



Submission in response to
ACMA Consultation Paper

**Spectrum Sharing:
Overview and new
approaches**

Public Version

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EXECUTIVE SUMMARY

1. Optus welcomes the opportunity to comment on the Australian Communications and Media Authority (ACMA) paper: *Spectrum sharing: Overview and new approaches*.
2. Current spectrum licensing arrangements – spectrum, apparatus and class licences – already provide a framework to authorise the use of spectrum across the Australian jurisdictions. Recent consultations, such as the *Proposed area-wide apparatus licence*, have similarly tried to canvas industry views on alternative arrangements to facilitate more flexible use of spectrum assets.
3. Opportunities exist for the introduction of more ways to enable sharing and compatibility, and these will occur in a healthy and competitive market. However, this may result in the potential for spectrum denial if such arrangements are not carefully implemented.

Non-traditional sharing arrangements remain in their infancy and limited in scope

4. The Paper focuses on non-traditional sharing arrangements and appears to take guidance from two main approaches adopted in other jurisdictions.
 - (a) First, the Citizens Broadband Radio Service (CBRS) approach adopted in the US, described as a generic hierarchical or tiered access model, and which is reliant on dynamic sharing techniques to manage access permissions; and
 - (b) Second, the Licensed Shared Access (LSA) approach adopted in Europe, which generally requires that all users need to be licensed before shared access to the band would be permitted.
5. There have been very few implementations of these spectrum sharing arrangements observed internationally. Even where such non-traditional sharing arrangements have been adopted, these remain in their infancy and limited in scope – and therefore it is inconclusive that such arrangements would provide any benefit or advantage, or necessarily be preferred over any of the existing arrangements for spectrum sharing available today.

Sharing flexibility needs oversight, structure and careful consideration

6. There is no single framework or approach that will meet the needs of all spectrum uses or users. Spectrum flexibility therefore needs to be approached with caution, while still adhering to a framework that respects the property rights afforded by existing or future spectrum licences.
7. Secondary market trading, spectrum leasing and geographical licence separation currently provide traditional sharing opportunities to meet existing needs, while allowing the incumbent licensees to control and determine additional uses within their spectrum licence areas. Other technical measures, such as, geographical separation distances between systems, physical shielding, filtering, interference coordination and power limits where necessary may also be considered in some cases.
8. Optus reiterates that the case for dynamic spectrum access (DSA) is questionable under many spectrum use cases and continues to present limited opportunities for domestic application in Australia. It is also likely that the technical limitations, spectrum availability factors and user expectations will continue to make DSA approaches unlikely to be viable into the medium term.

Spectrum sharing is not suitable for all frequency bands and uses

9. Spectrum sharing is described as one of many tools available for effective spectrum management, and that coexistence of spectrum uses or users is the desired outcome and the objective of sharing. In this context, the ACMA acknowledges that:

Spectrum sharing is the process or technique for managing interference so the spectrum resource can be utilised by multiple uses (services and/or applications) and individual users (individual licensees, assignments), while maintaining coexistence between those users.¹

10. Optus notes, however, that within the current spectrum management arrangements, the need to retain the primacy of property rights afforded to the spectrum licence holders remains. Not all spectrum frequency bands will be suitable for spectrum sharing in the broad sense being canvassed in this Paper.
11. Important questions first need to be answered, including: What are the possible candidate bands that could practically be considered for non-traditional sharing? Are the alternate uses in those bands currently allowed to operate within the existing technical parameters (if not, what needs to be augmented to facilitate this)? Is there sufficient demand to warrant the introduction of a new spectrum management arrangement? Who will be responsible for the operation of the new spectrum management arrangement (including assessment of any conflict of interests between the role of the 'controller' versus the 'spectrum user')? Who bears the cost of setting up the new arrangement (including the ongoing cost of operation)?
12. The introduction of any new arrangement is not without cost, both administrative and financial. In addition, the time and augmentation of current processes (both technical and regulatory) will also have significant downstream implications for long term investments.
13. For spectrum sharing to succeed, interference needs to be managed in a way that the utility and value of the available spectrum is not compromised. More importantly, is the complexity worth the additional costs and effort?

Continued monitoring of international developments is more than sufficient for now

14. While Optus does not consider spectrum sharing, as canvassed throughout the ACMA paper, to be an immediate priority in the ACMA's workplan, we will continue to be engaged in the ACMA consultation process as it continues to develop its thinking on its non-traditional approaches to spectrum sharing.
15. Optus likewise submits that the ACMA continue to monitor any international developments in non-traditional sharing to see what works in practice and what elements (if any) could translate well to the Australian environment.
16. Optus recommends that only as further evidence of their effectiveness and utility becomes available, should the ACMA consider assessing their suitability for Australian applications. Optus does not support experimentation in bands where spectrum licensees have property rights and significant business investments in infrastructure and services.

