Dynamic Spectrum Alliance Limited
3855 SW 153rd Drive
Beaverton, OR 97003
United States
http://www.dynamicspectrumalliance.org

October 19, 2020

Gloria Norwood
gloria.r.norwood.civ@mail.mil.
Defense Information Systems Agency

Re: *Request for Information from Industry regarding Dynamic Spectrum Sharing (DSS).*

Dear Ms. Norwood:

DSA[1] is pleased to respond to this Department of Defense (DoD) Request for Information (RFI). We have sought to answer those questions for which DSA has particular interest and expertise, and we are happy to offer our support to help DoD achieve its critical national security mission.

Disclaimer: please note that our responses to the RFI herein are for informational purposes only, and do not bind or commit DSA or DoD in any way.

A. How could DoD own and operate 5G networks for its domestic operations? What are the potential issues with DoD owning and operating independent networks for its 5G operations?

DSA fully supports DoD's efforts to free up additional mid-band spectrum for 5G operations and believes that a sharing framework is the most appropriate and expeditious way to proceed. Under such a framework, DoD could maintain priority to access the band for its use, while potentially making unused bandwidth available to civilian commercial users on an opportunistic basis. Private industry would build, finance, own and operate the network in accordance with DoD specifications.

DSA believes that numerous and substantial policy, legal, and political hurdles exist for DoD's ownership and operation of a 5G network or DoD's leasing of its spectrum to civil users. Should DoD build such a network, it could well run afoul of the Antideficiency Act, which prohibits payments outside of Congressional appropriations; civil use of DoD spectrum would most likely infringe upon the FCC's Congressionally-mandated jurisdiction; and if such a network generates revenue for DoD, it could violate the Miscellaneous Receipts Act absent Congressional

[1] The Dynamic Spectrum Alliance is a global, cross-industry alliance focused on increasing dynamic access to unused radio frequencies. The membership spans multinational companies, small- and medium-sized enterprises, academic, research, and other organizations from around the world, all working to create innovative solutions that will increase the utilization of available spectrum to the benefit of consumers and businesses alike. A full list of the DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members/.

Dynamic Spectrum Alliance Limited
3855 SW 153rd Drive
Beaverton, OR 97003
United States
http://www.dynamicspectrumalliance.org

authorization. Political opposition would also likely derail any DoD owned and operated network. Therefore, the most viable path forward for DoD would be to undertake a FirstNet-like network, with the required congressional authorization, in which private industry would finance the building of a network, provide DoD dedicated 5G services, and offer any excess bandwidth to civil wireless providers on a wholesale basis.[2]

There is ample empirical evidence for the success of spectrum sharing by government, differing industries and business models, and use cases. US industry has responded to recent spectrum sharing efforts by making substantial investments and demonstrating strong interest in CBRS and the recent C-band, 5.9 GHz, and 6 GHz proceedings. Indeed, more than 200 auction winners representing diverse industries (e.g., education, utilities, education, venues and real estate, as well as national carriers and cable broadband) and business models spent $4.5 billion in the recent Priority Access License auction in the CBRS. It is important to continue this success on the path to 5G and enable shared commercial use in the 3.1-3.55 GHz band in the near term to address industry demand.

A model that offers excess bandwidth for commercial use of DoD spectrum ensures a more efficient, expeditious use of the limited mid-band resources for 5G. Such a network could offer access for retail broadband service providers on a non-discriminatory basis, which has the potential to boost broadband competition and jumpstart lagging 5G deployment in the US, and also create a means of financing a DoD 5G network build through private funding. Furthermore, the footprint of such a network could reach underserved or unserved areas of the US with broadband, which would help serve the bipartisan goal of bridging the digital divide. Making such spectrum available for civilian commercial use would obviously require the authorization of the FCC under current law.

B. While the Department has made available the 3450-3550MHz spectrum band for 5G, are there new technologies or innovative methods as to how additional mid-band spectrum currently allocated to DoD can be made available for 5G faster?

