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DSA DYNAMIC • SPECTRUM • ALLIANCE

DSA Submission to the Spectrum Review of the Department of Communications

20 June 2014

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1 Introduction

The Dynamic Spectrum Alliance[1] is pleased to have the opportunity to contribute to the Department of Communications' and Australian Communications and Media Authority's consultation on the review of Australia's spectrum management and policy framework.

Usage of wireless networks globally is skyrocketing and Australian consumers are following this trend. The Cisco Visual Networking Index projects that mobile data traffic globally will increase eleven-fold over the next four years, and traffic from wireless devices will constitute the majority of all IP traffic by 2016.[2] In Australia, there are more wireless than fixed-internet subscribers.[3] Cisco projects that by 2018, there will be 3.9 billion global Internet users (up from 2.5 billion global Internet users in 2013), 21 billion

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[1] The Dynamic Spectrum Alliance is a global, cross-industry alliance focused on increasing dynamic access to unused radio frequencies. Its members are: 6Harmonics Inc.; Adaptrum, Inc.; Aviacomm, Inc.; Botswana Innovation Hub; British Sky Broadcasting Limited; Canadian Spectrum Policy Research; Communication Research Center of National Taiwan University; Council for Scientific and Industrial Research (CSIR); CTVR, Trinity College, University of Dublin; RelayServices; Facebook; Gigabit Libraries Network; Google Inc.; Institute for Infocomm Research (I2R); InterDigital Communications, Inc.; Mediatek Inc.; Microsoft Corporation; Mid-Atlantic Broadband Communities Corporation; MyDigitalBridge Foundation; National Institute of Information and Communications Technology (NICT); Network Startup Resource Center (NSRC); Panaftel Wireless Limited; UhuruOne; Shared Spectrum Company (SSC); SpectraLink Wireless, Ltd.; Taiwan Institute for Information Industry; Tanzania Commission for Science and Technology (COSTECH); Tertiary Education and Research Network of South Africa (TENET); Toyota InfoTechnology Center Co., Ltd. (Toyota ITC); University of Colorado at Boulder; University of New Hampshire - Broadband Center of Excellence; University of Strathclyde - Centre for White Space Communications; University of York; and WaveTek Nigeria Limited. For more information, please visit www.dynamicspectrumalliance.org.

[2] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update: Forecast and Methodology, 2013-2018 (Feb. 5, 2014), *available at* http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html ("Cisco Global Mobile Data Traffic Forecast Update"); Cisco Visual Networking Index: Forecast and Methodology, 2013-2018 at 1-2 (June 10, 2014), *available at* http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.pdf ("Cisco Forecast and Methodology").

[3] Australian Communications and Media Authority, *Five Year Spectrum Outlook 2013-2017: The ACMA's Spectrum Demand Analysis and Strategic Direction for the Next Five Years* (Sept. 2013) at 17, *available at* http://www.acma.gov.au/~/media/Spectrum%20Outlook%20and%20Review/FYSO%202013%202017/pdf/fiveyear_spectrum_outlook_20132017_FINAL%20pdf.pdf ("Five Year Spectrum Outlook 2013-2017").

networked devices globally (up from 12 billion networked devices in 2013), and global IP traffic will reach an annual total of 1.6 zettabytes (up from 614 exabytes in 2013).[4]

Meeting this demand is essential to promoting technological innovation and economic growth. Increasing demand for wireless broadband and higher data rates require access to more spectrum. The efficient and flexible management of spectrum has become more important than ever. While it will be important to allocate and assign more exclusive–use licensed spectrum for mobile broadband, it is critical that ACMA consider other forms of spectrum access. To that end, the Department should support, and ACMA should execute, policies that: (1) enable robust access to more unlicensed and licensed spectrum; (2) enable dynamic spectrum sharing[5] as a means to ensure effective spectral utilization; and (3) make spectrum usage data publicly available.

2 Terms of Reference

The Dynamic Spectrum Alliance addresses the following Terms of Reference:[6]

Term of Reference 1
Simplify the framework to reduce its complexity and impact on spectrum users and administrators, and eliminate unnecessary and excessive regulatory provisions

Term of Reference 2
Improve the flexibility of the framework and its ability to facilitate new and emerging services including advancements that offer greater potential for efficient spectrum use, while continuing to manage interference and providing certainty for incumbents

Term of Reference 3:
Ensure efficient allocation, ongoing use and management of spectrum, and incentivise its efficient use by all commercial, public and community spectrum users

Term of Reference 6:
Develop an appropriate framework to consider public interest spectrum issues

Term of Reference 7:
Develop a whole-of-government approach to spectrum policy

Term of Reference 8:

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[4] Cisco Forecast and Methodology at 1-3 (June 10, 2014).

