



Small Cells: Is There a Business Model That Works For Vendors and Carriers?

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In the wake of growing data demand and their short-term plans to shift voice traffic to LTE, MNOs are actively investigating ways to densify their networks and to achieve an acceptable level of indoor performance.

Consider the uptick in demand for data, a phenomenon that continues to defy even the loftiest predictions:

- Estimated 15 petabytes of new data created every day (200 years of HDTV)⁽¹⁾
- 90% of today's digital data created in past 2 years⁽²⁾
- In 2015, the gigabyte equivalent of all movies ever made will cross global IP networks every 5 minutes⁽³⁾
- 3 billion photos are uploaded onto Facebook per month and the firm manages 25 Terabytes of data per day⁽⁴⁾

Notably much, if not all of this data, will ultimately traverse wireless networks. In fact, in its Q3 2014 earnings announcement, Facebook revealed that it has more than 1.35 billion active users. Of those, 1.12 billion were mobile users, accounting for more than 703 million mobile active daily users.⁽⁵⁾

Then there's the global adoption of 4G, which continues to increase significantly. GSMA Intelligence is forecasting that the number of global LTE connections will reach 2.5 billion by 2020, which will account for 27% of the worldwide population.⁽⁶⁾

Small cell investment is currently focused on improving coverage (indoor and outdoor), increasing capacity to keep up with user demands, and driving more efficient spectrum use. But this network densification comes at a time of flattening or declining ARPU, a brewing price war, and a

relatively saturated marketplace where growth is coming from lower value devices (e.g., tablets) and movement of customers among the big 4 carriers. There simply isn't a significant amount of new revenue on the immediate horizon to support a massive network investment. As a result, if small cells (in their various forms) ultimately are to be deployed in the tens or hundreds of thousands, an aggressive cost structure must be achieved.

WHAT CARRIERS ARE SEEING IN THE MARKETPLACE

There are a number of dynamics in the marketplace that are influencing the rate of small cell adoption by the carriers. Like most new technologies, achieving economies of scale will help drive down unit costs for the equipment and associated services. Some of the relevant market conditions include:

EARLY ADOPTERS

According to telecom research firm Infonetics, mobile operators in developed countries (including Japan, South Korea, the UK, and US) are the only countries today that are driving early adoption of small cells. As a result, small cells have not reached the critical mass required to drive costs to an attractive price point with an acceptable set of features and capabilities. Further, these early adopters bear the responsibility of working through the network design, deployment, integration, and management challenges associated with small cells. This steep learning curve and cost structure has delayed the ramp up considerably relative to previous aggressive forecasts.⁽⁷⁾

THE EVOLUTION OF THE VENDOR-CARRIER RELATIONSHIP

The infrastructure business model has not fully shaken out, with vendors taking a fairly conservative approach to the small cell market thus far. There are many traditional deployment services providers who are adapting their capabilities to deploy small cells in large volumes. However, the real estate side of the model has not yet matured into a sustainable steady state. Some traditional macro tower companies are sitting on the sidelines while others are willing to invest capital into small cell real estate (whether fiber or poles). There are other providers that have put the lion’s share of the capital burden on the carrier while collecting ongoing fees for operations, maintenance, and management of the underlying real estate. And there are still others that are offering a hybrid of the two approaches.

What has become clear, however, is that the traditional macro deployment approach will not work for small cells. The FCC has acknowledged as much with their recent order that will exempt certain small cells from environmental and

historic preservation reviews, providing for a shot clock to expedite approvals. This action may be the push required to focus carriers on utility poles and other structures in the right of way. The consequence of this order is that deployment service providers could see a significant reduction in some of the higher margin services associated with macro site deployment. The deployments, however, are still complex with many node-specific challenges like backhaul, power, site acquisition, and maintenance.

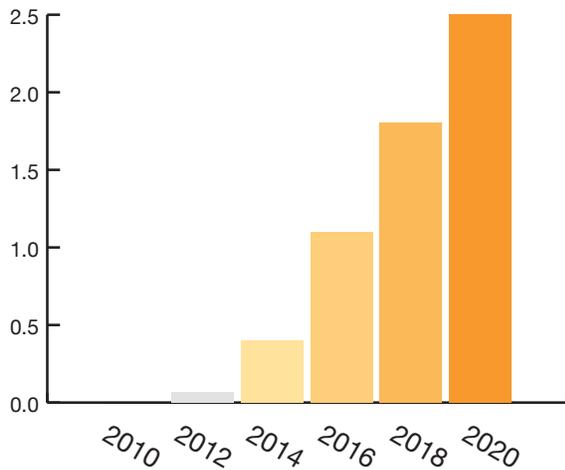
STANDARDIZATION VERSUS MENU-DRIVEN PRICING

The industry has not yet achieved a level of standardization of small-cell sites where menu-driven pricing is a feasible option. Acquisition models are emerging in two forms— turnkey and a la carte.