¹ ACMA, 2019, Spectrum sharing: Overview and new approaches, August, p.5

NON-TRADITIONAL SHARING ARRANGEMENTS ARE LIMITED

17. The Paper acknowledges that different sharing models can be achieved through a combination of technical and regulatory concepts and techniques. In particular, the ACMA discusses these arrangements in the context of four dimensions – Frequency domain sharing; Geographic domain sharing; Signal sharing; and Time domain sharing.
18. In simplistic terms, the frequency and geographic domain sharing forms the basic building blocks for spectrum licensing. It offers operators a framework that favours simplicity, stability, predictable sharing conditions and clear rules for access. As succinctly summarised by the GSMA,

Sharing is only possible if regulations don't prohibit it, commercial measures incentivise it, and it is technically practical (i.e. different users can operate effectively without interference).²

19. Optus considers any consideration of spectrum sharing, whether traditional or non-traditional, will still need to adhere to several basic principles similar to licence core conditions (i.e., specified frequency bandwidth and geographic location).

20. Furthermore, the ACMA notes:

Although there are numerous specific instantiations of these [DSA] techniques with a range of different names, a common feature is that they all typically take advantage of time-based changes in spectrum occupancy by incumbent users – that is, allowing access to spectrum that may not be in use in all geographic areas, all the time.³

21. Optus also highlights that non-traditional sharing arrangements remain limited in scope and, given their infancy, it is yet to be observed how successful the arrangements have (and will be) been in terms of unlocking the additional utility benefits of sharing. These are further discussed below.

International approaches should continue to be monitored

22. The Paper focuses on non-traditional (including dynamic) sharing arrangements and appears to take guidance from two main approaches adopted in other jurisdictions.
 - (a) First, the Citizens Broadband Radio Service (CBRS) type approach, which is a generic hierarchical or tiered access model; and
 - (b) Second, the Licensed Shared Access (LSA) approach adopted in Europe, which is an authorisation model based on licensed use where spectrum is not currently utilised and use will not cause undue interference.
23. While these are interesting international developments, Optus does not consider these approaches compatible with the spectrum requirements or utilisation profiles of mobile operators in the Australian market. Importantly, the introduction of non-traditional sharing techniques and initiatives are long-term projects that require significant resources and

² GSMA, 2018, Spectrum Sharing, GSMA Public Policy Position, November, p.3

³ ACMA, 2019, Spectrum sharing: Overview and new approaches, August, p.2

studies to identify the suitability and technical and regulatory considerations for different frequency bands.

CBRS-type approaches

24. The FCC's spectrum sharing arrangements in the Citizens Broadband Radio Service (CBRS) is based a hybrid framework which adopts a three-tiered shared access model – Incumbent Access; Priority Access⁴; and General Authorised Access (GAA)⁵ – to accommodate a variety of commercial uses on a shared basis with incumbent federal and non-federal users of the band.
25. The CBRS approach relies on a tiered access model based on the level of protections afforded to spectrum users. A key feature of the approach is the establishment of an automated frequency coordinator, known as a spectrum access system (SAS) which will be responsible for managing the access for shared wireless broadband use of the 3550-3700 MHz (3.5 GHz) band.
26. This arrangement is in its infancy (it is due to be launched in late 2019) and is yet to be proven effective or adopted more widely in other jurisdictions. For example, even the FCC and its stakeholders reserve judgement on the development of this spectrum sharing arrangement, and its ability to be replicated across other bands.

*While the Commission and industry stakeholders are confident and excited about the Citizens Broadband Radio Service and use of dynamic sharing techniques to enable sharing by licensed and unlicensed use with incumbent services, most comments in response to the Spectrum Pipeline Report Public Notice **coalesced around the adoption of a wait-and see-approach before the Commission decides to apply these techniques elsewhere.** Dynamic spectrum access will continue to develop; we are also aware that entities such as the WinnForum, which conducted a multi-stakeholder process for developing many of the implementation details for the 3.5 GHz band, are actively considering whether other bands may be appropriate for the application of similar techniques. **It is too soon to know whether other bands may be suitable for licensed or unlicensed use based on the techniques used in the 3.5 GHz band.** The Commission will continue to monitor and consider relevant developments.⁶*
[Emphasis added]

27. It would not be prudent to adopt a new approach in the Australian context without further investigation at this early stage. Any outcomes from other jurisdictions would need to

