

Private Wireless Market Opportunity

Introduction

The concept of utilizing private cellular networks—also known as non-public networks (NPNs)—for the sole use of a private entity, such as an enterprise or government, is far from new. In fact, the industry has gone through various private enterprise hype cycles over the past decade. And while there are already thousands of commercial private networks in service across the globe, it would be a stretch to suggest that the local private wireless market has surprised on the upside.

As private wireless is now showing up again in marketing collateral and business plans across the ecosystem, the fundamental question that presents itself is quite straightforward: What is different this time around and why should anyone be excited about private wireless?

In our view, there are five fundamental reasons to be excited about the private wireless opportunity over both the near and long term:

- 1) More countries are exploring how to allocate spectrum for private applications;
- 2) Advances in technology are improving the business case by driving down the price, introducing more flexibility, as well as simplifying the way that private wireless is installed, operated, and managed;
- 3) Enterprise awareness about the benefits of using cellular is improving;
- 4) Public cloud providers are more actively seeking to partner with communication service providers (CSPs);
- 5) New use cases are emerging that require cellular quality of service (QoS).

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WHAT IS PRIVATE WIRELESS

With the interest in private wireless and private 5G rising, one of the fundamental questions we need to address is rather basic: What exactly is private wireless? One of the challenges with the private wireless concept is that it is not a specific technology but rather more of a broad term encompassing a wide range of technologies. Marketing departments will have some wiggle room, as the meaning of private wireless varies significantly across the ecosystem.

Some Wi-Fi suppliers, for example, believe they provide private wireless connectivity to enterprises. Smaller radio access network (RAN) suppliers without macro footprints typically associate private wireless with dedicated standalone connectivity for enterprises, while some of the more established macro RAN suppliers envision private wireless as encompassing a broader set of technologies, including both macro and small cell networks.

Suppliers focused on mission-critical and public safety networks see private LTE and NR combined with new spectrum as an opportunity to upgrade existing private narrowband communications equipment. With the number of LoRa end nodes surpassing 0.2 B, LoRa base station suppliers believe they are dominating the private wireless IoT market.

The operators are also positioning the concept differently, with some focusing on the benefits with broader coverage, while others are capitalizing on some of the new local concepts.

While definitions or interpretations vary widely on the part of both suppliers and operators, there appears to be greater consensus among customers.

For end users, private wireless typically means consistent, reliable, and secure connectivity, not accessible by the public, to foster efficiency improvements. For industrial sites, private wireless typically means low latency and high reliability. It is less about the underlying technology, spectrum, or business model and more about solving the connectivity challenge. In other words, end users don't care what is under the hood.

From a Dell'Oro perspective, we will consider private wireless as nearly synonymous with 3GPP's vision for NPNs. According to 3GPP, NPNs are intended for the sole use of a private entity, such as an enterprise. NPNs can be deployed in a variety of configurations, utilizing both virtual and physical elements located either close to or far away from the site. NPNs might be offered as a network slice of a Public Land Mobile Network (PLMN), be hosted by a PLMN,

Private Wireless Segmentation

RF Output Power: Macro, Small Cell
Frequency: Sub 6 GHz & mmW
Radio Interface: 2G, 3G, 4G, 5G
RAN Access: Shared, Dedicated
Antenna System: Conventional, Advanced
Baseband Architecture: C-RAN, D-RAN
Baseband Hardware: V-RAN, Non V-RAN
Openness: Open RAN, Proprietary RAN
Performance: Mission Critical, Non Mission Critical
Product Mix: Hardware, Software
Region: North America, Europe, MEA, APAC, CALA
Location: Indoor, Outdoor
Buyer: Service Provider, Enterprise/Other
Investment: Perpetual, Subscription
User: Human, Machine (IoT)
Mobility: Mobile, Fixed

*Dell'Oro Group

or be deployed as completely standalone networks.

In other words, the Dell'Oro Group will adopt a somewhat narrower scope for private wireless, excluding non-3GPP technologies such as Wi-Fi and LoRa. At the same time, we will adhere to the NPN definition, including the larger mobile network when this is used to deliver private connectivity.