[5] "Dynamic spectrum sharing" describes a set of technologies and techniques that enable radio communications devices to opportunistically transmit on available radio spectrum. These technologies and techniques ensure that consumers and their devices have wireless bandwidth when and where they need it.

[6] DSA does not directly address Terms of Reference 4 and 5.

Develop a whole-of-economy approach to valuation of spectrum that includes consideration of the broader economic and social benefits

3 Response

Three key strategies will allow the Department and ACMA to make progress toward achieving the goals identified in the above-listed Terms of Reference:

- Enable robust access to both licensed and unlicensed spectrum;
- Pursue dynamic spectrum sharing as a way of improving spectrum utilization; and
- Make spectrum usage data publicly available.

We discuss these strategies below.

1. **The Department should support and ACMA should execute policies that enable robust access to both licensed and unlicensed spectrum.**

Enabling access to spectrum on both a licensed and unlicensed (or "license-exempt") basis is key to meeting increasing spectrum demands. Spectrum policy that balances licensed and unlicensed approaches will maximize innovation and investment and deliver higher-quality, more ubiquitous, and lower-cost wireless bandwidth to consumers. In the past, a balanced approach has fueled the wireless economy, benefiting consumers, innovators, and investors. Exclusive access to licensed spectrum provides the certainty major operators need to make large investments in their wide-area networks, while open access to spectrum on an unlicensed basis fosters widespread contributions to innovation and investment in emerging technologies. Thousands of new unlicensed devices are certified each year. Wi-Fi devices are the best known, but Bluetooth,[7] Zigbee,[8] and RFID[9] devices have all also experienced rapid growth in the last several years. Machine-to-machine ("M2M") technologies, which often rely on unlicensed spectrum, represent a large and growing market as well.

Utilizing unlicensed spectrum has several other benefits. First, opening up additional spectrum for unlicensed uses will increase coverage for wireless devices and reduce consumer costs. For example, increasing the spectrum available for Wi-Fi hot-spots has the possibility to improve indoor coverage and increase low-cost wireless Internet access in outdoor areas.

Second, enabling additional unlicensed spectrum will increase capacity. In many countries, more traffic travels over unlicensed networks than licensed networks. Indeed,

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[7] Bluetooth is a standard facilitating hands-free operation of music players, mobile phones, and other devices.
[8] Zigbee powers technologies that benefit from ad hoc and mesh networking solutions, such as home automation.
[9] Radio Frequency Identification ("RFID") technologies are used in a variety of industries to track inventory or other objects.

the rapid increase in traffic offloading from macrocell networks to Wi-Fi networks demonstrates that unlicensed uses serve a critical role in improving overall wireless capacity. This is especially true in congested areas that would benefit from increased small-cell coverage for offload.

Third, enabling unlicensed access can be accomplished quickly. With simple interference rules, streamlined type-approvals, the benefits of a global market, and existing industry processes for standardization, license-exempt devices can be brought to market quickly.

Fourth, unlicensed access enables innovation. Because license-exempt access to spectrum is free from the delays associated with the licensing process, and the use of the spectrum itself is not subject to licensing fees or auction participation, manufacturers can rapidly develop equipment to fill a unique need and enter the marketplace quickly.[10] Many of the newest wireless devices—such as the new wave of networked devices commonly referred to as the Internet-of-Things—will rely exclusively on unlicensed spectrum.[11] The "attendant economic benefits from [unlicensed] technologies are substantial, widely dispersed, and likely to exceed $270 billion per annum globally."[12] In fact, the spectrum bands authorised for unlicensed access now account for the majority of innovation in wireless communications, the majority of wireless devices manufactured, and the majority of Internet data traffic delivered to consumers.[13] Unlicensed spectrum also has proven essential to enable Wireless Internet Service Providers (WISPs) to provide fixed and nomadic voice, video, and data services to consumers located in remote areas.

Unlicensed use complements licensed use. For example, "the availability of Wi-Fi networks in many locations…enable[s] users to take much of their data off of a licensed network," benefiting users by enabling faster service and reducing congestion for licensed operators.[14] Cisco projects that by 2018, more traffic will be offloaded from cellular networks on to Wi-Fi than remain on cellular networks.[15] This ability to offload data from cellular networks to Wi-Fi has saved mobile network operators billions of

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[10] Kenneth R. Carter, Ahmed Lahjouji & Neal McNeil, FCC, *Unlicensed and Unshackled: A Joint OSP-OET White Paper on Unlicensed Devices and Their Regulatory Issues*, OSP Working Paper Series at 5 (May 2003).