⁴ The Priority Access tier consists of Priority Access Licenses (PALs) that will be assigned using competitive bidding within the 3550-3650 MHz portion of the band. Each PAL is defined as a renewable authorization to use a 10 MHz channel within a county for ten years. Up to seven total PALs may be assigned in any given county with up to four PALs going to any single applicant. See: <https://www.fcc.gov/wireless/bureau-divisions/mobility-division/35-ghz-band/35-ghz-band-citizens-broadband-radio-service>

⁵ The GAA tier is licensed-by-rule to permit open, flexible access to the band for the widest possible group of potential users. GAA users are permitted to use any portion of the 3.5 GHz band not assigned to a higher tier user and may also operate opportunistically on unused Priority Access channels. See: <https://www.fcc.gov/wireless/bureau-divisions/mobility-division/35-ghz-band/35-ghz-band-citizens-broadband-radio-service>

⁶ Federal Communications Commission, Report to Congress in Compliance with the Spectrum Pipeline Act of 2015 (November 2, 2018), Report, FCC DA 18-1128, para 26

demonstrate clear benefits and improvements in efficiency before adoption of non-traditional sharing can be considered in an Australian context.

LSA approaches

28. Ofcom's local licensing arrangements were introduced in July 2019, and *"designed to allow the flexibility to rapidly respond to changing demand and spectrum would only be authorised when and where it is needed."*⁷
29. The LSA approach is based on a set of rules and conditions for sharing between prospective and incumbent users based on technical and operational characteristics.
30. There are currently two forms of licensed shared access:
 - (a) Incumbent licence holders can sub-license spectrum to other users in a controlled way (e.g. leasing arrangements); or
 - (b) The spectrum manager can authorise use within a defined band or geographic area on specified terms (e.g. distinguishable by permitted power levels).
31. However, Ofcom also notes that demand for these new licences is uncertain.
32. It should also be noted that the licences granted are for a fixed, short duration *where* existing network deployments are not planned or expected for the life of that licence (i.e. in mature networks where the licensee has decided that the deployment of additional network infrastructure is unwarranted on economic or other grounds).

Mandating the use of DSA approaches for sharing is not warranted

33. Dynamic sharing, per se, already exists within the toolkit of efficient spectrum use – however, this approach for sharing is usually only adopted on an intra-operator only basis. Through existing secondary market mechanisms, incumbent licensees can open access to their allocated spectrum licences where they consider it is possible for co-existence within the same licensed area. Importantly, this decision is determined at the discretion of the spectrum licensee in conjunction with their current and future planned use of the spectrum licence held.
34. Where frequency bands are globally harmonised for specific uses, and can be supported by multiple vendors, devices may also be available to facilitate deployments across a wider bandwidth range. Device support however remains at the discretion of vendors (supply) and operators (demand) and mandating device selection for either UE or handset equipment is not the role of the regulator.

Access to licensed mobile spectrum should be limited

35. Mobile networks operate on a 24/7 basis and, are for the most part, deployed over extensive geographic areas. More importantly, access to the spectrum for mobile services is required on a continuous basis, hence there is limited opportunity for sharing with other users without access guarantees (in the form of strong guarantees and high quality of service for incumbents) being negotiated. Underutilised spectrum, if any, is therefore only likely in remote areas and away from the boundaries of existing mobile network deployments, and only under limited circumstances where traditional sharing techniques are not already in use.

⁷ Ofcom, 2019, Enabling wireless innovation through local licensing, Statement, July, p.2

36. Complex sharing frameworks, such as those with multiple tiers, may negatively impact future investment in innovation and infrastructure. For example,

They may limit the amount of spectrum for prioritised licensed access – which may make a band unsuitable for 5G – and introduce conditions (e.g. relatively low power limits, small licence areas, short licences etc.) that restrict deployment options (e.g. for macrocells or fixed wireless access) and discourage significant long-term wide-area network investment.⁸

37. Ofcom also acknowledges this point, noting that: “We also do not expect shared access to undermine the private value of spectrum or the incentive to invest since access will only be granted where the incumbent licensee has no foreseeable plans to deploy.”⁹

38. While Ofcom has introduced sharing for licensed mobile spectrum, it is important to note that the availability for sharing is limited and only applies to remote areas on a time-limited basis. The Local Access licence sits alongside the existing spectrum trading framework, which also already makes it possible for people to gain access to currently licensed mobile spectrum – but more importantly, even though Ofcom will consider applicants for the Local Access licence this may not always be granted. For example,

Unless the operator raises a reasonable objection (e.g. they are using the spectrum at that location, or they are planning to do so within the time period requested, or the transmitter would cause interference to nearby deployments), Ofcom will issue a licence.¹⁰

39. Optus submits that mandating sharing will be complex and will require the introduction of multiple overlays of associated rules and requirement, in order to maintain the operational status quo. The Ofcom allocation of spectrum under a shared local licensing arrangement should be carefully qualified as there are geographical, duration and MNO proximity constraints associated with the concept of sharing in the band.