From an end-user perspective, private wireless is also a broader term, generally including not just the RAN but also transport, mobile core network (MCN), Multi-Access Edge Computing (MEC), and corresponding services. With private wireless, it will not always be as important to segment the market into the traditional telco categories that we typically use to depict the public market. In some cases, the enterprise might simply purchase a connectivity-as-a service subscription.

WHY PRIVATE WIRELESS

Private Network Drivers



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Enterprises will have a plethora of 3GPP and non-3GPP technology and architectural options to use for addressing their connectivity needs, including Wi-Fi, LoRA, mobile network with slicing, and just the regular mobile network.

The key drivers will vary, as well, depending on a variety of factors. Ultimately, however, private wireless is being propelled by a set of core drivers that are difficult to realize with only Wi-Fi or the mobile network.

PRIVATE WIRELESS RAN AND CORE CONFIGURATIONS

There is no one-size-fits-all when it comes to private wireless. We are likely looking at hundreds of deployment options available when we consider all the possible RAN, Core, and MEC technology, architectures, business, and spectrum models.

At a high level, there are two main private wireless deployment configurations, Shared (between public and private) and Not Shared:

- The shared configuration, also known as Public Network Integrated-NPN (PNI-NPN), shares resources between the private and public networks.
- Not shared, also known as Standalone NPN (SNPN), reflects dedicated on-premises RAN and core resources. No network functions are shared with the Public Land Mobile Network (PLMN).

Not surprisingly, there will be a plethora of deployment options to address the RAN domain. In addition to the shared vs. standalone configuration and LTE vs. 5G NR, private wireless RAN systems can be divided into two high-level RAN configurations: Wide-Area and Local-Area.

Private Wireless RAN Options

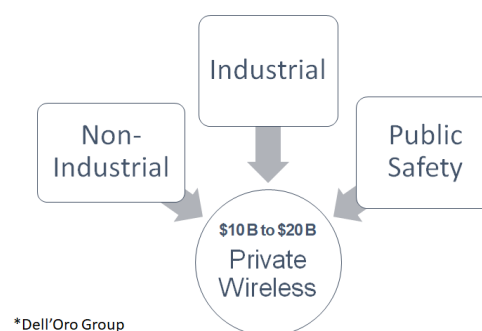
	Local-Area	Wide-Area Medium	Wide-Area Large
RAN FR Output Power	Pico	Micro	Macro
Location	Indoor	Outdoor	Outdoor
NPN & PN RAN Sharing	Unlikely	Possible	Likely
Radio Technology	LTE and NR	LTE and NR	LTE and NR
Access	Local	Network Slice Local	Network Slice
Spectrum	PLMN Private Unlicensed	PLMN Private Unlicensed	PLMN
Frequency	mmWave Sub 6 GHz	Sub 6 GHz	Sub 6 GHz
Typical Latency	<20ms	>20ms	>20ms
BB Hardware	vRAN Non-vRAN	vRAN Non-vRAN	vRAN Non-vRAN
Core and MEC Options			
Public MEC PNI-NPN	Unlikely	Possible	Likely
Private MEC PNI-NPN	Likely	Possible	Possible
Private Core SNPN	Likely	Possible	Unlikely
RAN Market Forecast	\$\$	\$	\$\$\$\$\$

MARKET OPPORTUNITY

One of the more compelling aspects with private wireless is that we are talking about new revenue streams, incremental to the existing telco capex. And while the TAM is not as large as it is for the public TAM, it is nonetheless significant, approaching \$10–20 B when we include Non-Industrial, Industrial, and Public Safety driven applications.

At the same time, it is important to separate the TAM from the forecast. Here at the Dell'Oro Group, we continue to believe that it will take some time to realize the full vision with private wireless. Setting aside the more mature public safety market, we expect that some of these more nascent local private opportunities to support both Broadband and Critical IoT will follow Amara's Law, meaning that there will likely be a disconnect between reality and vision both over the near and the long term.

Private Wireless Market Opportunity



IMPLICATIONS FOR TEST & MEASUREMENT

The shift from public to private deployments will have implications across the ecosystem. For the portable T&M market—including cable & antenna analysis, spectrum analysis, PIM, and signal analysis—testing will need to evolve, in order to accommodate new use cases with different KPIs and testing requirements typically associated with the public macro network. Broad-based testing to verify the appropriate KPIs for MBB, FWA, and all the various IoT segments will be pivotal for purposes of guaranteeing the performance, throughput, and reliability required to support not just humans but also machines.

