts, bus stops, and even sides of buildings.

PICOCELLS are generally deployed in indoor public areas, such as airports and shopping areas.

FEMTOCELLS are generally deployed in consumer and enterprise environments, as well as residential environments.

According to AT&T, here are the estimated number of users and ranges for the various types of technology:

- Distributed Antenna Systems (DAS) are typically fed by a macro or micro base station, provided by a high-power, multi-frequency carrier. DAS allows up to 1800 users per base station, with a cell radius of up to three miles.
- Wi-fi wireless access points connect a group of wireless devices to an adjacent wired LAN. Wi-fi allows up to 200 users per a three-radio access point, with a cell radius of about 65 feet.
- A microcell is a short-range base station used to enhance indoor and/or outdoor coverage. It allows between 32 and 200 users, with a cell radius of up to one mile.
- A metrocell is a high-capacity, low-power device that fills in coverage holes within buildings. It allows between 16 and 32 users, with a cell radius of between 10,000 and 20,000 square feet.

- A picocell is typically used for indoor applications, such as office buildings, airports and malls. It allows up to 32 users, with a cell radius of up to 750 feet.

- A femtocell is a small, lower-power cellular base station typically used for homes or small businesses. It allows four to six users, with a cell radius of up to 40 feet.

OPPORTUNITIES FOR ELECTRIC UTILITIES AND TELECOMS

According to estimates provided by Informa Telecoms & Media, the small cell market will generate \$22 billion during 2016, 73 percent of which will be driven by public area small cells.

According to the Small Cell Forum, the number of small cells deployed overtook the total number of macro cells in November 2012, and consumer femtocells overtook macro cells in February 2013.

A report published by Infonetics Research in January 2013 predicted that approximately 25 percent of total traffic will be carried over small cells by 2016. The report also found that 86 percent of surveyed operators plan to backhaul small cell traffic to nearby macro cell sites.

Verizon, AT&T, Sprint, and other cell service providers are all actively involved in small cell deployments.

There are opportunities in a number of areas:

- 2G Network Opportunities: Rural coverage is a key market that has developed, as mobile operators have started to install public access metrocells in remote and rural areas that have 2G coverage, or no coverage at all. The cost advantage of small cells compared with macro cells makes it economically feasible to provide coverage to smaller communities.

- 3G Network Opportunities: In these networks, small cells are proving effective as an offload technique.

- 4G Network Opportunities: These networks are already being constructed with layers of small and large cells.

As such, there are opportunities for electric utilities to participate in the growth, primarily as it relates to joint use with their poles. And, there are also opportunities for telecoms, since small cells need connections, and since the preferred connection is dark fiber. (This is discussed in more detail below.)

"Small cells have potential where you have a small area of concentrated usage," said Monica Paolini, founder and president of Senza Fili Consulting (Sammamish, Wash.), which provides market research, financial analysis, and consulting on wireless technologies and services. "These could include rural or other remote spots with a few houses, where wireless could become the main broadband connection for the residents, or even some suburban areas."

According to Paolini, it is crucial for operators to share the infrastructure to some extent - possibly not the radio, but certainly the backhaul, and in that case it may be easier to rely on a third party for the deployment and maintenance of the network.

TECHNOLOGY AND CONNECTIONS DETAILS

As noted earlier, small cells are significantly different from the macro cells that are placed on utility towers and poles. Small cell equipment is smaller and self-contained.

According to AT&T, small cell deployment requires a number of considerations. These include site acquisition requirements, adequate power solutions, sufficient backhaul availability, interoperability with other wireless solutions, and appropriate alarming and maintenance procedures.

Each unit is relatively self-contained. A microcell unit, for example, consists of a microcell, an external antenna, a GPS antenna, a small cell router (SCR), and an optional battery power backup (to back up the commercial A/C power source).

Options to power small cells include an AC plug, a router or switch, using Power over Ethernet (PoE) or a PoE injector.

There are three possible solutions for connecting a small cell to an IP network:

- Shared IP Network - Shared IP Backhaul
- Shared IP Network - Dedicated IP Backhaul
- Dedicated IP Network - Dedicated IP Backhaul

And, as just noted, small cells require backhaul capabilities. That is, each small cell location needs to be linked to the network (backhaul) in order to transport information. Transport options include: dark fiber (which is generally the preferred choice by mobile providers), lit fiber (which is usually the second choice), and microwave (which is the least desirable option).

However, microwave still has a place. For example:

- Metrocells typically have their own dedicated backhaul with agreed Quality of Service (QoS)-related Service Level Agreement (SLA) objectives. A wide variety of new and existing wireless backhaul vendors and technologies are competing for this activity.

- Mobile providers consider small cell more challenging than macro cell backhaul, because small cells are typically in hard-to-reach areas (such as street level), rather than in the clear (above rooftops).

- In some cases, fiber simply isn't practical, due to the cost, the time scale, and/or planning restrictions to run the fiber to each site. There is a trade-off between the higher equipment costs of wireless links, compared with the higher running costs for leased fiber.

Because each option has its pros and cons, the Small Cell Forum proposes that wireless providers utilize a "toolkit approach," which involves having a number of different options available to address a range of scenarios.

SMALL CELL DEPLOYMENT IN ACTION

Great Plains Communications (Blair, Nebr.) is Nebraska's largest independent telecommunications company, serving almost

90 rural communities across the state. The company has been involved in internet backhaul for about three years for a large Tier 1 carrier. "Since that time, we have been working with a couple of other Tier 1 carriers," said John Greene, Chief Network Engineer. "The arrangement has worked well for these providers, and has also been a very good revenue source for us."

Then, a few months ago, the first Tier 1 carrier approached Great Plains to see if the company was interested in bidding for a small cell build-out in certain semi-urban areas of the state. "These weren't areas where we had a strong presence, but we realized that we could still get there," said Greene. "The carrier is looking for a company that can install the equipment, provide the backhaul, and provide routine maintenance, since they don't have a lot of staff located in the areas."

Great Plains hasn't yet received a response on the RFP. However, the concept has gotten the company thinking in new ways. "We realized that this whole concept fit nicely in our toolbox, because we have a large fiber optic footprint in the state, and we have very well-trained technicians who are located all over the state," said Greene. As a result, in the meantime, Great Plains has contacted several other Tier 1 carriers to discuss similar small cell roll-outs.

PERSPECTIVE

So, how interested should electric utilities and telecoms be in the growth of small cells? Certainly, there are likely to be opportunities, and these opportunities will continue to grow. However, these opportunities will vary based on where the utility or telecom is located. Again, as noted earlier, the majority of activity is currently occurring in metro areas. Nevertheless, as also noted, opportunities for the technology exist in rural areas and are likely to increase in the future. How quickly or slowly, though, is not known at this point.

"This is new ground for everyone - us and the Tier 1 providers," said Great Plains' Greene. "We are all learning about this together. For example, if these bids come through, we will have to get some new equipment, and we will have to provide some additional training for our technicians. We will also have to redistribute where our bucket trucks are located throughout the state, so that we will be able to do repair work on antennas, radios and other equipment when it is necessary." However, according to Greene, all of that is very doable.

Senza Fili Consulting's Paolini agrees that the whole concept is still relatively new and thus a learning experience for everyone. "Mobile operators and their partners are currently trying to figure out which model works best, and who should do what," she said. There will likely be new business models, some of which will work, and some of which will fail."

Right now, according to Paolini, it is still too early to tell, but she believes that it is crucial for mobile operators to find a deployment/operation model that scales well, that does not require too much effort, and that is cost-effective.

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