Cisco Systems, Inc. Comments
April 2022

Response to ACMA Consultation on Five-Year Spectrum Outlook 2022-27 and 2022-23 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 2022-27 and 2022-23 Work Program* issued in March 2022. Cisco applauds the ACMA for taking the first step in enabling the latest generation of Wi-Fi in Australia by opening up 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 consider making the entire 5925-7125 MHz band available to class-licenced uses now 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.

Enterprise networks are rapidly evolving to wireless as the edge technology of choice for reasons of networking efficiency, the expanded use of data in core business operations, and to supply new capabilities associated with digital transformation. Much of this data will never leave the enterprise's own network, or will be transmitted via dedicated connections to a private, public, hybrid or a multi-cloud environment.[1] The COVID-19 pandemic has accelerated and expanded this trend for business and government, as a variety of applications (including collaboration tools) must now operate on an employee's or student's home networks powered by Wi-Fi, or perhaps even support telehealth applications. Whether Wi-Fi is on the enterprise premises or relied upon by the enterprise to support remote working, telehealth or education, demands on the spectrum for class-licenced technologies are rising quickly. While much of the public policy focus is on Wi-Fi at the edge of service provider networks (wired broadband, satellite, other), from Cisco's perspective, public policy should focus equally on whether business entities and governmental uses of class-licenced spectrum are adequately supplied for the future.

[1] Cloud capability enables enterprises to quickly increase or modify computing power without the need to order and install servers or other network hardware on premises. If properly incorporated into an IT strategy, cloud enables IT management and integration of applications with user devices in a secure way.

Part A – Opening Up the Full 6 GHz Band for Class-Licenced Use

Need for Full 6 GHz Band

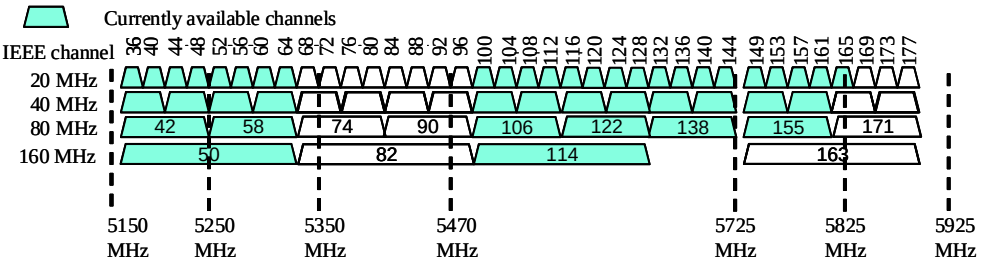
5G and Wi-Fi have a complementary role in enabling digital innovation across service providers, enterprises, public sector and various verticals in Australia. Cisco is heavily invested in both technologies, and believes that 5G and Wi-Fi have their unique roles in enabling innovation. The choice will be dependent on the specific use cases and associated economics. 5G standalone networks can support network slicing features to enable certain use cases peculiarly suited for 5G. Wi-Fi is a cost-effective wireless technology to connect devices to other transmission channels like mobile 5G networks. Wi-Fi is the most established technology for indoor connectivity. Wi-Fi is also the preferred enterprise wireless technology for many networking needs, and continues to evolve in capability with the introduction of Wi-Fi 6(E) and new Wi-Fi 7 standard. The benefit of class licensing cannot be understated, as it removes the barrier to entry for wireless networks, allowing anyone to deploy network whenever and wherever it is required. Ensuring that those networks continue to scale and support next generation applications should be a key consideration.

To fully enable next-generation technologies and support Australia's ambition to be a world-leading digital economy, there is a need for a spectrum plan that ensures both technologies can thrive in Australia, so that users have the ability to leverage both Wi-Fi and 5G. This means making the right amount spectrum available to both. In this regard, Cisco welcomes the ACMA's decision to make available 5925-6425 MHz for class-licensed use in Australia, particularly for LPI and VLP devices. Opening the band for class-licensed use enables customers throughout Australia to take advantage of the latest innovations that Wi-Fi has to offer, and provide improvements in speed, performance and capacity, and support an increasing range of use cases.

