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SATELLITE SERVICES WORKING GROUP (SSWG)

SUBMISSION

to the

Australian Communications and Media Authority's (ACMA)

Spectrum sharing - Overview and new approaches

27 September 2019

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EXECUTIVE SUMMARY

The Communications Alliance Satellite Services Working Group (SSWG) welcomes the opportunity to provide comments to the ACMA *Spectrum sharing - Overview and new approaches* Information Paper.

The Spectrum Tune-Up that the ACMA hosted in August provided industry members with a useful insight into the complexities around spectrum sharing techniques and the ACMA's current thinking around the technologies. Having international speakers such as Jennifer McCarthy and Kurt Schaubach, from Federated Wireless, was helpful in raising awareness of current use cases in the U.S. Our members find these Tune-Ups a valuable component of the ACMA's consultation process.

The SSWG acknowledges that dynamic spectrum sharing could offer some benefits to the satellite industry. There is concern, however, as to whether a dynamic shared spectrum regime will give the satellite industry access to new spectrum in a way that will sustain most business models. As commercial deployments of dynamic spectrum sharing regimes have barely begun, the ability to effectively manage spectrum use and avoid interference on significant scale remains to be seen.

There are many uncertainties with respect to how dynamic spectrum sharing can be implemented, with practical limitations around spectrum sensing techniques, the management and operation of geolocation databases, and security and integrity challenges. This submission provides further details on these points.

About Communications Alliance

Communications Alliance is the primary telecommunications industry body in Australia. Its membership is drawn from a wide cross-section of the communications industry, including carriers, carriage and internet service providers, content providers, equipment vendors, IT companies, consultants and business groups.

Its vision is to provide a unified voice for the telecommunications industry and to lead it into the next generation of converging networks, technologies and services. The prime mission of Communications Alliance is to promote the growth of the Australian communications industry and the protection of consumer interests by fostering the highest standards of business ethics and behaviour through industry self-governance. For more details about Communications Alliance, see http://www.commsalliance.com.au.

International developments in dynamic spectrum sharing

At the outset, the Communications Alliance SSWG agrees with the ACMA that 'non-traditional sharing approaches may not always be the most appropriate spectrum management responses to any given set of circumstances.' In the Information Paper, the ACMA raises thoughtful questions about how and when non-traditional dynamic spectrum access regimes should be deployed, and the potential challenges and difficulties in effective implementation.

Unfortunately, international developments offer only limited answers to the ACMA's questions. While the U.S. and some European countries have trialled spectrum sharing techniques in a number of bands, real-world experience at any kind of scale remains limited at best. For example, the FCC has only just authorized the first Spectrum Access Systems (SAS) providers for the Citizens Broadband Radio Service (CBRS) to enable commercial deployments beginning in September 2019 (after several years of trials and highly debated revisions to its rules, with some mobile operators continuing to express reservations).[1] Similarly, in Europe, licensed shared access regimes are only now exiting their trial phases and entering the commercial deployment phase.[2]

As a result, the actual benefits of dynamic spectrum sharing, their efficacy for managing interference at any significant scale, and their economic impact on incumbents and new entrants alike, are not yet clear. In such circumstances, the SSWG recommends that the ACMA continue to monitor international developments, and (at most) conduct limited trials of its own in 'sandbox' bands that have limited or no impact on ongoing commercial services. The imminent commercial deployments in the U.S. and Europe does, however, offer a good opportunity for the ACMA to gather real world data on the benefits, pitfalls and effectiveness of dynamic spectrum sharing.

Satellite industry perspectives on dynamic spectrum sharing

The satellite industry is very familiar with spectrum sharing, as virtually all of its spectrum is 'shared' in very concrete ways. In orbit, for example, multiple satellite operators 'share' the same satellite spectrum every two to three degrees along the geostationary arc (and increasingly with non-geostationary satellite operators in some bands). The ITU Radio Regulations provide a framework under which traditional frequency coordination agreements are negotiated among satellite operators. On the ground, some satellite bands are shared on an individually coordinated basis with terrestrial fixed services, which necessarily constrains the deployment of both services in the band.

Dynamic spectrum sharing could offer some benefits to the satellite industry by, for example, facilitating faster, real-time access to spectrum in bands shared with other services. For example, the 2015 proposal by Omnispace to use a sense-and-avoid technique to facilitate coexistence with ENG services could be reconsidered by the ACMA as a sandbox trial. In addition, as more satellites are deployed with dynamic beam forming and frequency selection (as compared with more traditional fixed beam, fixed frequency satellites), dynamic spectrum sharing techniques could be developed to help satellite operators maximize and optimize their use of spectrum resources in-orbit. On the other hand, dynamically shared spectrum (in contrast with 'static' frequency coordination agreements) may not provide the required certainty to support the investment cases for building new satellites and associated ground infrastructure.

