

(SPECTRUM) SHARING IS CARING

Author: Nick Marshall, Research Director

COORDINATED SHARED SPECTRUM

Spectrum is a scarce and limited resource in very high demand as mobile networks operators (MNOs) strive to densify their networks in an effort to satisfy the seemingly inexhaustible hunger for data throughput from their customers. Conserving this scarce resource by coordinating and sharing it among MNOs is a concept that is gaining traction in the U.S.; however, the devil is in the details.

CBRS DETAILS

Discussions on coordinated shared spectrum began in 2012 in the U.S. when the President's Council of Advisors on Science and Technology (PCAST) proposed a framework defining the three-tiered Citizens Broadband Radio System (CBRS). The U.S. Federal Communications Commission (FCC) established CBRS for shared commercial use and allocated 150 MHz of spectrum in the 3.5 GHz (3550 to 3700 MHz) band to it. However, these frequencies are currently in use by the incumbent U.S. Department of Defense/naval radar, wireless internet service providers (WISPs), and satellite earth stations, so any commercial use of these bands must share the spectrum with these users.

In order to ensure that users in this band do not interfere with each other, CBRS operates a three-tier priority access model defining Incumbent users, Priority Access License (PAL) users, and General Authorized Access (GAA) users. In the highest priority tier, Incumbent users are protected from interference from lower priority PAL and GAA users. Incumbent access to the spectrum is guaranteed, but since this is infrequent and/or localized to specific locations, PAL or GAA users can access the band when it is not in use by an Incumbent. The second priority PAL users are protected from interference by the GAA users. In addition, GAA users may opportunistically have access to the complete 150-MHz spectrum if it is not being used by Incumbents and PAL users. Access to the spectrum is coordinated by a cloud-based Spectrum Access System (SAS) that distinguishes between Incumbent, PAL, and GAA users. For WISPs, there is a grace period of 5 years where WISPs will be treated as Incumbents and will therefore be protected. After this period, they will transition from Incumbent status to PAL/GAA licensees.

Final FCC certification of the SAS administrators is expected towards the end of 2017, which will mark the start of commercial operations. The first CBRS applications are likely to be fixed wireless, using dedicated hardware for point-to-point, point-to-multipoint, and last mile fiber replacement scenarios for WISPs. In 2018, there will be MNO network densification, new MSO entrants for mobile services, and an increase in private LTE and neutral host deployments. The indoor enterprise and home consumer gateway device market will ramp up in 2019, and this equipment may include embedded Citizens Broadband Radio Service Devices (CBSDs) or basestations in Wi-Fi cable modems with interoperability with major MNOs.

The hardware ecosystem is busy preparing for CBRS with the major handset chipset vendors, including Qualcomm and Intel, working on CBRS chipsets, with availability expected in the third quarter of 2017 and CBRS equipped handsets launched beginning in mid-2018.

One signpost that CBRS will transform the in-building wireless and mobile industries is that the CBRS Alliance, which advocates for CBRS technology, now counts as members of all four major U.S. MNOs (AT&T, Verizon, T-Mobile, and Sprint), the major MSOs Comcast and Charter Communications, as well as Google, Intel, and Qualcomm. The equipment vendor ecosystem also stands poised to deploy CBRS with leading edge solutions from small cell and infrastructure vendors who are also members of the CBRS Alliance. These companies include BaiCells, Casa Systems, Cisco, Ericsson, Huawei, ip.access, Nokia, Ruckus, and SpiderCloud—all of whom have announced CBRS equipment.

CBRS promises to attract not only MNOs, enterprise, and private virtual network operators (PVNOs), but also new entrants thanks to its ability to offer densification, neutral host solutions, and low cost deployments and assign spectrum with near real-time updates unlike other shared spectrum approaches.

CARING EXPANDS MOBILE

CBRS has the capability to help MNOs augment mobile capacity, transforming the In-Building Wireless (IBW) industry, creating private LTE networks run by enterprises and venues and enabling new entrants such as multiple system operators/mobile virtual network operators (MSO/MVNOs).