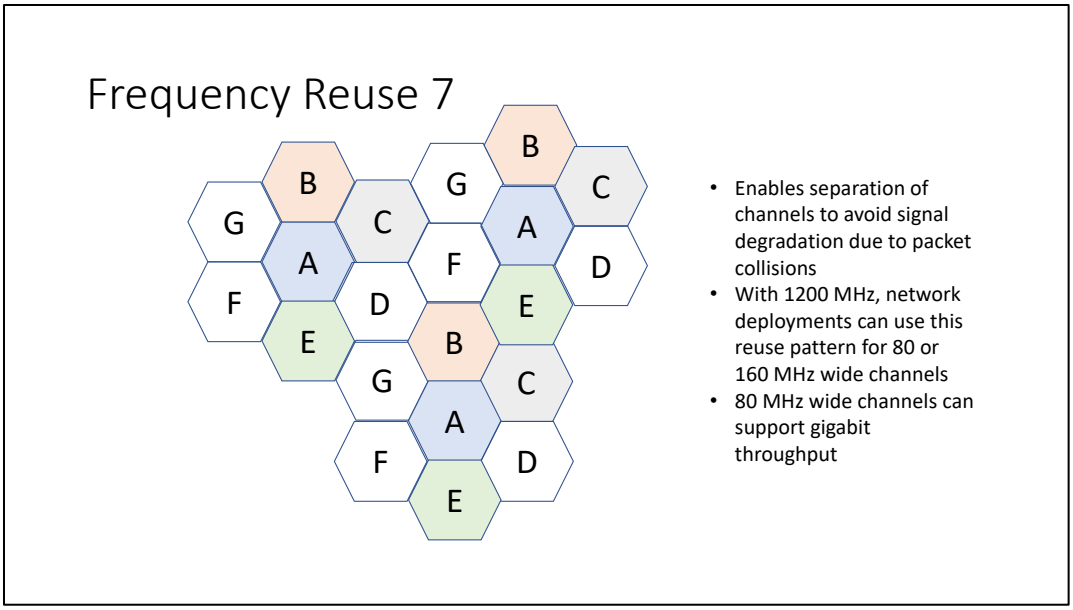
However, we believe that with only 500 MHz in the lower 6 GHz band, Wi-Fi will not succeed in its efforts to address the networking needs of Australia for the next 5 years. Having a single large contiguous block of spectrum in the 5925-7125 MHz range to support the current and coming generations of Wi-Fi is essential to support the continued growth in connectivity and density required to enable the expanding services within the enterprise. Releasing only the bottom 500 MHz for class-licensed use leaves the same constraints we have in 5 GHz, as we do not get effective use of wider channels than what we have today, and will not be able to take advantage of next-generation technologies. This is limiting to consumer choice and innovation, as well as enterprise applications.

Implementation restrictions with less than Full 6 GHz Band

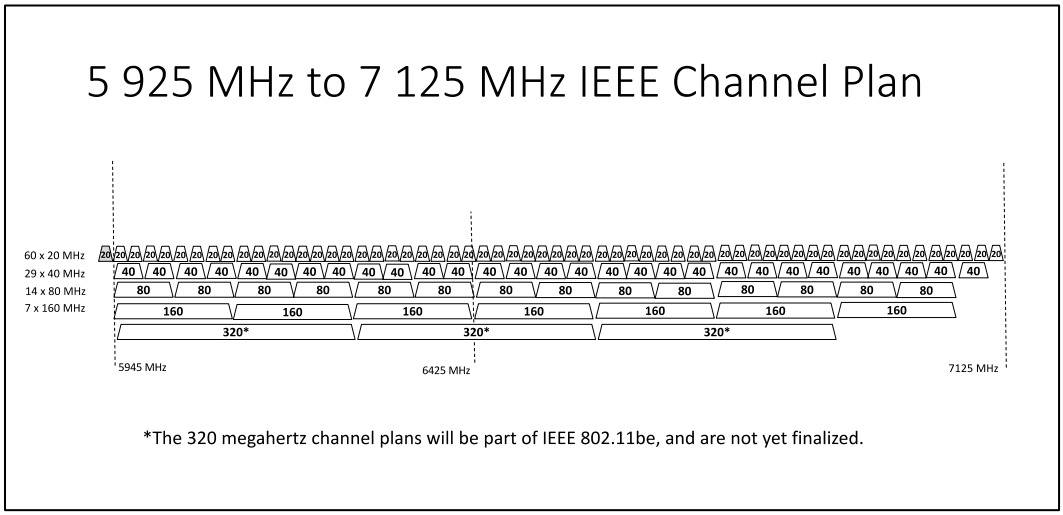
For a decade and a half, the Wi-Fi industry has been innovating new generations of technology on spectrum that was identified for licence-exempt/class-licenced use in the 5 GHz range by the World Radio Conference (WRC) of 2003. Over the years, numerous technological improvements – both standardized and vendor specific – were made to ensure that Wi-Fi networks could be relied upon to serve a variety of purposes in government and enterprise settings, even as the number of use cases and amount of data continued to increase. During this period, the industry learned to deploy dense networks of the type found in convention centres, stadiums, college campuses, and transportation hubs. We learned, for example, that the minimum practical distance between access points (APs) in a network is 12m, given the total number of available 40 MHz channels and the need to avoid co-channel interference. One way to boost throughput is to widen channels, which the industry set out to do in Wi-Fi 5. As customers migrated from Wi-Fi 4 to Wi-Fi 5, however, 40 MHz wide channels remained the norm for government and enterprise networks, despite Wi-Fi 5's support for 80 and 160 MHz wide channels. There simply are not enough of these wider channels to enable a networked deployment, at typical AP densities.



