June 2019
Market Report

CBRS: The Indoor Opportunity Market and Forecasts 2019-2024

Authors:
Adlane Fellah, Maravedis LLC
Earl Lum, EJL Wireless

MARAVEDIS
Wireless Infrastructure Analysts

EJL Wireless Research

Table of Contents

List of Figures

Executive Summary

We see two clearly distinct market segments for initial CBRS deployments. The first segment is for private LTE networks for secure mission critical IoT and voice/data applications that do not require any public access. The second segment is pretty much all other enterprises that need a combination of both private LTE as well as public access connectivity. The early adopters of private LTE over CBRS will be hotels/casinos, public venues, warehouses, and industrial/manufacturing.

Each segment has its own set of challenges and motivations to consider when deploying an indoor LTE network using CBRS spectrum. Generally speaking, previous use cases for a private LTE network evolved around the need for:

- Greater mobility as (a) large areas of coverage are needed (as in warehouses)
- Higher security as LTE is deemed more secure than Wi-Fi because of the SIM/hardware requirements, and last,
- Greater reliability due to a cleaner RF environment free from interference.

We have not seen evidence for the need for super low latencies at this point in time, a feature greatly promoted in the 5G discourse.

Accessing managed shared spectrum is a great driver for new indoor deployments, but it only solves part of the puzzle that CBRS represents for stakeholders. Deploying and managing an LTE core network remains a challenge, despite notable improvements in price and level of complexity. There are currently three approaches to deploying an LTE evolved packet core (EPC) network.

The EPC Piece

In the **Multi-Operator Core Network (MOCN) approach**, a single radio access network (RAN) is shared among various Mobile Network Operators (MNOs) who would open up their S1 gateways. At present, operators are not yet supporting this approach, as they are reluctant to open up their S1 gateway interface to strangers. Nevertheless, the industry is hopeful that this will change in the upcoming two years.

In the **Neutral Host Network (NHN) approach**, all or part of the CBRS system is deployed and maintained by a third-party entity who will be responsible for deploying an EPC and negotiating roaming agreements with each operator.

In the third approach, a **private EPC** is deployed by the enterprise for its own purposes only and may or may not negotiate roaming with third parties. Usually a private EPC is used to connect IoT and private SIM card devices. Enterprises need to be capable of managing all the data traffic they generate and to secure it; to comply with applicable legal intercept and privacy regulations; and to apply data analytics to support quick decision-making at the edge of the work, but on their own premises. And what enterprises really need is predictable performance, to the extent of enabling SLA-backed and mission-critical reliability.

The RAN Piece

The radio access network (RAN) is an equally challenging part of the overall LTE network architecture that CBRS relies on. We see two distinct paths for enterprise users to embark upon. The first and more difficult one is to purchase and manage the entire RAN, including vBBU/RRUs which we would not recommend unless it is mission critical to have the network locally onsite. The second option that we believe many enterprises may choose is to outsource and deploy a vBBU/RRU or small cell network to a NHN operator or another third party operator. Maintaining and optimizing an LTE network is more difficult than a Wi-Fi network.

Challenges Remaining

CBRS is a business and technological puzzle, and many pieces still need to come together for this novel approach to spectrum sharing to work. Pricing models and economics for CBRS are barely nascent and will require time to mature. EPC as a service (EPCaaS) is a promising alternative to the traditional do-it-yourself approach, but many pieces still need to be solved, including creating a dynamic roaming mechanism. Enterprise system integrators need to learn and embrace the CBRS opportunity. They are those companies that provide Wi-Fi integration and support to hotels, hospitals, and office buildings, but they are still ignorant about the LTE world, and that needs to change for CBRS to take off. The device ecosystem itself is slowly emerging.

During our investigations, we have not found much evidence that operators will rush to provide CBRS service to offices over 50,000 square feet, at least not before 2022. The economics and complexity of private LTE, including the necessity to reach roaming agreements, still make it a tedious and expensive venture for most buildings.