Fundamentally, though, the satellite industry is concerned as to whether a dynamic shared spectrum regime will give the satellite industry access to new spectrum in a way that can

[1] *See* https://www.multichannel.com/news/cbrs-gets-icd-approval-from-fcc (Sep 19, 2019).
[2] *See*, *e.g.*, https://www.etsi.org/newsroom/news/1625-2019-07-etsi-specifications-on-licensed-shared-spectrum-successfully-implemented-in-the-netherlands-for-the-entertainment-industry (8 July 2019).

sustain most business models. Rather, the satellite industry is understandably concerned that dynamic spectrum sharing will only be implemented in satellite bands in a manner that constrains or precludes the industry's continued use of such spectrum. That is, the industry is concerned that only certain spectrum users (e.g. WISPAU) will gain access to new spectrum under the rubric of 'spectrum sharing,' and that their gain will be at the expense of the satellite industry.

For example, under the 'spectrum sharing' regime in the FCC's CBRS, existing satellite deployments are frozen in place and no new satellite deployments are allowed. In the satellite industry's view, the benefits of this kind of 'sharing' (if it can be called 'sharing') are hard to see.

Implementation and enforcement challenges

Because commercial deployments of dynamic spectrum sharing regimes have barely begun, their ability to effectively manage spectrum use and avoiding interference on significant scale remains to be seen. Indeed, the regulatory and technical complexity of many shared spectrum regimes indicates the need for a cautious approach and validation of all aspects of the sharing regime before implementation.

Spectrum sensing techniques, for example, have obvious limitations as a means of managing interference into satellite downlink receivers. The signals from satellites in space are already very weak by the time they reach the Earth and are unlikely to be detected by a sensor. Even if detectable, the sensor has no idea whether there is a receiver nearby. While in some contexts, a weak transmit signal implies that intended receivers nearby will not be able to receive and decode the signal, that is not the case for high-gain satellite earth station receivers.

A geolocation/database approach (which seems to be the most common approach to dynamic spectrum sharing) may overcome some of the shortcomings of spectrum sensing, but their efficacy must also be tested to ensure their ability to control interference sources, especially those in rapid motion, in a timely manner to prevent interference to higher or equal tiered services. A proper interference calculation model would need to be agreed and implemented. Even then, how often must devices query the database for permission to transmit in order to ensure interference protection? What alternate communication channel is required for the database to be queried? What is the data rate necessary in such alternate communication channel? What is the impact of database queries on device performance or communications latency?

The security and integrity of dynamic spectrum sharing systems must also be validated ahead of implementation. In the U.S., for example, the FCC required dynamic frequency selection to be implemented (in a decentralized manner) in certain U-NII (Wi-Fi) devices in order to protect federal government weather radars. However, such radars experienced significant and persistent interference after commercial introduction of the devices. After a multi-year investigation, the FCC found that the dynamic frequency selection functions of these devices had often been disabled (either by the user or a third party), but by then it was too late to recall the devices and the FCC's enforcement options were limited.[3]

As for the pre-emption model, SSWG members find it unconvincing. It relies on an almost static model of pre-provision and for secondary users to 'opt in' to the process, without much incentive to do so. It is unclear what benefits such an approach may bring over more traditional licensed access.

[3] See, e.g., *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, First Report and Order, FCC 14-30 (rel. Apr. 1, 2014) at ¶¶ 11-14.

With any introduction of DSA, the SSWG recommends that a cost-benefit analysis be performed. Amongst other things, the administrative process, licence types and updates to IT systems that will have to be developed to support a DSA scheme are likely to have reasonable initial cost associated with it, and depending on how the solution is developed, may have ongoing administrative costs, for example, ongoing maintenance of an environmental sensing capability (ESC), should one be required as is the case for the CBRS scheme in the USA. It would be prudent to establish that demand for DSA services justifies the initial and ongoing costs, and one pragmatic way to ensure this would be to assume cost-recovery for the development of the necessary processes and systems from the beneficiaries of the scheme over some reasonable period of time through DSA licence fees.

The challenges ahead

Implementation of the DSA approach would need to be thorough, with an in-depth analysis involving the ACMA and all Australian stakeholders. More trials on a localised level would be beneficial to help gauge how this approach would be implemented to benefit different services. It would also be beneficial for detailed requirements to be fulfilled prior to the implementation of the DSA approach in order to measure the practicality and long term benefit.

Implementation of the DSA approach should avoid impacting the Services Level of Agreement (SLA) of current operational service implementation of the DSA approach, to the greatest extent that is possible. It should also avoid negatively impacting innovation in the communications industry.

The SSWG suggests that as deployments of DSA sharing have barely begun, there would be benefits with proper studies being carried out (e.g., via the APT Wireless Group) to assess the ability to effectively manage spectrum use and mechanisms to avoid interference. As the ACMA is only starting to look at DSA, the regulatory and technical complexity of various shared spectrum techniques around the world indicate the need for a cautious approach and validation process.

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