Future use of the upper 6 GHz band:

Amazon's response to the ACMA's options paper

Amazon welcomes the opportunity to comment on the ACMA's Future Use of the upper 6 GHz band – Options Paper (Options Paper).

We support Option 2 as most effectively addressing the ACMA's objectives. In particular, allocating the 6425-7125 MHz band to RLAN will drive economic value by supporting the immediate and growing demand for Wi-Fi and other devices utilising unlicensed spectrum, and the end-to-end throughput of fixed and mobile networks; support regional development and Closing the Gap Target 17, including as a critical solution for the localised delivery of services to remote First Nation and other communities; and support net zero objectives by maximizing the carriage of indoor traffic using the more energy-efficient Wi-Fi-supported fibre networks, as compared to 5G mobile networks. Amazon has also had the opportunity to review the DSA submission and fully supports it.

About Amazon

At Amazon, almost everything we do for customers is built on connectivity, including our work on wireless technologies enabled by spectrum. We are committed to developing innovative wireless devices and services for consumers, and enabling the expansion of affordable connectivity. Access to spectrum is critical to Amazon's business throughout the world. For example:

- We provide and continuously innovate in consumer devices and services, like eero, Fire TV Echo, Ring, Blink, and Alexa, which rely on and improve critical in-home connectivity, including Wi-Fi and other technologies[1] running over unlicensed spectrum in the 915 MHz, 2.4 GHz, 5 GHz, and 6 GHz bands.
- Amazon relies on unlicensed spectrum in the 24 GHz and 60 GHz bands to enable new and innovative radar applications for our customers, including devices offering health and wellness and better functionality for customers with disabilities, and to enhance the safe operation of our drones.
- Amazon has committed more than US$10 billion to build the Kuiper System, a non-geostationary satellite orbit, fixed-satellite service (NGSO FSS) that will operate in shared Ka-band spectrum. In preparing to deploy the Kuiper System, Amazon is rapidly moving toward its goal of providing affordable, reliable, high-quality connectivity to customers and communities in Australia and around the world, including to those living and working in unserved and underserved areas.
- Wireless connectivity – and the unlicensed spectrum relied upon by Wi-Fi technology – is also critical to the functioning of Amazon's web-store operations and logistics networks. Well-performing wireless technologies are crucial for our teams to efficiently stow, pick, pack, ship and deliver orders to our customers.

These examples demonstrate how access to spectrum is vital for Amazon to deliver for customers and why Amazon supports continued access to spectrum that serves end-users. Striking the right

[1] See, Local Connectivity Protocol Options for Smart Home Devices, Amazon (22 November 2023), https://developer.amazon.com/en-US/docs/alexa/smarthome/wwa-connection-options.html.

balance between licensed, unlicensed, and shared spectrum, will facilitate efficient ways to connect consumers, lower costs, and promote competition.

The value of Wi-Fi

Unlicensed spectrum underpins many of the technologies that consumers and businesses use and rely on every day. It also carries an overwhelming majority of internet traffic: in a 2022 report on how Europeans connect to the internet, the Dynamic Spectrum Alliance reported that fixed networks in Europe typically deliver more than 95% of overall data traffic, of which Wi-Fi relays 92.3%.[2]

As the ACMA notes,[3] NBN subscribers with connection types of 100 Mbps and above (which account for over 17% of the connections, and a 3% increase between 2021 and 2022) download more than 23 GB per day (on average). Subscribers with connections over 250 Mbps, on average, download 32 GB per day. Given the great majority of this traffic is carried over Wi-Fi, this data underscores the importance of Wi-Fi for Australian citizens.

The economic value of Wi-Fi is twofold. First, it is a complementary technology within the telecommunications ecosystem, enhancing the performance and efficiency of fixed and mobile networks and saving consumers and companies significantly. Indoor wireless connectivity is a core focus because the vast majority of data is consumed indoors: Cisco estimates that over 80% of mobile data is consumed indoors, with only 4% of mobile data consumed when 'on the go'.[4] 90% of broadband households in Australia have Wi-Fi capability, supporting the approximately 90% of residential traffic delivered by the NBN and the rest from mobile and fixed wireless networks.[5]

Second, Wi-Fi provides a platform for the development of innovative applications. For example, as mentioned, Amazon customers increasingly rely on unlicensed technologies to shop on Amazon.com.au and connect their Echo device (smart speaker), Fire TV (streaming media player), Alexa (voice AI) and Ring (home security), and Kindle (e-reader); connecting via eero (mesh Wi-Fi router). Unlicensed spectrum is also the backbone of streaming at home, supporting Prime Video, Twitch, and Amazon Music. Many other devices and smart home innovations, including gesture recognition and health and wellness applications such as sleep monitoring or audio streaming to hearing aids and cochlear implants, are enabled by unlicensed spectrum.