40. Key questions remain about how traditional regulatory considerations will be met under non-traditional sharing models. These include, but are not limited to:

- (a) Who manages access to shared spectrum?
- (b) Who pays for access to shared spectrum?
- (c) Who benefits financially from sharing spectrum?
- (d) Who pays for management systems?
- (e) Who resolves conflict between licensees in the event of dispute?

⁸ GSMA, 2018, Spectrum Sharing, GSMA Public Policy Position, November, p.6

⁹ Ofcom, 2019, Enabling wireless innovation through local licensing: Shared access to spectrum supporting mobile technology, Statement, July, p.67

¹⁰ Ofcom, 2019, Local Access Licence, Guidance document, p.2

ISSUES FOR COMMENT

41. Optus addresses the ACMA's questions below.
1. Given current momentum in international markets and opportunities for other sharing models offered by 5G technologies, it is timely to develop a more detailed consideration of spectrum sharing opportunities in Australia?
42. Optus contends that the ACMA should maintain a watching brief on developments in overseas markets until benefits and drawbacks of various non-traditional sharing techniques are available. Decision making of this kind should be based on evidence, so a measured approach is required.
2. Are there recent developments in sharing techniques that industry and the ACMA should be aware of?
43. Optus has no comment to make in response to this question.
3. What are the (potentially new) use cases that might benefit from secondary or tertiary access to spectrum and who benefits?
44. Optus reiterates that any spectrum sharing framework or methodology will require robust detection, management and enforcement processes to minimise any detrimental impact on primary spectrum licensees and their existing operations and use of spectrum.
4. What are the potential challenges/impediments to the introduction of DSA in Australia – technical, industry capability, licensing and regulatory frameworks?
45. One key challenge is to ensure that any new arrangement does not negatively impact on the operation of interference management, geography, duration and other proximity core licence provisions that already exist today. In some cases, DSA may introduce additional regulatory and financial risks to operators.
46. For example, inter-band DSA relationship dynamics have not been investigated.
47. In addition to the cost of establishing the framework, this will also require the ACMA, as the spectrum manager, to remain an objective arbiter in the event of any investigations and disputes.
5. Facilitating spectrum access (e.g. monitoring, control, reporting, assignment) logically necessitates involvement from both government and industry. Are there any early thoughts on what an appropriate industry/government balance might look like? How might the ACMA facilitate shared spectrum access? How might the ACMA address this?
48. In consideration of facilitating spectrum access, the ACMA should try to avoid implementing any new arrangements in already spectrum licensed bands.
6. What is the relevance of DSA examples such as the US Citizens Broadband Radio Service (CBRS) arrangements to the Australian spectrum environment? Are there other or lower cost alternatives to help inform access control and assignment systems of incumbent usage in a timely manner?
49. It is too early to comment on the international examples (e.g. the CBRS) in the Australian context. These can only serve as a potential case study, and nothing further.
7. Under a multi-tier DSA approach:

> Tier 1 (highest priority or incumbent) users would be expected to share spectrum with lower tier users when not being utilities. Are there any specific licensing and/or regulatory arrangements that might incentivise the tier 1 users to release unutilised spectrum for lower-tier access?

> Tier 2 and 3 users need to vacate spectrum (regardless of their service type or communication urgency) for tier 1 users to operate seamlessly. Do we see potential services/service types in Australia who would fit the criteria of second or third tier users? What are the incentives to adopt a conditional (lower priority) spectrum than an unconditional (full access) spectrum?

50. Optus submits that the potential success of any spectrum sharing initiatives will depend on establishing sufficient incentives for both primary and secondary users to make spectrum available in any sharing arrangement.
51. Significant investment would be required (on the part of incumbent licensees and/or all spectrum users in the band) to implement, manage and govern spectrum sharing approaches such as those outlined in the ACMA paper.
52. In particular, the incentivisation of tier 1 users to share spectrum would extend beyond simple financial compensation. The certainty afforded through the issue of spectrum licences ensures licensees the primacy of access – especially in a highly utilised and property rights governed spectrum licensing arrangement. It is unclear how a tier 1 operator would be sufficiently motivated to engage in non-traditional sharing arrangements, particularly where the operation of lower-tiered users risk interfering (whether intentional or otherwise) with the seamless operation of their services.
53. Optus has no current view on tier 2 and 3 use cases for spectrum sharing.