Opening Up New Possibilities with Dynamic Spectrum Sharing Technologies

By: Martha Suarez

As the industry looks to deploy 5G and faster connectivity, dynamic spectrum sharing technologies are playing a crucial role in the development of future networks. With the next-generation of Wi-Fi, named Wi-Fi 6, sharing spectrum models like the Citizens Broadband Radio Service (CBRS) in the U.S. and the Internet of Things (IoT) just around the corner, dynamic spectrum access will enable new kinds of networks and allow the participation of new stakeholders, opening up new opportunities for the industry and better connectivity for the users. There are numerous applications that spectrum sharing is relevant for, especially those that require high bandwidths and throughput.

At present, current networks will not be able to cope with the additional coverage and capacity demands that next-generation technologies, such as 5G and the IoT, will bring. Many efforts have been taken in recent years to identify more spectrum for 5G, and it is important to keep in mind that 5G will need a balance between licensed and unlicensed spectrum. To ensure we are taking full advantage of the wireless opportunities of spectrum sharing, the 6 GHz band should be considered for unlicensed use and new sharing schemes should be regulated, opened up and utilized.

Statista Research Department predicts that the total installed base of IoT connected devices will reach 75 billion worldwide by 2025, so now is the time to deploy solutions that will allow ultra-fast and reliable wireless connectivity. Dynamic spectrum sharing is crucial to making efficient use of the spectrum and adding capacity where it is needed.

The success of CBRS

CBRS is an example of a spectrum-sharing success story, with the first commercial deployments expected by the end of the year. CBRS is a three-tier sharing model, created in the U.S. to accommodate a variety of commercial uses on a shared basis with incumbent federal and non-federal users of the band. Access and operations will be managed by a dynamic spectrum access system. Database and location identification technologies are used to protect incumbent services, and this model enables the most efficient and intensive use of the 3.5 GHz spectrum that is critical for 5G. The three tiers are: Incumbent Access, Priority Access, and General Authorized Access.

Incumbent Access users include authorized federal and grandfathered Fixed Satellite Service users currently operating in the 3.5 GHz Band. Under the rules promulgated by the FCC, these users, particularly including U.S. Navy radar operators, will be protected from harmful interference from Priority Access and General Authorized Access users.

The Priority Access tier consists of Priority Access Licenses (PALs) that will be assigned using competitive bidding in a portion of the band. The General Authorized Access tier is licensed-by-rule to permit open, flexible access to the band for the widest possible group of potential users. General Authorized Access users are permitted to use any portion of the 3550 – 3700 MHz band not assigned to a higher tier user and may also operate opportunistically on unused Priority Access channels.

The deployment of a three-tier model allows spectrum sharing to open up opportunities for new stakeholders while still protecting incumbent users in the band. Rather than spectrum going unused, general authorised access users can start using

the spectrum if the higher tiers are not being fully utilized. Licensed access and general access will provide opportunities for both large and small entities to promote greater deployment.

CBRS provides an exciting opportunity for the wireless industry to grow and develop. Use cases and deployment strategies that address the needs of the customer, however, will be a key element of CBRS's success.

Enabling utilization of the C-Band

The C-Band (3.7-4.2 GHz) includes the prime spectrum for 5G operations that will be able to support a global ecosystem of devices. The C-Band is currently being assessed by the U.S government as discussions center on how best to repurpose this spectrum. The DSA has long advocated that the C-Band must be utilized in a way that allows for the most efficient and intensive use of this spectrum for both public and commercial benefit.

The C-Band is owned by the C-Band Alliance and the four satellite companies that comprise it: Eutelsat, Intelsat, SES and Telesat. Recently, Eutelsat announced its decision to withdraw from the alliance. The C-Band Alliance has proposed selling the spectrum for 5G, but this private sale raised concerns about fairness, efficiency and the risk of setting a poor policy precedent. To enable efficient use of the band, the FCC needs to look to implement stringent policies that ensure the clearing of C-Band is undertaken in a fair, public and transparent process that is run by the FCC itself and not outsourced to non-U.S satellite companies. A holistic approach needs to be taken to ensure the industry can deploy 5G and faster connectivity seamlessly.

The next generation of Wi-Fi

While 5G is a core focus, the next generation of Wi-Fi (Wi-Fi 6) is too. According to the Cisco Mobile Visual Networking Index (VNI) Forecast (2017-2022), total public Wi-Fi hotspots (including homespots) will grow four-fold globally from 124 million in 2017 to 549 billion by 2022.

The Cisco VNI also asserted that Wi-Fi 6 is important for the 5G era in driving increased offload from cellular networks. In order to provide a similar experience to 5G, Wi-Fi 6 is set to offer speeds that are 30 percent faster than Wi-Fi 5. But in addition to speed, Wi-Fi 6 will provide a better performance and end user experience in congested, busy areas where connectivity is often unreliable or slow. It does this through more efficient data encoding, which allows for a higher throughput.

Advanced Wi-Fi will improve connectivity in the home, at work and in public spaces, leading to a drive in productivity and an increase in economic growth and societal development. In 2018, a minimalist approach to spectrum regulation has helped smaller area networks, notably Wi-Fi, to deliver nearly $1.7 trillion in global economic benefit.

To provide high throughput and low latency, the next generation of Wi-Fi will support channel bandwidths of 160 MHz, and that is why we must look to the 6 GHz band. 6 GHz is nearby the already heavily used 5 GHz band and will allow for a more rapid deployment. This will open up the opportunities as existing operator backhaul infrastructure can be utilized because the network coverage areas are essentially the same.

A Radio Local Area Network (RLAN) can make use of wide channels to provide wireless gigabit broadband inside homes and buildings, which was not possible with previous generation wireless technologies.

As there are a limited number of RLAN devices that are operating in the airwaves, the typical user experience will be much better, even in busy and congested environments. The industry is preparing itself for 6 GHz access, with major chipset providers, OS vendors and major AP vendors already active in the area. If vendors are able to deliver the same Wi-Fi equipment in multiple regions, end users will benefit from greater

economies, lower prices and a more diverse supplier base.

Standards work has already begun and there are some ongoing regulatory processes in Europe and North America.

Looking ahead

Wi-Fi 6 standardization is a big development that is taking place, but we are still facing a Wi-Fi spectrum shortfall of up to 1.6 GHz in the mid-frequency range by 2025, which will limit the performance and availability of broadband access for billions of users. To combat this, it is important that regulators facilitate license-exempt access to the 6 GHz band (5925-7125 MHz). This will help to avoid a spectrum crunch and will be a step in the right direction to realize the full potential of Wi-Fi 6. The U.S is already moving in this direction, and we need to encourage others to follow in its footsteps.