The allocation of a full 1200 MHz of spectrum in the 6 GHz band for radio local access network (RLAN) in the United States and other countries is enhancing the development and proliferation of Wi-Fi devices currently operating in the increasingly congested 2.4 GHz and 5 GHz bands. These

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[2] https://www.dynamicspectrumalliance.org/wp-content/uploads/2022/06/DSA-WhitePaper-How-do-Europeans-connect-to-the-Internet.pdf. This report refers to data contained in ASSIA, State of WiFi Reporting, presentation, DSA Global Summit, 8 June 2021, see: https://dynamicspectrumalliance.org/wp-content/uploads/2021/06/ASSIA-DSA-Summit-Presentation-v7.8.pdf

[3] "Trends and developments in telecommunications 2022–23", ACMA, December 2023.

[4] The overall location split is 50% Home, 35% at work, 11% at a hotspot, and 4% on the go. Cisco Vision: 5G – Thriving indoors. See: Cisco Vision 5G: Thriving Indoors (accessed 20 June 2024).

[5] The Dynamic Spectrum Alliance report concluded in 2022 that for advanced economies, 90% of Internet traffic begins or ends on Wi-Fi. "How Europeans Connect to the Internet", https://www.dynamicspectrumalliance.org/wp-content/uploads/2022/06/DSA-WhitePaper-How-do-Europeansconnect-to-the-Internet.pdf. In fact, economies around the world with strong deployment of fibre or advanced cable technologies report similar statistics. See also ACMA (Australia), "Communications and Media in Australia: How we use the Internet (2022)" (mobile data is a small fraction of total data) at https://www.acma.gov.au/publications/2022-12/report/communications-and-media-australia-how-we-use-internet .

enhancements are leading to the innovation not only in Wi-Fi 6E and Wi-Fi 7 consumer devices (for example, Amazon's Fire TV Cube (3rd generation) and Fire TV stick 4K Max), but also in the development of advanced wireless access points (such as Amazon's eero routers). The impact of AI on consumer devices incorporating this functionality is leading to a demand for more on-device compute and a faster connection to the cloud, in turn increasing capacity demands on networks.

A report commissioned by the Wi-Fi Alliance[6] (Report) finds that the economic value of Wi-Fi in Australia falls in the range US$1000-1500 per capita,[7] calculating that this value amounted to $34.7 billion in 2021 and is expected to grow to $41.7 billion by 2025 (an increase of 20% over 4 years), as part of a projected global value of nearly US$5 trillion by 2025.[8] The Report also finds that Wi-Fi will generate approximately 37,800 jobs in Australia in 2025, based primarily in the communications and business services sectors, representing a 72% increase (or 15,800 jobs) on 2021 levels.[9]

The allocation of the upper 6GHz band for RLAN will therefore release additional capacity to accommodate increased demand for next-generation devices already being developed, manufactured, and distributed in the United States and throughout the world. The latest generation of Wi-Fi, Wi-Fi 7, leverages larger 320 MHz channels to support billions of devices and applications. The 6 GHz band provides enough bandwidth for three channels, but Wi-Fi 7 is being designed for four 320 MHz channels. These channels are critical for high throughput applications and also help Wi-Fi systems manage dense deployments and even device power management. As demand increases for Internet of Things (IoT) devices and smart home devices, the need for more unlicensed spectrum will only grow.

Regional Development/Closing the Gap

The advent of NGSO LEO broadband satellite services enables the delivery of cost-effective, high speed low latency broadband throughout Australia, including particularly in areas beyond the reach of fibre. These services will enable remote education, health, communications and support to agriculture and mining. This will promote community involvement, employment and shrink the tyranny of distance and associated cost that has held back service provision for decades. These services will be capable of providing backhaul solutions to mobile operators (thereby extending the reach of these networks) as well as reticulated Wi-Fi based local solutions.

The Initial Report of the First Nations Digital Inclusion Advisory Group ("FNDIAG Report") therefore appropriately identifies Wi-Fi as a critical solution in addressing Closing the Gap Target 17,[10] as an agnostic access technology for the effective delivery of traffic running over fixed, mobile, and satellite networks.

