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WHITEPAPER

POWERING 5G TO HOMES WITH FIXED WIRELESS ACCESS NETWORKS

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The speed and bandwidth benefits of 5G are here. We've all seen the colored coverage maps. Consumers are buying next-gen 5G-enabled smart phones, and business and big cities are readying their network infrastructures to harness the value of near-real-time, ultra-high bandwidth data.

While the initial focus is on deploying 5G at a macro cell level to build out reliable networks, once that initial push is completed, the priority can shift to supporting newer use cases enabled by the high bandwidth and low latencies promised by 5G. This includes applications such as private 5G networks for enterprises and fixed wireless access to – and in – our homes.

WHY FIXED WIRELESS ACCESS? AND WHY NOW?

Fixed wireless access is not a new concept, however prior to 5G, the wireless technology and the hardware that were available didn't necessarily offer a viable business case. When considering the "last mile" of connectivity, traditionally you'll find cable and wires running from the pole (or underground) to the home, enabling the high-speed internet we rely on so heavily today. Laying or running that cabling requires a large initial capital expenditure (CapEx) investment and can be expensive to service or maintain as an operating expense (OpEx).

The alternative to running this cable to the home is utilizing wireless cellular connections. However, previous-generation networks (3G and 4G) offered bandwidth of less than 100 megabits per second (Mbps)[1], which could not support large-scale fixed wireless access deployments – there simply wasn't enough bandwidth available to divvy up. With 5G, on the other hand, the technology can support approximately 1000 Mbps, and the timing makes sense.

Deploying 5G fixed wireless access will have its challenges, however. And navigating those challenges will be essential to not only establishing these networks but also to reducing capex and opex while providing a similar user experience when compared to direct wired connection.

Below are a few of the immediate challenges associated with fixed wireless access deployments and how they can be solved.

CHALLENGE: MATCHING (OR EXCEEDING) BANDWIDTH AND LATENCY PROVIDED BY CABLE

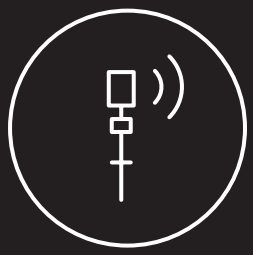
With broadband currently offering 500 Mbps to 1 Gbps speeds, current-generation wireless connections (4G) are not able to keep pace – partially because bandwidth is shared with mobile users and there is no additional bandwidth for in-home connections. That will change with 5G and the vast bandwidth it brings to the table. This will happen in two phases.

1. https://www.hp.com/us-en/shop/tech-takes/4g-vs-5g-bandwidth-across-the-globe

At present, 5G macro cell network buildouts/upgrades are already in process and will continue for the next two to three years. These macro cells will support 5G mobile users as well as 5G home broadband users. However, as the number of 5G users increases, macro cells alone may not be able to meet the increased throughput and capacity demands – or it may not be cost-effective to deploy additional macro cells to do so. It is at this juncture that 5G deployments are expected to shift to more localized, cost-effective small cell infrastructure. The technology can offer additional coverage and throughput to meet the high-bandwidth and low-latency needs of end users – enhancing the user experience. This would herald the transition to wide-spread wireless broadband usage, and hence fixed wireless access for the home.

CHALLENGE: REDUCING 5G DEPLOYMENT CAPEX

Right now, 5G buildout is full steam ahead; and that network buildout begins with the macro cell towers and radios. While these will create the backbone for 5G networks, it's not always feasible to build a new tower to expand coverage. While previous-generation cellular networks were able to send signals over much further distances (approximately five to 10 miles), 5G – operating at higher frequencies – can only cover five miles or less and will rely on double the infrastructure to accommodate the coverage and bandwidth it promises. This will be even more significant with the deployment of millimeter wave (mmWave) radios (which cover less than one mile) in the coming years. And with that added infrastructure comes added cost.



SOLUTION: SMALL CELL BUILDOUT FOR LAST MILE AND RURAL CONNECTIVITY

One way to combat the CapEx increases of building significantly more macro cell towers is to deploy small cell infrastructure instead – bridging the gap between connectivity need and CapEx investment. Small cells are significantly more cost effective than building whole new macro cells, and they can be deployed in areas where a macro cell doesn't necessarily make sense – such as throughout cities, more rural neighborhoods, and at industrial sites and facilities.

In addition to simply expanding coverage, small cells will also play a significant role in the deployment of fixed wireless access deployments. They will bring 5G closer to the point of end use (home) without the need for large towers in localized neighborhoods. With this smaller cellular infrastructure and radios comes the added challenge of, "how do you power it?"

CHALLENGE: POWERING SMALL CELL FWA

Compared to macro cells, small cell radios and infrastructure bring unique power needs and challenges.

- Since these radios are often deployed on poles, the sides and tops of buildings, and street posts – for example – there is limited space to put the power equipment. There is no cabinet or hut like at the bottom of a macro cell to feed power up the tower. Because of this, power supply foot-print is a key concern. Power needs to be compact, yet…
- New 5G radios require significantly more power than their 4G and 3G counterparts. This leads to the age-old design challenge of more power in less space – i.e., improved power density (since 5G radio sizes are not expected to grow larger).
- In addition, because many small cell applications are out in the open and deployed across various regions, the power equipment needs to be protected from the elements and from demanding (extreme heat/cold) environments.
- Adding to the power design challenge, because these radios and power supplies are often utilized throughout cities and residential neighborhoods (including for fixed wireless access), both the radios and power equipment need to be aesthetically pleasing.
- Also, while multiple carriers may want to mount their radios on the same pole, a “carrier-agnostic” small cell deployment supporting multiple carriers with optimal equipment could help to improve energy usage, efficiency, and sustainability.

SOLUTION: HIGH-POWER, COMPACT, WEATHERIZED, VISUALLY APPEALING POWER SUPPLIES

When you consider the challenges presented when powering small cell applications and fixed wireless access applications, the solutions become clear: high power density in visually appealing, weatherized and hardened enclosures that can be deployed in a variety of ways and places.

At OmniOn Power, we’re constantly collaborating with our customers to design and develop solutions to their power challenges. In the 5G space, that means leveraging our extensive expertise powering previous-generation wireless networks and evolving our technologies to meet the power needs of today’s and tomorrow’s advanced networks.

As 5G deployments continue and we begin to move from the initial cellular network infrastructure buildout (to support 5G devices) into the newer applications unlocked with 5G’s bandwidth and latency promises, we’re really going to start to see the benefits 5G can bring to our connected lives – both at home and in the business world. It’s an exciting time to be in the telecommunications space.

To learn more about what OmniOn is doing to power the 5G build out – including in powering fixed wireless access applications, please click here.