As the industry began to evaluate what it would need for its sixth generation of product (known as Wi-Fi 6), it was clear that technological innovation by itself would no longer be sufficient to address the demands of the future – such as more intensive wireless networking with denser deployments, more end points due to the Internet of Things, increasingly data heavy applications such as Augmented or Virtual Reality (AR/VR), and more. Not only did we need a new set of technologies to address these issues, but we also needed the spectrum to enable them to run on wide channels in networked configurations. The concept of Wi-Fi 6 was not just to make a step change function in Wi-Fi capability, but also to create a technology that could take full advantage of a contiguous swath of spectrum supporting the use of wide channels. That contiguous swath of spectrum became 6 GHz – selected because it afforded manufacturing and operational synergies with 5 GHz but also because class-licenced equipment is highly complementary to the incumbent licensed services in the band. In Cisco's view, the use of Wi-Fi 6 in the 6 GHz band enables networks to be designed with "frequency reuse 7" channel plans featuring 80 or 160 MHz wide channels, as follows:



The frequency reuse 7 methodology minimizes packet collisions that degrade throughput by keeping "like" channels separated. With the full 1200 MHz authorized, government and enterprise deployments have access to up to fourteen 80 MHz wide channels and up to seven 160 MHz wide channels. This is important because the 80 MHz wide channels are what can deliver gigabit throughput, which will be a necessity soon and is desirable now.



Even today, these advanced networking capabilities can be needed in government and enterprise networks. This is particularly true when the use case is broadband access. While in some cases, users and their devices might be uniformly distributed inside a facility – or at least predictably distributed – we find that most networks users will move around and cluster in meeting rooms, lecture halls, training rooms, at specific booths or event spaces inside convention halls, etc. We not only need better technology to deliver

a good user experience, but we also need to rely on more than one access point that can reach these dense spaces. These problems only get more challenging as we look ahead to deployments of AR/VR or robotics where the pressures on the network become more extreme. With Wi-Fi 6 in the full 6 GHz band (i.e. Wi-Fi 6E), industry will finally have sufficient spectrum to meet the challenges we are already experiencing with technology and with spectrum that is future-proofed.

The addition of 500 MHz is certainly appreciated and useful for the requirements of today's wireless network. Further, the lower 6 GHz spectrum is greenfield in that there are no prior generations of Wi-Fi operating in it,[2] which drives further efficiencies. However, given emerging technologies, such as AR/VR, it is clear that 80 MHz channels will be increasingly important for wireless networks.

Time Criticality

ACMA believes that decisions on the future use of the upper 6 GHz band will be better informed by a range of international harmonisation, equipment standardisation and demand developments that are yet to occur, regardless of WRC-23 outcomes. Cisco fully agrees with ACMA that waiting for the outcomes of WRC-23 agenda item 1.2 is itself not a valid reason to defer a decision on the upper 6 GHz band (especially given that it is only considering 100 MHz from the band in our region). However, Cisco is of the view that opening up the full 6 GHz band is a "no-regrets" move that ACMA should undertake immediately, especially since ACMA also acknowledges the "strong arguments" for the introduction of arrangements for RLANs across the entire 6 GHz band.