For an MNO, shared spectrum promises improvement in the economics of network densification and coverage extension, early and low cost access to a greater quantity of spectrum than can be had via refarming spectrum, and also offers the ability to serve rising demand for capacity sooner rather than later. The MNO also has the prospect of adding an incremental revenue stream by offering managed cellular services to enterprises and property owners, while simultaneously coordinating with the macro network.

CBRS can transform the DAS and neutral host market. Given its more favorable signal propagation characteristics, CBRS Class A CBSDs are most suitable for small cell indoor or venue deployments. With low to no spectrum acquisition costs, as a GAA user, and deployment economics comparable to Wi-Fi, IBW penetration in the vast middle-sized and enterprise verticals promises to increase dramatically, transforming the IBW market. One of the headwinds to distributed antenna system (DAS) deployment for IBW is that the deployment economics of such systems are incompatible with small- and medium-sized building and venues.

The alternative small cell technology for IBW has so far lacked a neutral host capability, limiting these systems to small floor area deployments before they too become expensive. A neutral host provider can leverage CBRS technology and share the deployment costs among several tenants. In this way, the neutral host can economically tackle these small- and mid-sized deployment scenarios for the enterprise or venue owner. With support from the major MNOs, neutral host providers can create a new class of mobile coverage funded by the enterprise or property owner.

By enabling the creation of private LTE networks, CBRS will make it possible for any property or business owner to deploy a mobile broadband network of their own. Again, the low deployment costs mean that a privately owned and operated network will be a popular and flexible alternative to traditional LTE. Private LTE networks will find applications in many verticals such as industrial, mining, ports, entertainment, transportation, and enterprises. Deploying a CBRS network to run enterprise- or venue-specific applications on mobile devices offers a flexible approach to running secure/private applications on workers' mobile devices. Private LTE networks, unlike public LTE networks, are managed locally, and the network is tailored and optimized for the local services and applications for which it is used. Sensitive or proprietary data stays local, as may be the case in manufacturing or enterprise applications.

With CBRS, MSOs can expand their service offerings to quad-play by offering a supplementary mobile service as an MVNO. By leveraging existing cable plant, MSOs can offer 4G cellular services in addition to their existing cable TV, fixed telephone, and broadband Internet services in urban, suburban, and venue locations. Access to fiber and DOCSIS networks across the MSO's cable footprint will enable the rapid deployment of access points in locations with a high demand for capacity. CBRS is an economical option for those MSOs who do not own licensed spectrum and will offer an effective traffic offload strategy for those MSOs seeking to offer mobile services as an MVNO. Many MSOs offer Wi-Fi, and they can charge for additional traffic on the 3.5-GHz CBRS network in addition to the 2.4/2.5-GHz Wi-Fi networks. Offering LTE service across a host macro network, in addition to their owned CBRS network, promises a more predictable user experience than simple Wi-Fi offload. Reducing the amount of traffic transiting the host MNO's network can reduce the fees paid by the MSO to the MNO. The MSO can also negotiate a "swap" agreement with the MNO offering roaming onto CBRS in return for reduced fees.

While the commercialization of CBRS is imminent, there remain a few open questions, including mechanisms for GAA user coexistence in the same location, since GAA users are not guaranteed protection from interference from other GAA users in the same channel. Also, the PAL competitive auction rules, license duration, and geographical area all remain to be defined by the FCC. We expect that the FCC will soon define the auction rules and that GAA coexistence under near real-time control of the SAS may be sufficient, or it might require the adoption of a Listen Before Talk (LBT) mechanism in the CBSD or a supplemental coexistence manager entity in the network.

© 2017 ABI Research. Used by permission. Disclaimer: Permission granted to reference, reprint or reissue ABI products is expressly not an endorsement of any kind for any company, product, or strategy. ABI Research is an independent producer of market analysis and insight and this ABI Research product is the result of objective research by ABI Research staff at the time of data collection. ABI Research was not compensated in any way to produce this information and the opinions of ABI Research or its analysts on any subject are continually revised based on the most current data available. The information contained herein has been obtained from sources believed to be reliable. ABI Research disclaims all warranties, express or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.