[11] Richard Thanki, *The Economic Significance of License-Exempt Spectrum to the Future of the Internet* (June 2012), *available at* http://research.microsoft.com/en-us/projects/spectrum/economic-significance-of-license-exempt-spectrum-report_thanki.pdf (last visited June 2, 2014).

[12] *See* Richard Thanki, *The Case for Permissive Dynamic Access to the Radio Spectrum*, at 16 (Aug. 2013), *available at* http://research.microsoft.com/en-us/projects/spectrum/case-for-permissive-rule-based-dynamic-spectrum-access_thanki.pdf (last visited June 5, 2014).

[13] *Id.* at 2.

[14] U.S. Federal Communication Commission, *The National Broadband Plan*, at 95 (2010), *available at* www.broadband.gov.

[15] Cisco Global Mobile Data Traffic Forecast Update at 3.

dollars in network deployment costs.[16] The Wi-Fi experience also makes clear that greater availability of unlicensed spectrum increases both demand for and the utility of licensed spectrum. Wi-Fi availability has enabled consumers to use their phones and tablets more intensively to access online content and services. Use and development of these online services in turn drives demand for licensed and unlicensed network access, creating a virtuous cycle of investment in content, services, and applications.

The Department and ACMA should support robust access to both licensed and unlicensed spectrum at a variety of high, medium, and low frequencies. Just as licensed and unlicensed access are complementary means of meeting growing spectrum demand, access to spectrum at different frequency ranges is essential to meeting users' varied needs. Lower frequencies enable non-line-of-sight transmission over longer distances, through walls, foliage, and other obstructions. Higher frequencies are ideal for greater transmission capacity over short, unobstructed distances.

ACMA can play an important role to increase the use of unlicensed spectrum by ensuring that suitable harmonised bands are available for use. They can impose "use it or share it" obligations on certain licensees, enabling unlicensed spectrum access in geographic areas where the licensee has yet to build out a network or has ceased operations. ACMA can also allow unlicensed use in areas where spectrum remains unauctioned. Employing such approaches will ensure otherwise fallow spectrum is being put to valuable use. With a variety of licensing approaches over a range of frequencies, hardware developers and service providers can better and more cost-effectively meet the needs of businesses and consumers, and use spectrum more efficiently.

2. The Department should adopt spectrum-sharing policies as a critical strategy for meeting increased demand.

Clearing and repurposing spectrum alone is not enough to meet the increasing demand for spectrum. Sharing spectrum can serve as a key tool to ensure efficient allocation and use.

First, sharing has the ability to increase capacity because it makes fallow spectrum available without displacing incumbent users. The Department of Communications will need to consider methods beyond the traditional model of dedicating spectrum to individual uses if rapidly rising demand is to be met. Spectrum

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[16] European Commission, *Study on the Importance of Wi-Fi & the Socioeconomic Benefits of Using Small Cell Infrastructures* at 5 (Aug. 1, 2013), *available at* http://ec.europa.eu/digital-agenda/en/news/study-importance-wi-fi-socioeconomic-benefits-using-small-cell-infrastructures, (finding that offloading reduced the network costs of European network operators by 35 billion euros in 2012, with savings expected to rise to as much as 200 billion euros in 2016); Mark Cooper, *Efficiency Gains and Consumer Benefits of Unlicensed Access to the Public Airwaves*, at iii, 15–18 (Jan. 2012) (finding that offloading lowers U.S. operator costs by approximately USD 26 billion per year).

sharing can unlock maximum value from wireless applications. Using shared spectrum is a flexible way to increase capacity and reduce artificial scarcity because it does not require significant up-front investments on the part of network operators.

Second, spectrum sharing, especially in sub-1 GHz spectrum, can create increased coverage for wireless devices. As noted, spectrum under 1 GHz has favourable propagation characteristics, allowing signals to penetrate buildings and irregular terrain. Sharing in these bands has the potential to increase the reach of wireless broadband, especially in rural and hard-to-reach areas. Sharing in sub-1 GHz spectrum also allows trade-offs between power, range, and throughput, enabling lower energy consumption. Allowing license-exempt access to television white spaces is an important example of this type of sharing. The DSA applauds ACMA for recognizing the potential benefits of utilizing TV white spaces in its *Five year spectrum outlook 2013 - 2017*, such as increasing the efficiency of spectrum use or providing broadband services in remote locations.[17] Australia should expand on the spectrum sharing it already enables in the 85 – 108 MHz, 174 – 230 MHz, and 520 – 820 MHz bands.

