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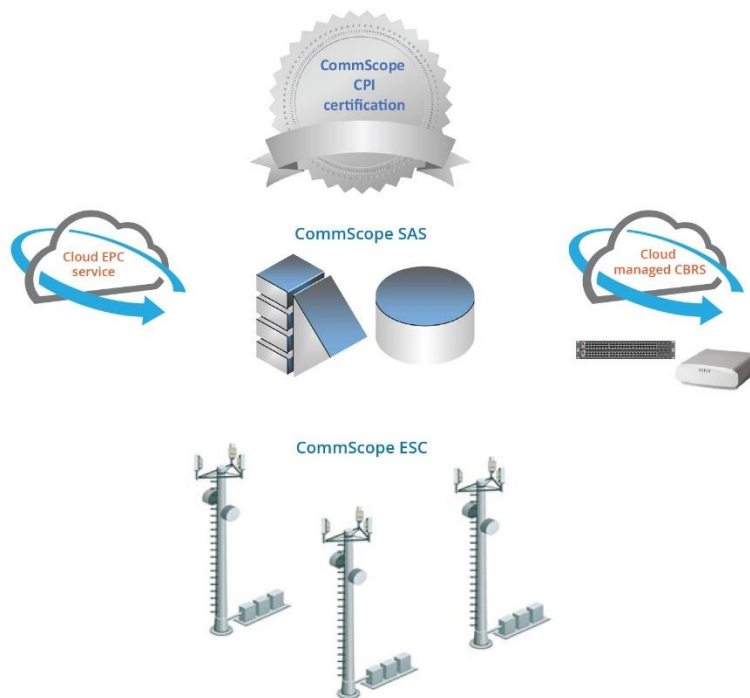
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## CBRS IS HERE TO STAY

Long-Term Evolution (LTE) wireless networks are designed to operate with the highest level of predictability and QoS and are designed to minimize RF interference. LTE is deployed in the 3.5 GHz band by mobile operators in many countries world-wide where it is available as licensed spectrum. Until now, LTE deployments have primarily been limited to service providers and mobile operators due to the level of complexity, cost, and regulatory licensing requirements. This is changing in the US as the FCC makes spectrum in the 3.5GHz band (CBRS) available to enterprises for private LTE networks. This band was previously not licensed to mobile operators in the US because it already had incumbent users, such as the US Navy, that are difficult to relocate. However, the typical utilization is very low, offering opportunities to use the band without endangering incumbent usage if managed correctly.

The FCC is now making this spectrum available under a new set of licensing rules that protects the incumbents while making the spectrum broadly available for a wide set of users.



## CBRS SOLVES TOUGH CONNECTIVITY PROBLEMS

Ruckus' proven performance and ease of use combines with LTE to tackle the hardest connectivity challenges that Wi-Fi alone cannot address. This includes:

- **Distance**—the range of coverage for Ruckus CBRS deployments is as much as 4 times the range of a typical 5Ghz cell. This is advantageous for things like inventory management, automation, and general network connectivity for employees.
- **Better network time coordination**—advantageous for automation and robotics applications.
- **Network security**—With the emergence of “zero trust networking”, Wi-Fi and wired networks have become much more complex to maintain and deploy under this model. Ruckus CBRS private LTE brings a zero-trust level of security with the ease of a typical Wi-Fi deployment.
- **Better roaming**—decisions concerning roaming are handled at the network level instead of the client as they are in Wi-Fi deployments.



Globally, industry and government are focusing on 3.5 GHz as the primary mid-band spectrum for 5G, with testing taking in place in Europe, the Middle East and East Asia. In October 2018, the FCC made targeted changes to its rules governing the 3.5 GHz band that will facilitate the deployment of 5G wireless networks using this spectrum.

## CBRS AND 5G

The new specifications from the CBRS Alliance will complement 5G New Radio (5G NR), the new air interface developed by the 3rd Generation Partnership Project (3GPP) to support the wide variety of 5G services, devices, and deployments. The latest release of 5G NR is expected to support operations in Band 48 and will improve the performance, flexibility, scalability and efficiency of mobile networks while enabling industries to get the most out of the available spectrum. Industry experts are excited about CBRS becoming not only part of the new 5G standards but the fact that the CBRS frequency range is seated in the heart of the 5G operating range.

“The shared spectrum paradigm presented by CBRS has immense potential to unlock value for carriers, equipment manufacturers and end users alike because of the new business models that become possible,” said Joe Madden, Principal Analyst at Mobile Experts. “By expanding the standards and capabilities to support 5G applications, we expect enterprises with short latency requirements and longtime horizons to increase their investments in CBRS and technologies such as OnGo.”