DSA believes that additional mid-band spectrum currently allocated to DoD can be made available for 5G faster by extending aspects of the successful CBRS framework in 3.55-3.7 GHz down to the adjacent 3.1-3.55 GHz band, and in particular to the 3.45-3.55 GHz band. Automated frequency coordination for DoD and commercial systems through the Spectrum Access System (SAS), for example, would greatly enhance the availability of spectrum for both DoD and commercial 5G users, compared to a more manual coordination regime, such as in AWS-3.

Industry and DoD learned many lessons through the arduous CBRS certification process. So while DoD incumbencies are different in the 3.1-3.55GHz band, extending the existing and proven CBRS framework would be the fastest way to make this critical spectrum available for civilian commercial operations. This extension of CBRS should be a starting point, not an end

[2] See https://www.firstnet.gov/about.

Dynamic Spectrum Alliance Limited
3855 SW 153rd Drive
Beaverton, OR 97003
United States
http://www.dynamicspectrumalliance.org

goal. Because of the unique DoD operations in 3.1-3.55 GHz, DoD will have to collaborate to find appropriate protection mechanisms for terrestrial and airborne systems. For example, the proven Environmental Sensing Capability system in CBRS could initially be extended into the lower band, which would protect certain DoD systems, while DoD and industry work toward a more efficient and secure incumbent informing mechanism. There is excellent precedent for such collaboration during the certification of SASs in the CBRS band and the Wireless Innovation Forum standards setting process (as discussed further below).

NTIA also provides support for our position that the extension of the successful CBRS sharing framework into the 3.1-3.55 GHz band would be the most expeditious way to make additional, critical mid-band spectrum available for 5G services. NTIA's January technical report on the prospects for sharing the 3.45-3.55 GHz with terrestrial broadband operators made it clear that very wide-area, higher-power outdoor mobile networks are almost certainly not feasible unless incumbent military radar systems are cleared out of the band.[3]

C. What are other innovative ideas as to how 5G can share spectrum with high-powered airborne, ground-based and ship-based radar operations in the 3100-3550MHz spectrum band?

NTIA reported earlier this year that time-based coordinated sharing, in conjunction with a "federal incumbent-informing mechanism" (which would be used to notify commercial spectrum users of federal spectrum operations), will likely be the most effective sharing approach in the 3.1-3.55 GHz band, and would be superior to static sharing on a separated frequency or geographic basis.[4] While additional work needs to be done before stakeholders can reach firm conclusions, the lessons, technologies, and methods developed during the creation and certification of CBRS are obvious guideposts for opening the 3.1-3.55 GHz band to sharing. For example, database coordination of commercial spectrum operations and the use of Dynamic Protection Areas (DPAs) may be particularly helpful in enabling commercial services in the band.

While some stakeholders have suggested that this spectrum could be cleared of the federal incumbents – which include primarily U.S. military airborne, shipborne and ground-based radar

[3] Edward Drocella, Robert Sole, Nickolas LaSorte, *Technical Feasibility of Sharing Federal Spectrum with Future Commercial Operations in the 3450-3550 MHz Band*, NTIA Technical Report 20-546 (rel. Jan. 2020) ("NTIA 3.45 GHz Report"). "The report indicates that commercial operations would impact incumbent federal systems; however, spectrum sharing that provides both sufficient protection to incumbent operations and an attractive commercial business case may be possible with further information and analysis, including studying the efficacy of deploying appropriate time-based sharing mechanisms. . . . In the aggregate and in some cases individually, the federal systems use the entire band throughout the United States and its possessions, including near and over the most populated areas." *Id*. at viii.

[4] *NTIA Technical Report TR-20-546 Technical Feasibility of Sharing Federal Spectrum with Future Commercial Operations in the 3450-3550 MHz Band*, Jan. 2020, at Sec. 9.1, Pg. 125.

Dynamic Spectrum Alliance Limited
3855 SW 153rd Drive
Beaverton, OR 97003
United States
http://www.dynamicspectrumalliance.org

systems – and auctioned for geographic area licensing on an exclusive basis,[5] in its report NTIA indicated that a dynamic, time-based sharing mechanism "present[s] a potentially attractive approach to both protecting federal systems and providing viable commercial operations."[6] Recognizing that clearing this spectrum of federal incumbents may not be possible and could at best take many years to implement, delaying commercial use of the band, DSA recommended[7] that the FCC and NTIA move as quickly as possible to extend the CBRS framework to 3.45-3.55 GHz while also exploring options for sharing 3.1-3.45 GHz.