Turnkey models include the provision of deployment services (such as RF engineering, candidate identification, securing backhaul and power, performing make-ready work, and equipment installation) as well as providing backhaul (either via new or existing fiber assets), ongoing operations and maintenance services, and assuming primary responsibilities for the

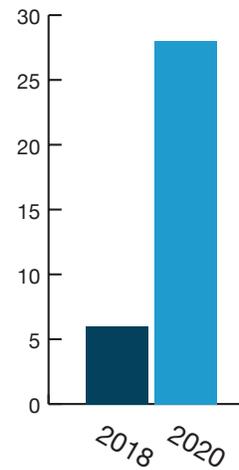
GLOBAL LTE CONNECTIONS (BILLIONS)

(6)



PERCENTAGE OF TOTAL WORLDWIDE LTE CONNECTIONS

(6)



underlying leases. These offerings allow a service provider to become one-stop sourcing partners to wireless operators and to drive utilization of the space, power, and transport assets over time. For carriers, advantages include offloading small-cell development projects at a time when demand – and 4G-related jockeying for competitive position – is at its peak.

A la carte configurations typically saddle operators with more onerous project management, including the sourcing of multiple vendors across an increasing number of network points, with each point having more than one supplier (e.g., design, deployment, maintenance, power, lease management). While a single vendor may provide the deployment services, this model contemplates separately procuring power and backhaul and usually entering into a lease relationship with a landlord. This results in a more challenging management of scope and scale and less cost predictability.⁽⁸⁾

Still, turnkey offerings will not be the only successful deployment model. While the scale and complexity of small-cell deployments favors single vendor sourcing, desire for control of the build-out process and ongoing management of the network and underlying rights exists with some of the carriers. Further, there are many factors that will prevent carriers from leveraging a turnkey model in certain locations, including price, footprint coverage, and vendor capabilities.

On October 17, 2014 the Federal Communications Commission met to consider rule changes that would expedite wireless infrastructure deployment and make it easier for wireless service providers to win regulatory approval from municipalities for these deployments. The new initiative singles out small cells and distributed antenna systems (DAS), noting their “minimal effects on the environment.”⁽⁹⁾

“New Distributed Antenna System (DAS) networks and other small-cell systems use components that are a fraction of the size of traditional macrocells and can be installed – unobtrusively – on utility poles, buildings, and other existing structures,” wrote Tom Wheeler, FCC Chairman in supporting faster deployment of DAS and small cells. “The draft order accounts for that change by crafting a far more efficient process for small deployments that do not trigger concerns about environmental protection or historic preservation.”⁽¹²⁾

The provisions, adopted in October and effective beginning February 9, 2015: include:

- Excluding small cells and certain other wireless facilities from environmental and historic preservation review, particularly for those deployments leveraging rooftops and utility poles in rights-of-way*
- Defining certain terms of the Spectrum Act and rules for their implementation at the state and local level, including a new “shot clock” which requires that an application be addressed within 60 days or it is deemed granted; and*
- Limiting when additional information can be requested regarding an application and clarifying when the shot clock begins and when it can be tolled.*

INDIVIDUAL COST COMPONENT CONSIDERATIONS:

In addition to the relatively immature small cell equipment and services space, carriers must focus efforts on achieving price points that support their business case. These are the primary cost drivers associated with a small cell deployment:

POWER

While it can add complexity, power itself is generally not a cost driver. In fact, recurring power charges will likely be less than \$50 per month. That said, providers need to be conscious of the need for commercial power when selecting sites as extending power to some locations can be costly. Additionally, carriers still need to work through whether backup power is required in all situations. Installation of batteries and the associated cabinets introduces a new set of permitting, deployment, and cost constraints.