Market Projections

We thus have produced conservative forecasts for indoor CBRS deployments in buildings, and strongly believe the market will be primarily driven by private LTE in higher education, lodging, warehouses, and manufacturing sectors where the use cases and requirements are very high, and enterprises are willing to pay for CBRS systems to support their digital transformation. These enterprises also are not limited by mobile device availability.

Licensing Agreements

Single License

This **Single-User Agreement** is a legal agreement between the customer and EJL Wireless Research LLC/Maravedis LLC for the use of the EJL Wireless Research LLC/Maravedis telecommunications market research information as indicated on the invoice. By using the research information listed on the invoice, you agree to be bound by the terms of this agreement. The research data is protected by copyright laws and international treaties, as well as other intellectual property laws and treaties. The research data cannot be stored anywhere other than your individual computer. This license may not be shared or used concurrently on different computers (PCs, servers, Intranets, etc). By installing, or otherwise using the research information, you agree to be bound by the terms of this agreement.

Under the copyright laws, you may install and use a copy of the research data on a single computer. The information may be used for the exclusive use of this single user. The information can only be used for individual use for the user stated on the invoice. You must treat the electronic version of our research data as any other copyright material. Furthermore, you cannot make the information commercially available to anybody else than yourself. Under no circumstances should other data be copied into our research information, nor may parts be cut out of it into other reports, without our written permission.

Without prejudice to any other rights, EJL Wireless Research LLC/Maravedis LLC may terminate this license if you fail to comply with the terms and conditions of this agreement or if the license holder cancels the agreement. In such an event you must delete all EJL Wireless Research LLC/Maravedis LLC research data covered under this subscription.
It is an offense, punishable by US$1,000,000, for the license-holder to make the material available to any unauthorized person, either via e-mail messaging or by placing it on a network.

Corporate License

This Corporate User Agreement is a legal agreement between the customer and EJL Wireless Research LLC/Maravedis LLC for the use of the EJL Wireless Research LLC/Maravedis telecommunications market research information -property of EJL WIRELESS RESEARCH LLC/MARAVEDIS LLC - and licensed to the customer under the terms of the License Agreement printed herein ("Agreement") as indicated on the invoice. By using the research information listed on the invoice the customer agrees to be bound by the terms of this agreement. The research data is protected by copyright laws and international treaties, as well as other intellectual property laws and treaties. EJL Wireless Research LLC/Maravedis LLC is granting you, the customer, a limited, non-exclusive, non-transferable license to use the research in whole, for your internal business or members of your company.

The research data cannot be stored anywhere other than in computers belonging to the same company, as stated on the invoice. Reproduction, disclosure, copying, dissemination, redistribution or publishing in whole or in part to parties external to the company -customer-, which is the original subscriber to this report is not permitted. This research shall be treated at all times as a confidential and proprietary document for internal use only. By otherwise using the research information, you agree to be bound by the terms of this agreement.

User shall have the right to use the Research solely for its own internal information purposes including information storage and retrieval systems; recordings and re-transmittals over any network (including any local area network). Any internal use of the Research content must be accompanied by the phrase "Used with permission from EJL Wireless Research LLC/Maravedis LLC". The report can be shared with any legally full-time employees of the company in all divisions and physical locations and can be posted on the company's intranet without limitations. You must treat the electronic version of our research data as any other copyright material. You cannot make the information commercially available. Under no circumstances should other data be copied into our research information, nor may parts be cut out of it into other reports, without our written permission.

Without prejudice to any other rights, EJL Wireless Research LLC/Maravedis LLC may terminate this license if you fail to comply with the terms and conditions of this agreement or if the license holder cancels the agreement. In such an event you must delete all EJL Wireless Research LLC/Maravedis LLC research data covered under this subscription.
It is an offense, punishable by US$2,000,000, for the license-holder to make the material available to any unauthorized person, either via e-mail messaging or by placing it on a network.