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# Small Cell Conundrums

## Confronting the Challenges and Cell-ing the Opportunities


By Ed Myers

**Boyle's Law** states that a gas will expand to fill the available space. The same can be said for a data network. The more throughput available, the more uses people will find to fill up that pipe. For example: Every month, more than 20,000 apps are released in the Apple iOS store, with the vast majority requiring some sort of broadband connection to run. To date, there have been over 50 billion downloads from the Apple iOS store, with over half of those being downloaded in the last 12 months.*

The proliferation of smartphones and tablets with even higher resolution cameras and two-way video capabilities has only exacerbated the consumption of data. As such, the wireless networks of today simply cannot handle the onslaught of traffic that is being pushed through the virtual pipes.

While the predictions may vary slightly, all point to a data-heavy mobile future. Wireless traffic is now measured in zettabytes, or a billion terabytes.

## Start Thinking Small

There is no one single solution to delivering the bandwidth users require today. As mobile network operators (MNOs) migrate to 4G/LTE, they are achieving more efficient use of radio channels, while improving uplink and downlink speeds for users, but this is limited by the amount of available spectrum. MNOs are looking to make use of Wi-Fi where possible to help offload the radio network. However, Wi-Fi has inherent limitations with respect to spectrum interference mitigation and mobility. A "managed" Wi-Fi hotspot has the same issues in regards to deployment and backhaul as a licensed small cell.

Small cells are yet another option. These smaller versions of macro tower sites are comprised of antennas roughly 2 cubic feet in size, weighing less than 30 pounds, and mounted 25 feet above ground level. These small cells are about 1/10th the overall size of a macro site and are rapidly deployable, economical, and provide targeted coverage for those high-density hotspots to offload the congestion from

the macro network. In addition, where the investment for new macro infrastructure is cost prohibitive, small cells can be used in areas where coverage is thin or non-existent today.

While small cells are viable in a number of situations, they are not a cure-all. Small cells can be placed in a wide variety of outdoor and indoor locations, but placement is still subject to rigorous regulatory oversight from state and local authorities. Since every site is different in terms of mounting, loading, and coverage, it is imperative that a simple set of installation and commissioning instructions be replicable across an entire carrier implementation.

Backhaul, the movement of traffic from the network edge to the core and back, continues to be the linchpin in the small cell network.

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## The Case for Small Cells

In the next 24 months, Tier 1 MNOs are expected to deploy in excess of 100,000 new small cells. Worldwide, nearly 11 million small cells have already been deployed by 47 operators.** AT&T has announced their Project VIP, which alone will deploy more than 40,000 small cells by 2015 in the U.S. Other industry experts predict at least 5 million small cells will ship annually by 2017, translating to an annual growth rate of at least 125 percent beginning in 2014.***

Small cells are the logical option. The deployment cost is significantly reduced by the physical size of the small cell, both in terms of the hardware expense and the required real estate footprint. While small cells alter the scale of a network and add many new sites to monitor and manage, leading to increased operational costs, these ongoing expenditures are generally offset by the value inherent in a more efficient and higher capacity network, more subscriber traffic, and an improved subscriber experience.

Small cells can be deployed on the sides of buildings, on utility poles, street furniture, along right-of-way corridors, in airports, schools, and indoors. The coverage can be targeted for parks, stadiums, hospitals, office buildings, residences, or anywhere traffic offload is required.

The reasons for this industry-wide embrace of small cell technology are many, and begin with the 2 key fundamental drivers in today's rapidly changing mobile network arena:

### Fundamental Driver #1: TIME

Roughly 10 small cells can be deployed in an area that would replace a macro cell in a fraction of the time that it would take to deploy a traditional macro cell.

### Fundamental Driver #2: COST

The lack of viable real estate coupled with stringent local and state zoning regulations (NIMBY) make the siting of a new macro cell challenging within customer demand-driven timeframes.

Small cells operate on licensed frequencies, and improve an MNO's quality of service capabilities, while offering additional coverage flexibility. For example, a series of small cells can be deployed near stadiums, to add additional capacity during big games or events. Those same cells can then be moved the following week to cover the championship parade route. Or, they may stay permanently fixed in those locations as a capacity "underlay" network complementary to the existing macro network.

