



Cisco Systems, Inc. Comments
May 2023

Response to ACMA Consultation on Five-Year Spectrum Outlook 2023-28 and 2023-24 Work Program

Introduction

Cisco Systems, Inc. hereby files comments in response to the Australian Communications and Media Authority (ACMA) Public Consultation Paper on *Five-Year Spectrum Outlook (FYSO) 2023-28 and 2023-24 Work Program* issued in March 2023. Cisco appreciates the ACMA for opening up the much-needed spectrum in the lower 6 GHz range for low power indoor (LPI) and very low power (VLP) devices. In this submission, Cisco urges the ACMA to continue taking steps to make the entire 5925-7125 MHz band available to class-licensed uses to sustain and grow the economic activity that Wi-Fi has historically supported, as well as allowing standard power devices to be used in the full 6 GHz band, subject to Automated Frequency Coordination (AFC).

Cisco is a global provider of Internet Protocol (IP)-based networking solutions with a strong presence in Australia. Among Cisco's many products are Wi-Fi network solutions for enterprise, enterprise networking solutions generally, and service provider networking solutions. We believe there is urgency to make more spectrum available to support Wi-Fi to enable the technology to keep pace with other technological improvements in complementary technology such as 5G, and ensure that Wi-Fi does not become a bottleneck in Australia's digital infrastructure.

Need for Full 6 GHz Band (5925-7125 MHz) for Class-Licensed Use

Cisco appreciates that ACMA has stated in the FYSO Consultation its intention to continue to explore the use of the upper portion of the 6 GHz band (6425-7125 MHz) alongside the monitoring of developments in ITU and other international developments. We look forward to the consultation being planned for Q2 2024, if not earlier, on this band.

The tremendous benefits of deploying Wi-Fi continue to be seen around the world. For instance, Cisco has worked with Baldwin Wallace University (BW)¹, a private university near Cleveland, Ohio, United States, to deploy campus Wi-Fi that provides accessible wireless services that meet growing demands, enable private network partition and enhanced security. BW's existing network relied on Wi-Fi legacy bands and was becoming increasingly congested. Students and staff were growing frustrated with dropped connections and slow performance. As BW's Chief Information Officer stated, "[s]ince all academic and business processes are connected to the network, a student who isn't connected is struggling. Connectivity is a requirement."

To address these issues, Cisco worked with BW to upgrade its network to Wi-Fi 6E LPI devices utilizing the full 6 GHz band. These upgrades resulted in lightning-fast speeds, even as thousands of users run voice and video collaboration applications or stream class content or research. The deployment has achieved a remarkable result of "zero help desk requests"

¹ <https://www.cisco.com/c/en/us/about/case-studies-customer-success-stories/baldwin-wallace-university.html#~the-story>

instead of the University's help desk being bogged down by requests by students for help gaining access to the network.

In another example, Cisco has worked with Renown Health², a health provider in Nevada, United States, that provides residents with much-needed health and medical services. Its Level II Trauma Center serves over 1 million people across 100,000 square miles. Renown Health has 6,500 employees across more than 70 sites, serving 74,000 Nevadans every month. Seamless and highly reliable wireless connectivity is especially important in healthcare, as there are many essential checks and documentation requirements, including hourly confirmation that samples and medication are properly refrigerated. Renown Health needed to update its network to reflect its growing number of connections – in 2000, it had about 2,000 devices on its network. By 2023, that number had grown to 14,000.

Like BW, Renown Health partnered with Cisco to deploy LPI access points utilizing the full 6 GHz band. With the new spectrum and equipment, Renown Health was able to triple network speeds and managed a 700 percent increase in connected Internet of Things (IoT) devices. In embracing the deployment of Wi-Fi technology, a team of three was able to manage this network effectively, with a significant 94% reduction of troubleshooting time while enabling the proliferation of devices supported on its network for both staff and patients.

Need for 80 and 160 MHz Wide Channels

In our previous submission to the ACMA's FYSO 2022-2027, we explained how the deployments of Wi-Fi technology will face implementation restrictions when there is less than the full 6 GHz band available for use due to the lack of sufficient number of wide channels to enable dense deployments in environments such as schools, hospitals and stadiums. We have noted that 500 MHz of new spectrum in the 6 GHz band, while appreciated and useful for present day requirements, still limits deployments to 40 MHz channels. Looking forward, 80 and 160 MHz channels will be increasingly important for emerging technologies such as Augmented Reality and Virtual Reality (AR/VR). Enterprise grade wireless networks are currently designed to support real-time voice and video, which only require latencies on the order of 100 milliseconds (ms). AR/VR, however, have much tighter requirements, approaching latency requirements of 10 ms.