## HOW CBRS WORKS

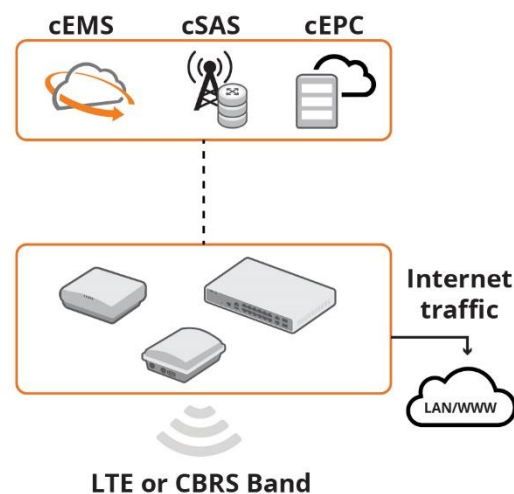
### Components of a CBRS Network

**Spectrum Access Server (SAS)** is responsible for protecting incumbents (other operators transmitting on the spectrum) from harmful interference from new deployments. A CBRS base station, called a Citizens Band Radio Service Device (CBSD), must connect to a SAS when the CBSD is powered on. The base station provides its coordinates (latitude, longitude, altitude) and globally unique CBSD identifier to the SAS. Based on this information, the SAS provides the CBSD with the channels not already in use within the CBRS spectrum. Multiple entities operate SAS systems and there is a standard interface between the SAS and CBSDs that allows them to interoperate. Technically, CBRS rules allow the SAS to change the channels available to a CBSD at any time to protect higher tier users. E.g. if a navy radar in a given location starts to use a specific portion of the CBRS spectrum, the SAS becomes aware of this. The SAS reassigns all lower priority CBSDs operating in that area and using that specific part of the CBRS spectrum to other channels within the CBRS spectrum within 5 minutes.

The role of the SAS in LTE networks is vital to keeping interference between LTE networks low—a requirement for low latency and high predictability.

**Evolved Packet Core (EPC)** is a framework for providing voice and data on LTE networks. It offers 3GPP-specific routing and signaling functionality as well as maintenance of 3GPP-specific database contents. Much of the complexity of an LTE network resides within the EPC. Once an EPC is in place, the private LTE network becomes just another way to gain IP connectivity for the enterprise IP network and services, exactly in the same way as Ethernet or Wi-Fi are used.

**Environmental Sensing Capability (ESC)** ESC networks monitor the frequencies in the area they are installed and report back statistics useful to the SAS for SON coordination of deployed networks. ESCs are a useful tool for large scale networks and congested areas.



- Accurately detect frequency use in the 3550-3700 MHz band and adjacent frequencies;
- Communicate information about detected frequency use to an approved SAS.
- Maintain security of detected and communicated signal information.
- Comply with all Commission rules and guidelines governing the construction, operation, and approval of ESCs.
- Be available at all times to immediately respond to requests from authorized Commission personnel for any information collected in the ESC.
- Ensure that the ESC operates without any connectivity to any military or other sensitive federal database or system.

## CommScope and Ruckus

**Comsearch, a CommScope company**, has been a leading innovator in spectrum management since 1977. Now, our newest SAS and ESC solutions can provide wireless operators access to CBRS and its precious capacity.

Our participation and leadership with the FCC and in the Wireless Innovation Forum and CBRS Alliance are helping to ensure successful development of rules, standards and recommendations for making the CBRS band a commercial success in the United States.



**Ruckus as a co-founder of the CBRS Alliance**, Ruckus Networks has been at the forefront advocating for CBRS and was the first vendor to ship an FCC-approved CBRS access point/base station. Ruckus CBRS is 100% LTE. This means all benefits discussed before applying to a Ruckus wireless network, including improved security, latency, superior client management and roaming decisions (handled at the network level instead of the client) and so on.

**CPI certification**; CommScope is a trainer and partner for the certified professional Installer certification required for any CBRS deployment.



**SAS**: CommScope is a leading provider for SAS services worldwide and combined with Ruckus Networks flexible cloud based SAS offerings any deployment no matter how big or small can be accommodated.



**Cloud managed CBRS Aps**: Ruckus CBRS Aps are the first FCC certified CBRS ready AP available worldwide. The Ruckus CBRS Aps can be cloud managed and deployed in the same manner as a Ruckus Wi-Fi deployment is done today.



**Switching**: Ruckus Networks and CommScope provide a best in class switching offering in the Ruckus ICX line of ethernet switches.



**ESC:** CommScope is the industry's first company to receive FCC certification for our Environmental Sensing Capability (ESC) network. As CBRS is more widely deployed the frequency space will get tighter and CommScope has developed the ESC to ensure smooth operation in both indoor and outdoor deployments far into the future.

ESCs can be deployed on existing towers and other structure and utilize either a dedicated modem per the site network connectivity to establish a link back to the SAS.

## COMMSCOPE AND RUCKUS, "ONE STOP CBRS SHOP".

The advantages of combining CommScope and Ruckus has opened new doors for operators interested in deploying CBRS. CommScope and Ruckus combined provide a solutions warehouse that can accommodate a CBRS deployment ranging from small enterprise all the way up to a multi city carrier grade installation. A provider can source every piece they need to have a successful CBRS deployment with best in class, rock solid ICX ethernet switching, to Ruckus cloud managed CBRS Aps, cloud-based EPC services and soon MNO interconnect services to provide for roaming from local CBRS networks to desired carrier networks. CommScope is one of the oldest and most trusted names in SAS and LTE provided systems and has pioneered the new ESC advancements that will lead to even further growth not only in CBRS but in 5G and other LTE emerging technologies for years to come.

With CommScope and Ruckus deploying CBRS has been made available to operators at a very small level all the way up to major carrier deployments. The simplicity of the cloud services provided by CommScope and Ruckus allow operators to spend more time on new projects and not on painfully complex management consoles.

The illustration is an example of a deployment outline possible with CommScope Ruckus CBRS.

## About Ruckus Networks

Ruckus Networks enables organizations of all sizes to deliver great connectivity experiences. Ruckus delivers secure access networks to delight users while easing the IT burden, affordably. Organizations turn to Ruckus to make their networks simpler to manage and to better meet their users' expectations. For more information, visit [www.ruckuswireless.com](http://www.ruckuswireless.com).

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## About ARRIS

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