Hewlett Packard Enterprise

29 April 2022

The Manager
Spectrum Licensing Policy
Australian Communications and Media Authority
PO Box 13112
Law Courts
Melbourne VIC 8010

Re: Five Year Spectrum Outlook 2022-2027 and 2022-23 work program draft for consultation

Hewlett Packard Enterprise ("HPE") submits these comments in response to the consultation from the Australian Communications and Media Authority ("ACMA") on the Five-year spectrum outlook 2022-27 and 2022-23 work program.

HPE is one of the world's largest providers of managed wireless local area network ("WLAN" or "RLAN") infrastructure and is a global leader in the Wi-Fi equipment marketplace. HPE's Aruba business unit ships millions of indoor and outdoor Wi-Fi access points ("APs") every year, representing approximately 15% of the global market revenue for such devices. We have been a significant provider of WLAN equipment to Australian enterprises and service providers for nearly two decades.

In addition to being a global leader in the Wi-Fi equipment marketplace, HPE's Aruba business unit provides small cell solutions for the United States' 3.5 GHz CBRS band with plans to expand into international markets as the demand for private and neutral-host cellular systems continues to increase around the globe. As the integration and convergence of Wi-Fi and cellular technologies continues, Aruba has invested significantly in areas such as developing and deploying Air Pass, a Passpoint-based service enable public cellular subscribers to leverage our existing and extensive high-quality footprint of Wi-Fi coverage[1].

HPE's Communications Technology Group is a market leader in mobile communication. With our 5G Core Stack and Open RAN solutions, HPE is a key enabler of next generation 5G solutions, both directly and via a vibrant ecosystem of partners.

Please find on the following pages HPE's comments on ACMA's consultation. If you have questions, please contact any of the HPE signatories below.

Sincerely,

Xin Tang
Manager, APJ Wireless Policy
xin.tang@hpe.com

Carlos Gómez Gallego
VP, Aruba CTO for APJ
carlos.gomezgallego@hpe.com

Mark Verbloot
Snr Director, Product, Solutions and Systems Engineering, APJ
markv@hpe.com

[1] https://www.arubanetworks.com/assets/so/SO_Air-Pass.pdf

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Part 1: Five-year spectrum outlook

Market and technology drivers of change in spectrum demand

Wireless (mobile and fixed) broadband, including 5G

Wi-Fi spectrum is becoming congested

Under both government and private investment, Australia has built outstanding telecommunication infrastructure with widely available fibre to the home ("FTTH") and DOCSIS 3.1 networks. In addition to those, the 26/28 GHz spectrum allocated last year will provide multi-gigabit fixed-wireless access ("FWA") services serving homes and businesses in the regional and remote areas. The increasing uptake of high-speed wired and wireless broadband contributes to the increased demand for Wi-Fi services as the final connection to devices in the home and office. Consumers expect that their "last meter" Wi-Fi performance will not be the limiting factor in the overall performance of their home and business broadband networks.

Unfortunately, Enterprises today have already experienced this "Wi-Fi bottleneck" in their overall network design. The currently deployable 20 MHz and 40 MHz channels are increasingly insufficient to address the steep growth in the number of devices and applications with higher data rate requirements. A two-stream client device can only achieve up to a 574 Mbps data rate in theory when operating in a 40 MHz channel with Wi-Fi 6. Although 80 MHz channels became available since Wi-Fi 5, narrow 20 MHz and 40 MHz Wi-Fi channels are still the default channel choices by enterprise users simply because there are not enough 80 MHz channels available in the 5 GHz bands to support a moderately dense enterprise deployment with sufficient channel reuse. Our customer research found that in 2021, 91% of our enterprise customers were still running 20 or 40 MHz narrow channels on their Wi-Fi APs despite our equipment being capable of supporting 80 MHz channels since 2014. As a local example, our response to the ACMA consultation 12/2021 - RLAN use in the 5GHz and 6 GHz band had noted that the NSW DoE schools are limited to utilizing 20 MHz and 40 MHz narrow channels for this reason.