The availability of the full 6 GHz band is not just about improving Wi-Fi experience today, but also about enabling and supporting the next generation of emerging applications. Low latency AR/VR streaming, particularly in dense deployments, can have transformative applications in many sectors, such as collaborative design in VR^{3,4},

² <https://www.cisco.com/c/en/us/about/case-studies-customer-success-stories/renown-health.html#~the-story>

³ <https://www.nvidia.com/en-au/design-visualization/technologies/holodeck/>

⁴ <https://hardware.webex.com/capabilities/hologram>

telehealth patient care and virtual clinics^{5,6,7}, high-quality social gaming experience⁸, and specialized immersive training, such as for military training and heavy equipment handling⁹.

Innovative AR/VR companies currently face challenges in innovation and expansion due to spectrum limitations for Wi-Fi. An example is Zero Latency⁸, a Cisco customer, which is at the bleeding edge of AR/VR social gaming and provides arena-scale free-roam VR offerings. Testing by Zero Latency using Wi-Fi 6E shows that 80 MHz channels are necessary to provide a quality user experience with less than 10 ms latency. With only 500 MHz, it is challenging to support multiple cells with 80 MHz channels, while minimizing co-channel interference. In an environment such as Zero Latency's VR arena that is highly sensitive to co-channel interference, the company has found that no more than four 80 MHz channels can realistically be utilized when only the lower 500 MHz of the 6 GHz band is available, which translates to a maximum of 8 concurrent users in a given confined space. Increasing the number of users within this environment will materially impact the VR experience, as even a single interfering client with a data stream of 10 Mbps will have a noticeable negative impact on user experience¹⁰. Zero Latency has also found that when deploying the VR area in environments using the existing 5 GHz band compared to the 6 GHz band, over 92% of VR sessions were impacted due to the significant presence of external interference and congestion in the 5 GHz band. These constraints on the maximum number of users will also be faced in other scenarios such as a classroom or training environment requiring similar network performance for a good experience, limiting the number of participants in a group learning or training setting.

While 5G is also being considered for AR/VR applications, there are some challenges that make it unsuitable for use in cost-conscious applications. Amongst other reasons, the cost for leasing private 5G spectrum from Governments is prohibitive. Even in the case of remote rendering over public 5G networks, the costs are also very high, especially if special provisions have to be made to ensure that compute resources are physically close to end-users to ensure latency requirements (<10ms) are met. As such, 5G for AR/VR is usually not an option for start-ups and small and medium enterprises seeking to create new innovations.

⁵ <https://xrhealth.com.au/>

⁶ <https://www.hopkinsmedicine.org/news/articles/augmented-reality-guides-surgeries-for-johns-hopkins-patients>

⁷ <https://www.cisco.com/c/en/us/solutions/collaboration/healthcare.html>

⁸ <https://zerolatencyvr.com/>

⁹ <https://seriouslabs.com/>

¹⁰ A cap of 8 players is placed on Zero Latency's gaming platform with only the lower 6 GHz band available. However, based on Zero Latency's projection, 16 players would be a requirement to achieve a viable business case. Without the full 6 GHz band, to support more users with only 500 MHz, the user experience would be significantly compromised with the need to use narrower channels. The streaming bandwidth for each user will drop from 50 Mbps to 30 Mbps with the use of 40 MHz instead of 80 MHz channels. This places serious limitations on Zero Latency's innovative potential.

Separate to the spectrum costs, AR/VR headsets supporting 5G are still very much in the early stages. The costs of 5G chipsets, as well as the power requirements—which link to battery weight and heat dissipation issues—are non-trivial, and as such, we expect Wi-Fi to remain the technology of choice for such technologies for the foreseeable future.

As noted, similar constraints on innovation are faced by other sectors beyond gaming where similar high bandwidth and high capacity are demanded. For instance, Zero Latency has applied its technology to provide a 400m² squad-based VR training facility for the Australian Defence Force, and for architects and real estate developers to visualize building designs within a warehouse-scale VR environment.

These examples demonstrate the innovative and limitless potential of Wi-Fi 6E and future Wi-Fi generations over the full 6 GHz band but cannot be realised unless the full 6 GHz band is open for class-license use. This is not simply about enabling AR/VR but ensuring support for other future applications and technologies. A policy of making the whole 6 GHz band available will allow innovative companies such as Zero Latency the freedom to continue innovating in Australia, finding new use cases, and deploying products and solutions at a reasonable price point. It ensures that the innovation potential of Australia's economy is maximized and is not limited only to large organizations.

WRC-23 Should Not Be Reason to Delay Decision on Upper 6 GHz

We note that ACMA, in its 2021 consultation regarding 6 GHz¹¹, stated that Australia “do not consider that WRC-23 agenda 1.2 is a sufficient reason to delay a decision on the upper 6 GHz band – indeed, how other major international jurisdictions choose to use the band will provide a better gauge than studies under/outcomes of that agenda item”.