The FNDIAG Report notes the increasing deployment of community-wide Wi-Fi and Wi-Fi hotspot solutions to remote First Nations communities; as both a solution for improved community access, as well as an enabler for services such as health, education, local council, police, social security, and

[6] Global Economic Value of Value of Wi-Fi 2021-2025, Wi-Fi Alliance, September 2021, https://www.wi-fi.org/system/files/Global_Economic_Value_of_Wi-Fi_2021-2025_202109.pdf
[7] Ibid, p 10.
[8] ibid, p 8.
[9] ibid, p 60.
[10] Target 17 of the National Agreement on Closing the Gap commits the government to ensuring that Aboriginal and Torres Strait Islander people have equal levels of digital inclusion by 2026. This sits within the broader Outcome 17, which is that Aboriginal and Torres Strait Islander people have access to information and services enabling participation in informed decision-making regarding their own lives: https://www.closingthegap.gov.au/national-agreement/national-agreement-closing-the-gap/7-difference/b-targets/b17

other critical community services. It also identifies Wi-Fi as an important element of affordability, including as a means of addressing the possibility of congestion of mobile networks due to limited capacity of the network in some remote areas.[11]

As part of this, and as both the Department's LEOSat Working Group and the Communications Alliance's Satellite Services Working Group (SSWG) have noted, Wi-Fi also serves as an essential adjunct to the ability of satellite-based services - the primary solution for the localised supply of connectivity to remote communities, including to the 670 First Nations communities located beyond the range of mobile networks. For these reasons, the Initial Report encourages the government to partner with telcos and local communities to rollout community Wi-Fi in communities that do not have it; and further recommends that it explore the cost and feasibility of providing funding to achieve this.[12] Supporting this, the government is working collaboratively with remote First Nations communities to co-design free community Wi-Fi, with work underway across the first 18 communities to narrow the digital gap.[13]

Net Zero

Amazon believes we have an obligation to stop climate change, and reducing carbon emission to zero will have a big impact. We want to reach net-zero carbon emissions by 2040, a decade ahead of the Paris Climate Agreement, and we are on a path to powering our operations with 100% renewable energy by 2025 as part of our goal to reach net-zero carbon.

In 2020, Amazon became the first consumer electronics company to commit to addressing the electricity used by our devices through renewable energy development, starting with our Echo devices. At the end of 2022, we contracted enough renewable energy capacity through new wind and solar farms to equal the expected energy use of Echo, Fire TV, and Ring devices globally in 2025. Some of these farms are operational today, and others are currently under construction, expected to begin operating in 2023-2024. Today, new devices feature Low Power Mode, and we're delivering updates to introduce this feature for older devices already in customers' homes.

The allocation of the upper 6GHz to RLAN could also promote the government's net zero goals, on the basis of the greater energy efficiency of using Wi-Fi in indoor environments to complement fiber access, as compared to the indoor usage of 5G networks.

A report recently prepared by WIK-Consult[14] on commission by the Wi-Fi Alliance (WIK-Consult Report) finds that 5G mobile networks are significantly less energy efficient for the same amount of data traffic than fibre-to-the-home (FTTH) networks, which remains the case even when energy consumption from Wi-Fi routers is considered.

The WIK-Consult Report found that, in Europe, allocating the complete 6 GHz band for license-exempt access including Wi-Fi would contribute to reducing the energy consumption and environmental footprint of telecoms networks.

[11] FNDIAG Report, p 16.
[12] FNDIAG Report, Recommendation 1.14.
[13] The Hon Michelle Rowland MP Minister for Communications The Hon Linda Burney MP Minister for Indigenous Australians, "Narrowing the digital Gap through community Wi-Fi", Media Release, 21 June 2024.
[14] WIK-Consult, Sustainability Benefits of 6 GHz Spectrum Policy – Study for Wi-Fi Alliance, 31 July 2023: https://www.wi-fi.org/system/files/SustainabilityBenefitsof6GHzSpectrumPolicy202307.pdf

As Wi-Fi networks operate at much lower power levels than cellular systems, they could be the most energy-efficient connectivity option in many scenarios. To this point, the French regulator ARCEP found that the combination of fibre and Wi-Fi is the most efficient solution in terms of energy consumption, performance and flexibility.[15]

Assessment of options

Our responses to the Options in the Options Paper are follows:

1. **What are your views on the 4 broad planning options identified for the upper 6 GHz band?**

- **Option 1:** Maintain existing arrangements, with potential reconsideration at a later date.