SPACE

The costs associated with securing space can vary greatly for small cells, ranging from cheap regulated rates (e.g., <\$10/month) to \$200+/month when privately owned. When it comes to evaluating space many structures are available (e.g., lamp posts, utility poles, buildings) and each have their tradeoffs. Key attributes to consider include:

- Adequate mounting height and structural capacity and located where needed
- Ability to lease in relatively large quantities
- Low capital cost to install (e.g., avoid pole replacements)
- Low ongoing rental expense
- Power and backhaul options available or close by



TRANSPORT

Although dark fiber allows wireless carriers to maintain complete control over their service experience by increasing capacity on their own terms and on their own timeline, dark fiber back to the macro has proven to be an expensive option (i.e., \$500 or more in monthly OPEX for the fiber and tens of thousands in CAPEX for its construction). Lit transport options are also available, however, bandwidth and performance vary significantly depending on the choices available (e.g., fiber-based service, asymmetrical coax-based service, consumer vs. carrier grade). Carriers are well aware of the cost structures for lit service as it will typically parallel that which is available on their macro sites. Backhaul providers have not been quick to discount service simply because it is terminating at a small cell. LOS/NLOS microwave options exist as well, complete with relatively low CAPEX and almost no OPEX. However, microwave isn't without its challenges when operating in a highly cluttered close-to-the-ground environment.

OPERATIONS AND MAINTENANCE

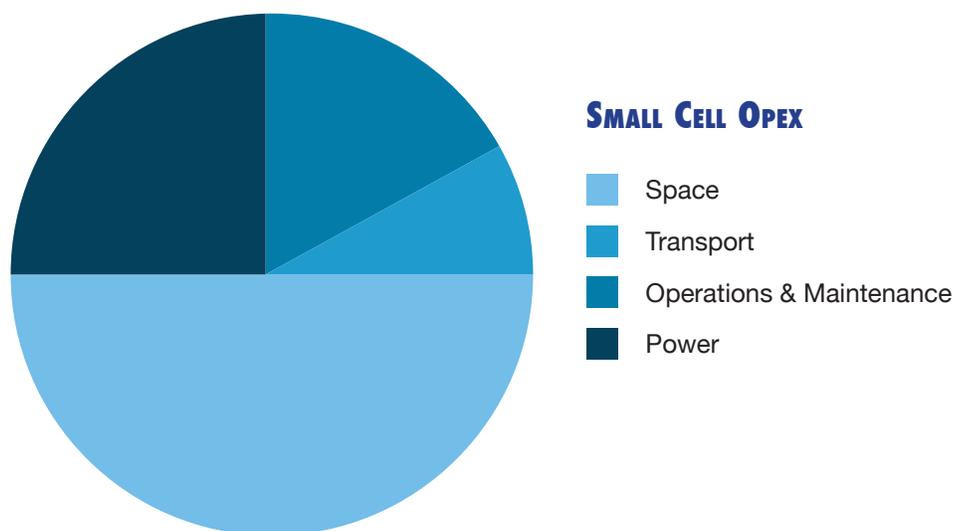
While cost structure and scope of needs are largely undefined at the outset, it's helpful to include and allow for some level of monitoring and mobilization for diagnosis and repair (~ \$100/month/node). This is particularly important when extending the coverage footprint (versus enhancing capacity) as an outage has the same consequences as a macro site outage, albeit on a smaller scale. Additionally, installing on utility poles – especially above the power space – can require specialized crews.

ELECTRONICS

This can vary widely depending on the technology solution selected and specific carrier configurations. Current offerings are primarily 3G or 4G and support only a single wireless carrier. Most major OEMs have multi-technology and multi-carrier equipment on their roadmap.

ACQUISITION, CONSTRUCTION AND INSTALLATION SERVICES

With elements that include leasing, permitting, construction, and installation, costs are running \$20-\$40k/per node with very focused efforts to reduce these numbers by 50% or more over time.



HOW TO DRIVE COSTS DOWN

Vertex Consulting believes that in order to drive meaningful volumes it is important to get OPEX down below \$400/month total and CAPEX down to \$20K (or less). At current price points carriers will deploy in major problem areas and use these projects as a litmus test to analyze performance and to further evaluate cost structures. Vendors are salivating at the prospect of growing services revenue (or replacing slowing macro revenue growth) and have shown limited efforts to drive price points down significantly. Some considerations include:

IDENTIFYING TRANSPORT SOLUTIONS THAT REDUCE OPEX AS WELL AS CAPEX

- Lower cost copper options that meet performance requirements
- LOS/NLOS microwave aggregation
- Leverage existing outside plant