One of the reasons that some countries in the Asia Pacific region have delayed decisions regarding the 6 GHz band is the uncertainty about the coexistence of IMT and incumbent services in the band. While studies on this point are mixed, we note that most recently, UK Ofcom released a study on *Sharing and Compatibility of FSS and IMT*¹² which found that “unless a global beam is used and the satellite orbital slot is confined, a dense IMT deployment would exceed the protection criterion” for FSS uplink in many of the carrier/slot scenarios and “additional mitigations would be needed if widespread IMT deployments were to be permitted in the 6425-7125 MHz band”.

Other sharing studies relating to FSS downlink have also shown that separation distances of up to tens of kilometres are needed between the IMT station and the FSS earth station.

¹¹ <https://www.acma.gov.au/consultations/2021-10/radio-local-area-networks-rlans-6-ghz-band-consultation-372021>

¹² <https://www.itu.int/md/R19-WP5D-C-1611/en>

With fixed services, the studies also show that separation distances of up to 68 km (or 200 km in the worst-case scenario) are needed. These other sharing studies on downlink significantly influence the potential for IMT deployments around incumbent users.

In addition, Innovation, Science and Economic Development Canada (ISED) also reflected in its 2021 decision¹³ regarding the 6 GHz band that the band is “an opportunity to begin considering some of the new spectrum sharing techniques in order to provide access for new services in the band while maintaining access and protection for existing services”.

As such, we hope that ACMA continues to hold the view in its 2021 consultation on 6 GHz that there is no need “to wait for WRC-23 outcomes and any subsequent global adoption”.

As a leader in digital economy regulations, we, once again, urge ACMA to lead in making the full 6 GHz band available for class-licensed use as soon as possible. In doing so, ACMA will join a growing group of forward-looking regulators like the US, Canada, South Korea, Saudi Arabia, Brazil, Columbia, Costa Rica, the Dominican Republic, Guatemala, Honduras and Peru¹⁴ and, more importantly, bolster the government’s efforts in making Australia a world-leading digital economy.

Automated Frequency Coordination (AFC)

Cisco recommends that ACMA take steps towards exploring expressions of interest to deploy AFC capabilities in Australia. We encourage ACMA to consider in such a Request for Information the question of where such a service should be geographically hosted. We understand that the ACMA’s Register of Radiocommunications Licenses is publicly accessible. As such, it may be possible to allow the provision of AFC from international locations without the need to mandate local hosting. This would increase the options for deploying an AFC in Australia from global providers, thus offering better market scale and cost efficacy. To ensure that ACMA can address any issues relating to the AFC operator, a non-Australian domiciled AFC system operator should have to register with ACMA, sign a declaration agreeing to be held accountable under Australian law and regulations, and provide a local contact to resolve any issues that may arise. The local contact may be an employee of the AFC system operator, or a third party hired by the AFC system operator.

Similarly, we believe that steps taken in Australia to explore and support AFC deployment could also extend support to potential future AFC services for New Zealand to better address market scale and cost profiles. As such, shared AFC services, supporting both countries, should also be considered.

¹³ <https://ised-isde.canada.ca/site/spectrum-management-telecommunications/sites/default/files/attachments/2022/SMSE-006-21-2021-05EN.pdf>

¹⁴ <https://www.wi-fi.org/countries-enabling-wi-fi-in-6-ghz-wi-fi-6e>

In Cisco's 2022 FYSO submission, we noted that both the United States and Canada have authorized a Standard Power device class, subject to an AFC system that will steer devices away from frequencies in use. Since then, Brazil and Saudi Arabia have also started to explore Standard Power operations under the control of an AFC system. In the United States, the FCC is expected to grant final approval to the AFC applications and Standard Power devices later in 2023. As such, we expect that examples of benefits of full 1200 MHz and full power 6 GHz technology to be available soon.

We would also reiterate that availability of an "Open AFC"¹⁵ approach using open source software. Cisco is a supporter of this initiative together with Broadcom and Meta. "Open AFC" will allow anyone, including in Australia, interested in becoming an AFC provider anywhere in the world to utilize (and modify) AFC software to offer AFC services to device owners.

Conclusion

Cisco appreciates the opportunity to provide the above input to the ACMA's consultation. This topic is important for the future of Australia, for connecting residents and accelerating the industry digitalisation of your economy. We would be happy to discuss further on any further questions or follow up that you may have.

Contact Information

For more information, please feel free to reach out to the following:

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¹⁵ The goal of the Open AFC Software Group is to develop a reference open source implementation of an Automated Frequency Coordination (AFC) system. <https://telecominfraproject.com/open-afc>