The 1200 MHz of spectrum in the 6 GHz band yields an equivalent number of 80 MHz channels as there are 40 MHz channels in the 5 GHz band. With 1200 MHz of spectrum in the 6 GHz band, 80 MHz channels would become the default in the large majority of enterprise deployments. It even allows 7 x 160 MHz channels that can enable novel use cases like Augmented/Virtual Reality which require low latency and very high throughput.

Shortage of spectrum for outdoor Wi-Fi use

The use cases for outdoor Wi-Fi are growing strongly - from smart cities, campuses, sports arenas, to delivering broadband to remote and rural areas. The problem of inadequate spectrum access for outdoor Wi-Fi is exacerbated further by the fact that RLAN access to the 5 GHz and 6 GHz bands are required to protect incumbent services. Except for 5150 – 5250 MHz and 5725 – 5850 MHz, the spectrum harmonised for Wi-Fi use in the 5 GHz range is subject to Dynamic Frequency Selection ("DFS") constraints. In the 6 GHz range, protection of the incumbent fixed services deployments in some countries requires the use of an Automated Frequency Coordination ("AFC") service to limit channel availability and EIRP so that harmful interference does not occur. In areas of dense fixed services utilization, there may be few if any channels available for outdoor Wi-Fi.

With DFS constraints in 5 GHz and the AFC requirements in 6 GHz, the spectrum available for outdoor Wi-Fi is very limited. To accommodate the growing use cases and improve the outdoor Wi-

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Fi user experience, ACMA should permit outdoor Wi-Fi to access 5150 – 5350 MHz and the 6 GHz band.

Demand for private cellular networks is increasing, enabling new business models.

HPE agrees with ACMA that there is increasing interest in the deployment of private cellular networks for business enterprise services. We see a growing number of enterprises today placing greater value on having their own 4G or 5G network for advanced, secure connectivity. We envision a new world of private cellular opportunities for organizations, from manufacturing, logistics, and transportation to retail, government and education.

HPE is an industry leader in enterprise connectivity, possessing unique capabilities for private networking across both 5G and Wi-Fi, enabling new enterprise and industrial applications from edge to cloud. Our private cellular solutions have been designed to operate in concert with Aruba Wi-Fi networks using technologies such as Aruba Air Pass, which can automate roaming from both cellular and Wi-Fi neutral-host deployments.

Private cellular networks can allow enterprises to bring a customized experience to indoor or outdoor facilities where mobility and increased coverage are crucial. The future of enterprise networks will be a multi-RAN architecture with Wi-Fi and cellular technologies performing distinct roles in the access network, with integration at the core and application layers. Private cellular, with its wider coverage characteristics and mobility support, will be complementary to Wi-Fi.

Private cellular network deployments are not limited to traditional MNOs but can be deployed by 3rd party providers such as equipment vendors, cloud providers, or directly by the vertical industry entity themselves. This enables a new business model and catalyses innovation for the ICT industry. Private networks can also increase market competition as there can be some overlap between “public” and “private” deployments with public operators providing managed private network services to business customers.

Another use case for private networks is “neutral host”. In locations where outdoor to indoor cellular coverage is poor or unavailable (due to the propagation loss or energy efficient building structures) and/or the progress of area-wide or indoor deployment of mobile service is slow, neutral host networks deployed by 3rd party providers can provide in-building cellular connectivity more efficiently. In these situations, the neutral host network can connect the MNOs’ subscribers via a “roaming” relationship.

Class licensing and the Spectrum Commons

LIPD class licencing is critical to Australia, enabling Wi-Fi and other unlicensed technologies. These services provide important benefits to Australian citizens, businesses, and society, including digital transformation, bridging the connectivity gap, advancing the information and knowledge economy, and driving productivity across industries. HPE welcomes the recent announcement that the lower 6 GHz band is added to the LIPD class licence for use by RLAN. This band will help to enable gigabit Wi-Fi use cases and ease the congestion in current enterprise Wi-Fi networks.