Considering the strong demand for mid-band spectrum for 5G, NTIA's findings that sharing in this spectrum appears feasible, and the success of CBRS as a framework for protecting incumbent military radar systems, it is clear that the highest and best use of the 3.1-3.55 GHz band is for innovative, commercial wireless use, which can be readily implemented on a shared basis with DoD incumbents.

D. Are there other spectrum bands that can be made available to share quickly in the low and high band spectrum ranges?

As DoD looks to supplement its current communications capabilities with 5G technology and to leverage the technology and the economies of scale that exist for equipment in the commercial sector, DoD may wish to access commercial spectrum through leasing arrangements and/or through opportunistic use, where authorized, such as in the General Authorized Access (GAA) tier of the CBRS band. By accessing spectrum available to GAA users, DoD could avail itself of spectrum to support its own operations on bases and test ranges while also tapping into the larger ecosystem of commercial 5G equipment. Were the FCC to extend the "use-it-or-share-it" rules of CBRS to other commercial bands, there could be additional opportunities for DoD to access commercial spectrum on a shared, opportunistic basis for its own operations.

E. What types of technologies exist, or are anticipated, that will allow civilian users to share spectrum faster?

In the whitepaper entitled "Automated Frequency Coordination - An established tool for modern spectrum management,"[8] the Dynamic Spectrum Alliance makes the case that the use of databases to coordinate spectrum assignments has evolved but is nothing new. The basic steps are exactly the same as in a manual coordination process. What is new are: (1) surging consumer demand for wireless connectivity and hence the need to intensively share underutilized frequency

[5] *See* Comments of CTIA at 8; Comments of AT&T at 3-4; Comments of 5G Americas at 6; Comments of Nokia at 2.
[6] Edward Drocella, Robert Sole, Nickolas LaSorte, *Technical Feasibility of Sharing Federal Spectrum with Future Commercial Operations in the 3450-3550 MHz Band*, NTIA Technical Report 20-546, at ix (rel. Jan. 2020) ("NTIA 3.45 GHz Report").
[7] WT Docket No. 19-348. DSA Reply comments. March 23, 2020
[8] See http://dynamicspectrumalliance.org/wp-content/uploads/2019/03/DSA_DB-Report_Final_03122019.pdf

Dynamic Spectrum Alliance Limited
3855 SW 153rd Drive
Beaverton, OR 97003
United States
http://www.dynamicspectrumalliance.org

bands; (2) significant improvements in the computation power to efficiently and rapidly run advanced propagation analysis and coordinate devices and users in near real-time; and (3) more agile wireless equipment that can interact directly with a dynamic frequency coordination database. There is no question that today we have the technical ability to automate frequency coordination and thereby lower transaction costs, use spectrum more efficiently, speed time to market, protect incumbents from interference with certainty, and generally expand the supply of wireless connectivity that is fast becoming, like electricity, a critical input for most other industries and economic activity.

Under a DSA approach, equipment communicates directly with a database to be granted access to spectrum at the location and time required on whichever frequencies are unused at the time by existing users. This is the approach which underpins TVWS devices, CBRS and now AFC in the 6 GHz band. Based on the type of device (fixed or personal/ portable) and its coordinates, information about the transmitter's location and operating parameters, and the technical rules the regulator puts in place to protect incumbents from harmful interference, a calculation engine determines the list of available channels at the secondary user's device location and its maximum permissible radiated power. This capability enables a regulatory framework for shared access without disruption to incumbent operations, giving regulators control and flexibility in improving spectrum utilization while simultaneously protecting against harmful interference. The FCC's regulatory framework and private industry's investment in the CBRS band is the most recent example of the technical and commercial viability of DSA, even in the most challenging of spectral environments.

Adopting dynamic database systems also has the added benefit of reducing the administrative burden on both industry players and the regulator by eliminating the need for each individual user to apply for permission to share spectrum and thus encouraging more users to leverage shared spectrum. To further enhance transparency and immutability, the use of blockchain is currently being investigated to manage spectrum databases.