Cellular IoT Segments

Massive IoT	Broadband IoT	Critical IoT	Industrial Automation IoT
Low-cost devices Small data volumes Massive numbers	High throughput Low latency Large data volumes	Ultra-reliability Ultra-low latency High availability	Industrial protocols Time-sensitive networks Precise indoor positioning

Source: Ericsson, 3GPP

Also, the role of the various T&M segments will likely change as the requirements, frequencies, and the size of the base stations change. The need for Distance-to-Fault measurements might not be as valuable with local low-power small cells as with macro deployments but PIM can still be an issue with rooftop deployments, affecting both link budget and overall performance.

Next, the combination of wider bandwidths, more spectrum bands becoming available, increased use of repeaters to improve the mmWave business case, and enterprises in some cases bypassing the operators—taking on some aspects of the build phase—will undoubtedly spur demand for simplified interference analysis and coverage mapping-testing solutions.

Ongoing architectural shifts with macro base stations are already changing the ratio between OTA and physically connected testing. The shift from public to private will likely further strengthen this migration, especially with local-area and wide-area medium small cell deployments, thereby amplifying the need for OTA testing.

In addition to supporting new KPIs with different requirements inherent with private 5G, the T&M suppliers also need to develop their portfolios to address a workforce with different skillsets. While the service providers are already playing a dominant role in the private 5G market using the PNI-NPN model, they are not equipped to manage and test 100 K enterprises by themselves. Regardless of whether this will be addressed by the enterprise or outside partners, there will be a resulting skillset gap that the T&Ms can help address by simplifying the testing for a workforce that will likely not have the same RF background as the typical macro-site technician.

Architectural transitions can also cause a shift in testing priorities. Although the macro network is the primary target in this initial Open RAN and Virtualized RAN phase, enterprises and private deployments can also benefit from disaggregating the RAN. Testing will need to evolve as interoperability, conformance verification, and overall life cycle management to support asynchronous product updates across the various RAN functions and suppliers are shifted from the supplier to the operator/enterprise.

CONCLUSION

In sum, for more than a decade now, we have been talking about deploying cellular equipment in the enterprise. This time, however, there are reasons to believe that the hype is more warranted. While this does not change the fact that there could be a near-term disconnect between the long-term vision and reality, the timing is right for everyone in the ecosystem to start preparing for private 5G. Because as much as we want 5G to be as easy to deploy and manage as Wi-Fi, the reality is that we are not yet there. At the same time, for those who play their cards right, the market potential is considerable.

ABOUT THIS REPORT EXCERPT

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To get the full Dell'Oro Group Private Wireless advanced research report or learn more, please reach out to dgsales@delloro.com.

About Author



Stefan Pongratz joined Dell'Oro Group in 2010 and is responsible for the firm's Mobile RAN market and Telecom Capex research programs. While at the firm, Mr. Pongratz has expanded the RAN research and authored multiple Advanced Research Reports to ensure the program is evolving to address new RAN technologies and opportunities including small cells, 5G, Open RAN, Massive MIMO, mmWave, IoT, private wireless, and CBRS. He built the Telecom Capex coverage detailing revenues and investments of over 50 carriers worldwide.

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About Dell'Oro Group

Founded in 1995 with headquarters in the heart of Silicon Valley, Dell'Oro Group is an independent market research firm that specializes in strategic competitive analysis in the telecommunications, networks, and data center IT markets. Our firm provides world-class market information with in-depth quantitative data and qualitative analysis to facilitate critical, fact-based business decisions. Visit us at www.delloro.com.

About Dell'Oro Group Research

To effectively make strategic decisions about the future of your firm, you need more than a qualitative discussion – you also need data that accurately shows the direction of market movement. As such, Dell'Oro Group provides detailed quantitative information on revenues, port and/or unit shipments, and average selling prices – in-depth market information to enable you to keep abreast of current market conditions and take advantage of future market trends. Visit us at www.delloro.com/market-research.

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