While Wi-Fi indoor use provides great value to the digital economy, HPE has noted in our responses to ACMA consultation 37/2021- Radio local area networks (RLANs) in the 6 GHz band that there is also strong demand for the standard power and outdoor services in Australia. Standard power will exploit the full value of Wi-Fi 6E by enabling more use cases like connectivity in mining, farming, manufacturing, sports arenas, campuses, etc. Unlike LPI devices that can inherently protect the incumbent fixed services by benefiting from the building attenuation, standard power devices

require careful coordination to co-exist with the incumbent services. Most countries that enable standard power require that the Wi-Fi APs' operations are coordinated by an AFC system. The outdoor APs use GNSS receivers to report their locations to the AFC system, then the AFC calculates the protection contours for nearby fixed service and advises the available channels and allowed EIRP to the APs.

In addition to outdoor use cases, HPE has also developed an innovative solution to bring standard power operations to indoor use, in cases where higher power (than LPI) or connectorized antennas are needed. We recently announced the first self-locating wireless infrastructure and Open Locate initiative to bring the ease and accuracy of GNSS to indoor locations. Our APs use a combination of built-in GNSS receivers, fine time measurements, and advanced software techniques to establish their locations accurately and automatically in the universal language of latitude and longitude.[2]

Accordingly, we encourage ACMA to enable the LIPD class licence for these important standard power use cases, by:

- Enabling the outdoor RLAN use in 5150 - 5350 MHz and increasing the maximum EIRP to 36 dBm.
- Adding 6425 - 7125 MHz for RLAN use in the LIPD class licence.
- Authorising standard power RLAN use in the 6 GHz band for both indoor and outdoor in conjunction with AFC systems.

Part 2: 2022-23 annual work program

Band-planning and forward spectrum allocations

6 GHz (5925–7125 MHz)

HPE noted the divided views from industry on the appropriate use of the upper 6 GHz band in response to ACMA's 6 GHz RLAN consultation outcome paper. HPE has an interest in both the unlicensed Wi-Fi and the licensed IMT businesses. We believe that to maximise the value of broadband infrastructure investment over the years in Australia, ACMA should take a comprehensive view of the needs for both licensed and unlicensed (i.e. LIPD class licence) spectrum.

As all aspects of society (e.g. work, home, education, entertainment, etc.) become increasingly wireless it is critical that the policymaking processes keep pace with technological developments and business investments. The ongoing planning activities in the 700/800 MHz, 1800 MHz, 3.4 - 4.2 GHz and 26/28 GHz bands will provide the licensed IMT ecosystem with a sufficient amount of spectrum to deploy their services. Focusing specifically on mid-band licensed IMT allocation, Australia has more access to spectrum than almost any other comparable country. In the near term, the challenge is for the MNOs to roll out services that can make efficient use of these new spectrum resources. Examining the past 4G and early 5G deployment experiences, it usually takes years for MNOs to even moderately exploit new licensed spectrum holdings.

On the other hand, the primary challenge for class licence technologies is still obtaining access to sufficient mid-band spectrum to deliver gigabit services and next generation user experiences (e.g. augmented reality and virtual reality). Releasing the lower 6 GHz band for Wi-Fi helps with certain

[2] Aruba Blog – Bring the ease and accuracy of GPS to indoor location services

use scenarios. However, it will not be sufficient to support advanced use cases or even routine consumer and enterprise network needs in the very near future. As customers start planning to migrate to 80 MHz Wi-Fi channels, they will soon realize that even with the addition of the lower 6 GHz band there are still not enough channels for dense deployments.

HPE acknowledges ACMA's consideration that future use of the upper 6 GHz band may be better informed by global harmonisation and equipment standardisation. In particular, the IEEE 802.11be standard ("Wi-Fi 7") is not expected to be finalised until 2024. However, there would be an opportunity cost by taking this "wait and see" approach. Especially for enterprise networks, the performance improvement from Wi-Fi 7 will not be as great as Wi-Fi 6E provides relative to prior generations. Enterprise buyers are very sophisticated and understand that virtually all of the attainable performance gains from Wi-Fi 7 are available right now in 6E products, so there is no need to wait. There is a large and growing ecosystem of Wi-Fi 6E equipment available today that could make good use of the upper 6 GHz band under a LIPD class licence. Australia should join the other leading countries around the world that have made the full 6 GHz band available for Wi-Fi and other unlicensed technologies.