The cost, deployment time, and signal quality benefits that make small cells invaluable for increasing capacity in dense urban areas also make them vital in outlying rural regions. By offloading data from the macro cell, improving coverage at the cell edge and between cells, and by connecting difficult-to-reach rural areas, small cells are becoming an increasingly attractive solution for handling mobile network growth.

## Cell-ing the Small Cell Reality

While small cells bring great promise, their deployment presents certain challenges, particularly in the areas of infrastructure demand and regulatory requirements. There are high-profile instances where cities are attempting to regulate against the proliferation of small cells in an area by imposing significant regulatory hurdles. Small cells still require zoning approvals and a mountable, co-locatable structure (such as an existing utility pole or low rooftop) for the antennas, with access to reliable utilities and backhaul services.

# Want More Proof?

Think you can get away from deploying small cells? Check out these stats:

A Cisco Systems Inc. study from early 2013 reported **global mobile data traffic grew by 70 percent last year**; wireless data use was almost 12 times greater in 2012 than all Internet traffic -- wired and wireless together -- in 2000. Cisco predicts **worldwide mobile data traffic will continue to expand, increasing thirteenfold by 2017,** a compounded annual growth rate of 66 percent.

(Source: www.cisco.com)

Strategy Analytics also predicts a tremendous escalation in wireless data usage, **estimating a total rise in data traffic of 300 percent between 2012 and 2017,** with wireless video streaming, Internet browsing, and apps consuming the terabytes. And UK-based Juniper Research forecasts that mobile data traffic will grow tenfold by 2017, reaching an **"equivalent to almost 42 quadrillion tweets or approximately 7 billion Blu-ray movies."**

(Source: www.strategyanalytics.com)

Available backhaul options today range from fiber to high capacity, fixed broadband wireless. While fiber remains the preferred backhaul option, connecting fiber to multiple small cell sites in dense urban areas, for instance, may not be cost-effective. The conundrum is that it may not be cost-effective to dig up and repave the streets of a city center or a suburban shopping area to connect hundreds of small cells with fiber, but those areas are where the capacity is most needed.

The next option is to deploy high-capacity microwave solutions to provide this vital connectivity. However, high-capacity microwave is traditionally limited to line-of-sight and licensed spectrum availability, which puts further limitations on the small cell placement.

## The Comprehensive Conundrum Continues

MNOs today are pursuing a comprehensive strategy for small cell deployment that considers many interwoven challenges such as:

- network capacity
- coverage needs
- backhaul requirements
- balancing issues of backhaul deployment costs
- real estate opportunities
- network capacity
- speed-to-market
- coverage need
- and even service-level requirements

These heterogeneous networks are a multi-layered series of interlocking high-capacity networks tied together with network intelligence. The nature of small cells and their varied and multiple site potential requires the pursuit of a new kind of approach.

The best option for MNOs is to consult with experts who can help them with the variety of conundrums they face along the way. Companies like Parallel Infrastructure are able to deliver these key attributes in a single, comprehen-

sive platform. By combining backhaul and construction capability with access to thousands of miles of rights-of-way that run through urban, suburban, and rural population environments, reputable deployment experts can offer attractive MNOs the guidance they need for their small cell deployments throughout the U.S.

Small cell technology is no longer a hypothetical future for mobile network environments. Nor is it a distant solution to coverage and capacity concerns. Clearly, the small cell trend has already arrived. Deploying the technology in a way that is cost-effective and cognizant of future network evolution requires an understanding of multiple backhaul solutions and emerging technology, along with a strong commitment to incorporate new real estate options into the equation of site considerations.

Endnotes

*Source: http://www.apple.com/pr/library/2013/05/16Apples-App-Store-Marks-Historic-50-Billionth-Download.html

**Source: http://www.fiercewireless.com/story/report-small-cell-shipments-hit-5m-annually-2017/2012-12-03

***Source: http://www.fiercewireless.com/story/att-will-use-small-cells-strengthen-volte-coverage/2013-05-09

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