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Analyst Angle

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## Analyst Angle: Small Cells—Suddenly Essential

By Peter Rysavy, Rysavy Research, March 20, 2018.

The future of wireless networking depends on the widespread deployment of outdoor small cells. Not only are small cells essential for realizing the full potential of 5G, but they are also key to the success of LTE License Assisted Access (LAA). Paving the way for these new technologies with a dense coverage fabric will result in a huge expansion of wireless network capacity and performance, transforming the broadband landscape, and enabling many new use cases. Success, however, is far from assured due to the challenge of siting.

History demonstrates that before any technology undergoes rapid adoption, it staggers through an extended hype phase, nurtured by the aspirations of early adopters willing to put up with the technology's immaturity. I personally experienced this with work on touchscreens in the 1980s and wireless data in the 1990s, neither of which reached widespread acceptance until years later. So, too, have small cells promised benefits for the past five years, but compared to more than three hundred thousand macro sites, outdoor small cell deployments in the US so far amount to only tens of thousands of sites.

Achieving the wireless network densification in which 5G is a viable wireline substitute for tens of millions of subscribers will require approximately a million small cells. That number may seem astronomical today, but technological progress and appropriate actions by cities with respect to siting policies could make this level of deployment possible by the late 2020s, as analyzed in my 2017 report, [Broadband Disruption: How 5G Will Reshape the Competitive Landscape](#).

Cellular operators are already emphasizing small cells in their infrastructure deployments. For example, Verizon [recently stated](#) that 62% of its wireless deployments in 2017 were small cells and that the percentage will increase with 5G deployment in 2018 and beyond. Driving this densification are Verizon's fixed-wireless ambitions of using 28 GHz mmWave spectrum to compete directly with cable broadband.

Similarly, T-Mobile [has indicated](#) it will deploy 25,000 small cells in conjunction with LAA, a technology that, [according to CTO Neville Ray](#), turbocharges LTE with a five- to ten-times performance boost. The

LAA methods in LTE for efficiently binding unlicensed spectrum into cellular networks will also migrate into 5G, enabling the use of not only unlicensed spectrum at 5 GHz, but also in mmWave bands.

Numerous benefits arise from using 5 GHz or mmWave spectrum in small cells. First, at 5 GHz alone, a vast pool of spectrum up to 640 MHz is available (although it must be shared with Wi-Fi users), and that amount is small compared to the many GHz of spectrum available at 28 GHz, 37-39 GHz, and beyond. Second, the small coverage areas mean fewer people share the augmented capacity of each cell. This combination results in capacity and performance that, according to my modeling, meets or exceeds hybrid fiber/coax performance. Dense 5G networks will be able to deliver capacities of 1000 Gbps/square kilometer, ten to one hundred times greater than what is possible with a macro-cellular 4G network. This means each of one thousand homes in a dense suburban area could receive 1 Gbps.

This tantalizing explosion in capability, however, is threatened by the jumble of siting procedures and varying costs that hinder small cell siting today. According to [Forbes](#), in California alone, San Jose is an expensive and slow environment for deployment whereas Sacramento is the opposite, the reason that Verizon is deploying its fixed 5G service in that city first.

The FCC is attempting to reduce deployment friction by streamlining review processes for small cells. This week the FCC will be voting to amend its rules by adopting a [Wireless Infrastructure Streamlining Report and Order](#). These rules address deployments that are subject to National Historic Preservation Act (NHPA) and National Environmental Policy Act (NEPA) review. The FCC's modifications to these rules will reduce the time and cost it takes to complete certain kinds of reviews for siting small cells.

Due to intense global competition from countries such as China, Korea, and Japan doing everything possible to accelerate 5G deployment, rapid deployment of 5G has become a national priority. The ultimate benefits of being first to deploy 5G broadly will be huge, including local testbeds for wireless technology and wireless application innovation, as well as more efficient economies that leverage the power of these networks.

How the U.S. navigates these threats and opportunities will have a profound effect on communications and computing industries. Small cells are where the rubber hits the road. A combined federal and municipal response can eliminate current potholes and accelerate us into a bright broadband future.

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