H. What are other current and perceived barriers that industry is aware of to DSS?

DSA has always advocated for a balanced spectrum policy--with a mix of exclusively licensed, shared, and unlicensed in low-, mid- and high-bands--as the best approach to 5G. There is however a perception among large national carriers and a subset of policymakers that exclusively-licensed spectrum is the best path forward for deployment of 5G networks. While there are certain advantages to exclusively-licensed spectrum (including increased power limits, certainty of use, and quality of service), there are also significant drawbacks to relying solely or primarily upon such an approach to achieve 5G. Exclusive licensing regimes result in scarce spectrum resources lying fallow, especially in rural areas disproportionately on the wrong side of the digital divide, and often block access by smaller providers who lack the financial resources to take part in expensive auctions. Clearing spectrum for auction, especially in a densely-packed and highly-used band such as 3.1-3.45 GHz, can be complicated, costly, and take years to implement. Finally, the FCC rulemaking and auction process is lengthy and adversarial, often leading to outcomes favoring one business model or industry. By contrast, commercially

Dynamic Spectrum Alliance Limited
3855 SW 153rd Drive
Beaverton, OR 97003
United States
http://www.dynamicspectrumalliance.org

deployed SASs are available, technologically proven, and ready to be deployed to free up DoD mid-band spectrum. Indeed, this offers DoD and commercial users the fastest path to using DoD bands for communications networks, while protecting critical incumbent systems, and putting the nation on a path to 5G. In addition, under a "use-it-share-it" regime, diverse business models can gain access to spectrum and make the most efficient use of scarce resources, as we highlighted in our response to Question A.

K. How can spectrum modernization, including spectrum Information Technology (IT) modernization and automation, help facilitate faster spectrum sharing?

There are several emerging technological advances that can further amplify the benefits of automated frequency coordinated systems. These include the incorporation of more detailed, real-world GIS data (e.g., terrain, clutter, building heights and materials); real-time spectrum sensing data; the growing sophistication of propagation and interference modeling; value-added, cloud-based database services; and the potential to combine blockchain technology with dynamic database coordination.

Cloud-based solutions vastly improve the speed at which coordination can be conducted, In the recent years the cost of cloud computing has decreased. Additionally, highly detailed geographic databases have rapidly evolved and combined with clutter-aware propagation models, are very powerful.

Database operators are also likely to offer a host of innovative value-added services. Among these is the potential to combine blockchain technology with dynamic database coordination. Blockchain may have the potential to enhance frequency coordination and secondary market transactions in shared bands that will need (or benefit from) an AFC database. A blockchain not only speeds transactions and minimizes their cost, but also ensures transparency and trust, including among regulators in contexts where it is fashioned to facilitate a public policy purpose. In that context, a blockchain can be a permissioned network limited to parties, or types of transactions, that are pre-approved by a certificating authority. In some scenarios (e.g., secondary market transactions on exclusively-licensed bands) it may be the right database solution; whereas in other scenarios it might enhance the functionality of spectrum coordination databases or, in other situations, not add sufficient value to justify the additional overhead costs for users.

At least three possible applications have been outlined by regulators, academics and others: First, a blockchain can potentially improve coordination and reduce interference among users of a shared band, second, a potential application for blockchain is to verify and execute spectrum sharing agreements between primary and secondary users in licensed spectrum, and third, blockchain could automate ex post enforcement[9].

[9] See http://dynamicspectrumalliance.org/wp-content/uploads/2019/03/DSA_DB-Report_Final_03122019.pdf

Dynamic Spectrum Alliance Limited
3855 SW 153rd Drive
Beaverton, OR 97003
United States
http://www.dynamicspectrumalliance.org

DSA
DYNAMIC • SPECTRUM • ALLIANCE

Conclusion

In conclusion, DSA fully supports DoD's efforts to free up additional mid-band spectrum for 5G operations and believes that a sharing framework is the most appropriate and expeditious way to proceed. Under such a framework, DoD could maintain priority to access the band for its use, while potentially making unused bandwidth available to civilian commercial users on an opportunistic basis. We are happy to offer our support to help DoD achieve its critical national security mission.

Sincerely,

Martha SUAREZ
President
Dynamic Spectrum Alliance