Whilst this option would enable the ACMA to adopt a "wait and see" approach, including to observe both industry and global regulatory developments, it would do so at the expense of the immediate accrual of the economic benefits identified in this submission. In addition, we suggest that the unique blend of features of the Australian topography, demographics, technology solutions, social and economic development challenges and policy priorities, impel the ACMA to form its views first and foremost with direct reference to these conditions.

In our view, for the reasons expressed in our submission, allocating the upper 6 GHz band to RLAN at the earliest opportunity would best promote the ACMA's objectives.

- **Option 2:** Introduce arrangements to enable RLAN access to some or all of the upper 6 GHz band, via a variation to the Low Interference Potential Devices (LIPD) Class Licence. There would be no introduction of arrangements introduced for wide-area wireless broadband (WA WBB).

Allocating the upper band to RLAN it would make all of the 320 MHz RLAN channels available to public sector, large enterprise, and remote community users. This would include university campuses, schools, and hospitals; sporting and entertainment stadiums; and remote and geographically dispersed business operations such as mining and agriculture. This would maximise the efficient use of spectrum in support of economic growth.

As this submission also notes, the allocation of adequate spectrum for Wi-Fi will promote innovation in Wi-Fi enabled devices in support of economic value. Amazon therefore supports this as the preferred option.

- **Option 3:** Introduce arrangements to enable WA WBB access to some or all of the upper 6 GHz band, using apparatus and/or spectrum licensing. There would be no arrangements introduced for RLANs.

6 GHz spectrum is primarily an urban solution: its propagation characteristics and other features do not lend themselves to broad deployment in regional, rural, and remote areas. We also note that mobile operators have existing inventory of spectrum, are likely to have access to other spectrum, including mid-band spectrum, such as in the 4 GHz, 7 GHz and 10 GHz bands. Allocating the upper GHz band to WA WABB would not lead to meaningful deployments in non-urban areas, and

[15] The digital environmental footprint in France: ADEME and ARCEP report to the Government January 2022 Available online

therefore serves only to exacerbate, rather than address, the digital divide. In contrast, Wi-Fi reticulation is a critical and irreplaceable solution for the delivery of connectivity to communities beyond the reach of fixed, mobile, and fixed wireless networks, and is therefore a key element of the imperative to close the gap and promote digital inclusion for First Nation and other underserved communities. Importantly, and in contrast to WA WBB-based access networks, unlicensed spectrum affords a very high degree of flexibility in the development of place-based solutions and can be deployed as a localised solution by a range of fixed, mobile, or satellite network operators.

We have also noted in this submission that allocation of the upper 6 GHz to WA WBB would not promote net zero goals in relation to the indoor use of wireless connectivity – by far the greatest contributor to internet data usage.

Accordingly, we believe that this option would not best promote Australia's national social and economic development objectives, including in relation to regional development and digital inclusion issues.

- **Option 4:** Introduce arrangements to enable both RLAN and WA WBB access to different frequency segments within the upper 6 GHz band, using the respective authorisation arrangements in options 2 and 3.

This is discussed under Options 2 and 3 above.

2. **If we decide to divide the band into different RLAN and WA WBB segments, should the WA WBB segment:**
    1. **be a multiple of 100 MHz? This would align with the largest 3GPP channel size (noting that the ability for WA WBB operators to deploy one or more 100 MHz channels will depend on the outcome of the assignment process).**

We note that the IMT raster is 5MHz, therefore there is more flexibility to maximise the number of RLAN channels. We therefore suggest that Option 2 is the preferable solution.

    2. **align with the 160/320 MHz wi-fi channel raster? This would maximise the number of the larger wi-fi channels available (by avoiding options that would split these channels).**

We consider Option 2 is the best option for the reasons expressed above.

3. **Of the segmentation options based on wi-fi channels (options 1–3 in this paper), what is the preferred option and why?**

We consider Option 2 is the best option for the reasons expressed above.

4. **Is it appropriate to limit our consideration of hybrid options for accommodating multiple services to frequency segmentation only? For example, should geographic segmentation or less traditional sharing models be considered when determining models for enabling access to the upper 6 GHz band by both WA WBB and RLAN services?**

We reiterate our view that Option 2 represents the best outcome to promote the ACMA's objectives, especially in light of the likely alternate bands available to WA WBB providers. In the

context of an approach to hybrid sharing, we understand the reasoning behind limiting consideration to frequency segmentation at this stage and note ACMAs commitment to monitoring international progress on non-traditional sharing models. However, it is important that any implementation of frequency segmentation does not, as far as possible, preclude the incorporation of non- traditional sharing models in the future which could potentially enable RLAN access to spectrum outside the designated part of the band.