Third, sharing can be accomplished quickly. It offers a much faster route to increased capacity than is possible with the traditional process of clearing of incumbents and auctioning exclusive licenses, which can be lengthy and complicated. Spectrum sharing minimizes delays by leaving incumbent operations in place. Further, spectrum sharing can be utilized in times of transition between clearing and auctioning—for example, geolocation databases and/or sensing technologies can enable temporary access to available spectrum before new licensed services become operational.[18] This flexibility was demonstrated recently in the Philippines, where the Philippine Government deployed TV white space radios and connectivity in aid of earthquake and typhoon recovery in Bohol and Tacloban, respectively.[19]

Fourth, spectrum sharing is proven. Networks relying on shared spectrum have been deployed successfully.[20] In Cape Town, South Africa, for instance, a TV white space trial delivered broadband over vacant broadcast spectrum with a minimum data rate of 2.5 Mbps and peak data rates of 10 Mbps to 10 secondary schools at distances between 3 and 6 kilometers of a base station, without causing harmful interference to incumbent services. Similar and higher performance measurements have been observed in other

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[17] *Five Year Spectrum Outlook 2013 – 2017* at 106.
[18] *See* Michael Calabrese, *Use it or Share it: Unlocking the Vast Wasteland of Fallow Spectrum* (2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1992421; *see also Expanding the Economic and Innovation Opportunities of Spectrum through Incentive Auctions, Notice of Proposed Rulemaking*, 27 FCC Rcd. 12357, ¶ 405 (2012).
[19] *See, e.g.*, Pia Ranada, *TV White Space connects Bohol fisherfolk to the Net*, Rappler (Apr. 7, 2014), *available at* http://www.rappler.com/nation/54742-tv-white-space-fisherfolk-bohol.
[20] Amar Toor, *North Carolina Launches FCC-approved TV White Space Network in Wilmington*, Engadget (Jan. 30, 2012), *available at* http://www.engadget.com/2012/01/30/north-carolina-launches-fcc-approved-tv-white-space-network-in-w/

trials around the world, in locations as diverse as the United States, the United Kingdom, Singapore, Japan, Korea, the Philippines, Kenya, Tanzania, and Malawi. Importantly, these projects have achieved excellent performance without causing any harmful interference to incumbent licensees.

More intensive dynamic spectrum sharing should be a key regulatory objective, enabling ACMA to accommodate varying demands of different uses. Over time, sharing should become the default policy, in sharp contrast with the traditional practice of allocating particular bands to specific uses. By establishing wide bands for sharing, regulators can create the capacity needed by emerging applications and establish the flexibility to respond to changes in market needs and opportunities for international harmonisation, for example. The DSA also believes that spectrum sharing and incumbent protection should not be mutually exclusive. The US FCC's current actions to use registration systems (such as the "Spectrum Access System" to be used in the US 3550 to 3650 band) is an example of a spectrum policy innovation that will enable spectrum sharing while minimizing interference.[21]

Overall, the Department and ACMA can support sharing by: (1) making enough spectrum available for sharing to support industry investment, and (2) developing flexible, straightforward rules for secondary users that encourage investment, innovation and use. The Department should work to remove uncertainty regarding the use of shared bands, as this uncertainty makes new manufacturers hesitant to invest in new devices and operators hesitant to build networks. In particular, the Department should work with the industry to clear the way for dynamic sharing to be applied generally across all suitable bands, with priority being given to those bands where there is a prospect of international harmonisation in the near future.

3. **ACMA should track spectrum data and make as much of that data publicly available as possible.**

ACMA should track spectrum usage data for the purpose of identifying spectrum suitable for sharing. Additionally, it should make the data as fully available as possible to the public (especially in bands where planning is ACMA's responsibility—e.g., the broadcast bands). Because spectrum is a finite resource, understanding where it is intensively used and where it is under-used is a necessary part of developing sound spectrum policy. In order to protect individual users of spectrum and business confidential information, however, usage information should be subject to reasonable confidentiality protections for personal or commercial data.

[21] Amendment of the Commissions' Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket No. 12-354, http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0425/FCC-14-49A1.pdf

4 Conclusion

In order to enable continued growth and innovation in wireless technologies and the Australian economy as a whole, we urge the Department to support and ACMA to execute policies that increase the amount of licensed and unlicensed spectrum available for wireless use. In particular, the Department should support dynamic spectrum sharing and make spectrum usage data publicly available. The Dynamic Spectrum Alliance appreciates the opportunity to contribute to the Department's review and would be happy to provide further information at the request of the Department.

Respectfully submitted,

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