The direction for bandwidth has only grown in one direction. Future generations of Wi-Fi technologies will require wider and wider channels to support next-generation technologies. In the United States, the FCC believes that wider channel, including 160 MHz for Wi-Fi 6E and even up to 320MHz for Wi-Fi 7, is going to be critical for the US economic benefit in terms of the capabilities and services that it would enable, and that was what led them to ultimately decide to open the full 1200 MHz.

Furthermore, ACMA should consider the opportunity costs of inaction in terms of making the entire 6 GHz band available for class-licensed use. For our enterprise customers, opening the 6 GHz band for class licensing ensures that in their use of Wi-Fi,

[2] The existing technology supporting Wi-Fi spectrum at 2.4 GHz and 5 GHz currently allows every Wi-Fi protocol since its inception to operate. The additional requirement of interoperability and burden of backward compatibility results in further reductions in efficiency and determinism which further negatively impacts voice and video quality when using the existing 2.4 and 5 GHz bands for Wi-Fi. The 6 GHz band would, for the first time, eliminate outdated and inefficient radio access technology, permitting the far more spectrally efficient Wi-Fi 6 (and above) to operate without the burden of legacy radios. This will dramatically improve the user experience and efficient use of the spectrum. This much-improved experience can only further the adoption of Wi-Fi technologies.

they can finally move beyond the 40 MHz wide channels used in enterprise networks since the mid-2000s, and toward 80 MHz or 160 MHz wide channels that they will need to power their networks in the future. For our service provider customers, the 6 GHz band as class-licenced allows for more mobile offload to Wi-Fi in congested areas and deep indoors, and supports enhanced in-home applications together with fibre broadband expansion. Service providers can also consider use of 5G NR-U to supplement macro 5G for specific locations. For consumers, ACMA needs to evaluate the steps already taken by the global consumer electronics industry to enable their equipment for the full 6 GHz band, with a range of more than 200 devices already in the market from smartphones to smart TVs to laptops and more. Those devices will simply not be accessible to Australian users in the absence of a change to the 6 GHz rules. Waiting and holding back the upper 6 GHz band also means that innovation using next-generation Wi-Fi technologies cannot be tested and developed in Australia. This runs counter to Australia's Action Plan for Critical Technologies, which identifies Wi-Fi and other advanced radio frequency communications as "critical technologies in the national interest". It also presents an impediment to Australia's digital economy ambitions, as well as its broader national interest/security.

As a leader in digital economy regulations, we urge ACMA to lead in making the full 6 GHz band available for class-licenced 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, Chile and Peru and, more importantly, bolster the government's efforts in making Australia a world-leading digital economy.

Part B - Standard Power Indoor and Outdoor Devices

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 by nearby microwave links. The US process is more advanced, with over a dozen AFC applicants seeking authority to offer commercial services to class license device owners. In addition, the Wi-Fi Alliance and WinnForum are both working on test plans and/or requirements for testing for both Wi-Fi and New Radio-Unlicensed devices. Both groups are in the final phase of development and are positioning to turn their work over to the FCC for its use in testing the AFC systems that have been proposed. The FCC is expected to announce its plans for testing soon. Interest in Standard Power devices is high, whether for outdoor use, indoor enterprise use (especially large facilities like warehouses, manufacturing, etc.) or for "whole home" coverage for residential applications where the LPI signal from a single router is not sufficient and mesh type applications would be required. Countries that fail to authorize Standard Power devices will not be taking full advantage of the 6 GHz band for connectivity, and we urge ACMA to move forward on a plan to authorize Standard Power.

Moreover, some applicants for AFC have initiated an "Open AFC"[3] approach using open source software. Cisco is a supporter of this initiative together with Broadcom and Meta. "Open AFC" will allow anyone interested in becoming an AFC provider anywhere in the world to utilize (and modify) AFC software to offer AFC services to device owners. This ensures a relatively friction-less expansion of market opportunity for AFC-enabled devices wherever regulators allow Standard Power, and provides confidence to regulators that standing up an AFC system is not a difficult journey. Countries may seek to run an AFC system themselves, or to turn to the private market, as the FCC has done. With Open AFC, no one needs to start "from scratch."

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

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[3] 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/