Dealing with incumbent services is an important aspect of the spectrum planning process. Wi-Fi uses a contention-based protocol to access the spectrum, which facilitates co-existence with other services. Unlicensed access to the 6 GHz band was predicated upon the protection of the important incumbent services in the band. Various studies and work have been done, resulting in the creation of several new 6 GHz unlicensed device classes tailored to support different use cases and implementing various mechanisms to protect existing fixed services, fixed-satellite services, radio astronomy service etc. These device classes and mitigation mechanisms are easily replicated from country to country. This is evidenced by the rapid adoption of Wi-Fi 6E globally. By contrast, exclusive licensed IMT operation in the 6 GHz band would be significantly more challenging, almost certainly requiring that incumbent operations be cleared or relocated, including satellite earth stations. The aggregate interference from IMT transmitters can also degrade the satellite space receivers' performance. The current sharing studies presented by the IMT industry are very controversial, and they are opposed by the satellite industry in almost every country.

For the above reasons, HPE believes the ACMA should accelerate the process of releasing the upper 6 GHz spectrum under a LIPD class license. This will unlock the band for use by the existing Wi-Fi 6E market and turbocharge innovations in Australia.

Spectrum-sharing approaches

Newer dynamic spectrum access (DSA) systems significantly reduce the coordination effort and make more efficient use of the spectrum resources. Innovations in DSA are going to have a transformational impact on spectrum management.

The modern DSA systems involve tunable/configurable radio access networks, spectrum sensing systems, and centralized databases that dynamically coordinate the spectrum access request. In the U.S., the DSA approach was successfully utilized by the Federal Communications Commission (FCC) to facilitate 3-tiered sharing in the 3.5 GHz Citizen's Broadband Radio Service (CBRS) and is the foundation for 6 GHz standard power via AFC systems, which are in the process of being approved.

Since the FCC adopted rules for unlicensed use of the 6 GHz Band in 2020, industry has been hard at work standardizing and developing the AFC systems that will enable Wi-Fi standard power use. By

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December 2021, 14 companies had filed proposals to the FCC to operate 6 GHz AFC systems.[3] It is expected that the FCC will approve some of these applicants for AFC operation in the second half of 2022. The flexible rules adopted by the FCC should result in a thriving ecosystem of AFC implementations with operators from chipset suppliers to industry organizations to dedicated database operators like Federated Wireless. Notably, many of the AFC applicants are already certified to provide spectrum database services for TV whitespace and/or the U.S. CBRS band. HPE has been deeply involved in both the development of AFC technical standards as well as the creation of prototypes. We formed a strategic partnership around AFC and standard power with Federated Wireless in 2019.[4] Since then, we have worked closely with Federated on joint development and prototyping/demonstrating standard power and AFC capabilities. HPE is very interested in engaging with the ACMA on a trial of 6 GHz standard power and the AFC system in Australia.

The CBRS spectrum sharing system has already succeeded in making much more intensive use of the 3.5 GHz spectrum. CBRS equipment operates in the 3550 – 3700 MHz band under the coordination of centralized spectrum access system (SAS) databases. A sensing network is implemented in the CBRS framework to protect Federal/military incumbent operations. Some of the principles of the CBRS framework could be applied to dynamic coordination approaches in frequency bands like 3.8 – 4.2 GHz by other administrations. Indeed, Ofcom UK has solicited industry input on the possibility of evolving to a dynamic database-coordinated regime in 3.8 – 4.2 GHz, when they currently have implemented a manual coordination process for the Shared Access License framework.

HPE recommends the ACMA take a forward-looking approach to spectrum planning that acknowledges the needs of all spectrum users by promoting innovative spectrum sharing methods which will enable more efficient and dynamic use of the spectrum.

[3] https://www.fcc.gov/ecfs/search/search-filings/results?q=(submissiontype.description:(%22APPLICATION%22)+AND+proceedings.name:(%2221-352*%22))

[4] Aruba and Federated Wireless Partner to Deliver Outdoor and Higher Power Wi-Fi 6E with AFC.