LOOKING AT INSTALLATION DIFFERENTLY THAN MACRO SITES

- Dramatically reduce the scope of required services (e.g., surveys, title searches, drawings)
- Evaluate performance requirements relative to macro sites (e.g., battery backup)
- Look to the FCC to help streamline environmental and permitting process (see sidebar)⁽⁹⁾

LOOKING TO VENDORS TO COME UP WITH INNOVATIVE BUSINESS MODELS

- Tower companies have invested large amounts of money in tower assets in exchange for an ongoing rent stream from carriers. Will vendors emerge to do the same for small cells in large volumes? How will they be valued? Can they make it attractive to carriers with shorter terms, less onerous restrictions and lower rents? We believe

that vendors will emerge with these shared infrastructure models. However, carriers need to be careful to avoid the long term burdens (i.e., escalating costs, limited flexibility) that have historically accompanied the tower company relationships. Carriers also need to be cautious regarding the long term viability of these providers.

- True equipment sharing never materialized at carrier macro sites. Are small cells a better candidate? Will OEMs produce equipment that can support multiple wireless carriers in a single enclosure with shared installation, backhaul, and power? This would enable any number of vendor models where investors appreciate multi-tenant solutions with low turnover. We don't believe the OEMs are motivated to reduce the number of distinct devices that they sell without some external prodding and possibly substantial volume commitments.
- Cable companies (MSOs) are another possible disruptor to the small cell model. They have access to space on a significant number of utility poles, can provide power (with backup) directly from their HFC plant, can provide fiber or coax-based backhaul, and have the field force required to maintain the assets. MSOs have been actively deploying WiFi equipment in a similar fashion, however, there are strategic reasons that may prevent them from being too aggressive in the small cell space. Are they willing to give up premium strand space where people congregate? Would they rather work to monetize their WiFi offering instead of enabling the MNOs to enhance wireless service? Are they comfortable leasing dark fiber? Will they approach the lower prices required for small cells and risk impacting their macro backhaul business? We believe that MSOs will continue to investigate if and

how they want to play in the small cell space and feel that they may ultimately be forced to participate to prevent new entrants from overbuilding their networks and threatening existing and future revenues.

- The OEMs have danced around a managed network model in the past but have never made any significant investments in such a strategy. Are small cells, along with a shift of network capabilities to the cloud, the catalysts that will stimulate such a strategy? OEMs have been reluctant to do anything viewed as competitive to their MNO customers. However, it presents an opportunity to ensure that their equipment is deployed over competitors. Further, OEMs generally feel like they have the technical capabilities to engineer, design, deploy, and manage a network, as long as they don't have to handle the customer side of the business. While this model may emerge over time, we do not believe it will happen in the short term.

ACHIEVING THE OPTIMAL BUSINESS MODEL

Until significant new revenue streams like content, M2M, and connected cars become commonplace, carriers will need to be focused on keeping small cell deployment and operating costs down. Without being able to justify deployments that concurrently rein in OPEX as well as CAPEX, they will find it challenging to meet the lofty volume targets that have been published in recent years. By executing a disciplined approach to developing the strategy, pushing vendors to try different models, and shifting the internal mindset away from a macro mentality, MNOs will ultimately find the model that enables them to deploy small cells by the tens or hundreds of thousands.

SOURCES

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ABOUT THE AUTHOR

Greg Weiner is a managing Partner and co-founder of Vertex Consulting. He has over 14 years of industry and consulting experience with a strong emphasis on sourcing/outsourcing and the telecom industry. Previously he was a Vice President of Strategy and Business Development with Mobilitie, a wireless infrastructure owner with tower and fiber assets across the US country. Prior to Mobilitie he was a co-founder and CIO of Pace Harmon, a boutique consultancy focused primarily on supply chain and strategic sourcing.

ABOUT VERTIX CONSULTING

Vertex Consulting provides pragmatic and actionable insights on the most critical issues faced by telecom and other evolving industries. We pursue our collective passion for helping companies by working with carriers, OEMs, tower companies, MSOs, network services and equipment vendors, and telecom services consumers to help them resolve their most complex sourcing and technology challenges. Our telecom expertise, focus and simplified delivery model differentiates our practice from other management consulting firms, enabling Vertex to deliver an alternative vision for our clients: producing client-centered telecom advisory solutions for a select group of highly-complex industries in a way that only experienced and proven professionals can truly deliver.

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