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9 October 2021

Malaysian Communications and Multimedia Commission
MCMC HQ Tower 1
Jalan Impact
Cyber 6
63000 Cyberjaya
Selangor Darul Ehasn
Malaysia

Dear Sir/Madam,

Public Consultation on Wireless Area Network (WLAN) In the 6 GHz Frequency Band

Please find attached the submission from Cisco Systems regarding the above consultation issued 12 August 2021.

Please feel free to contact me at shgoh@cisco.com if you need any further information.

Thank you.

Yours sincerely,

Goh Seow Hiong
Executive Director, Global Policy & Government Affairs, Asia Pacific

Cisco Systems, Inc. Comments
October 2021

Response to MCMC Consultation on Wireless Local Area Network (WLAN) in the 6 GHz Frequency Band

Introduction

Cisco Systems, Inc. hereby files comments in response to the Malaysia Communications and Multimedia Commission (MCMC) Public Consultation Paper on *Wireless Local Area Network (WLAN) in the 6 GHz Frequency Band* issued in August 2021. Cisco applauds the efforts of MCMC to take steps to enable the latest generation of Wi-Fi in Malaysia by opening up much needed spectrum in the 6 GHz range. In this submission, Cisco responds to the specific questions called out by MCMC for industry inputs, and urges MCMC to consider making 5925-7125 MHz available to license-exempt uses now to sustain and grow the economic activity that Wi-Fi has historically supported.

Cisco is a global provider of Internet Protocol (IP)-based networking solutions with a strong presence in Malaysia. 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 advanced manufacturing, training, quality control and more. 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 employee, student or patient home networks powered by Wi-Fi.[2] Whether Wi-Fi is on-premises or relied upon by the enterprise to support remote working, telehealth or education, demands on the spectrum for license-exempt 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 license-exempt 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.

[2] When working from home and communicating with enterprise networks, employees are generally utilizing Virtual Private Networks (VPNs) that securely "tunnel" through a public service provider network to connect with the enterprise. VPN usage has surged to new never-before-seen levels during the pandemic. See https://www.businesswire.com/news/home/20201127005318/en/Global-Virtual-Private-Network-VPN-Market-Report-2020-VPN-Adoption-Surges-as-COVID-19-Pandemic-Leads-to-a-Rise-in-Remote-Work-and-WFM-Culture---ResearchAndMarkets.com

Cisco Responses to Consultation Questions

***Question 1**. MCMC seeks your views and comments on the demand for spectrum for Wi-Fi in the 6 GHz frequency band.*

Cisco believes that there is a need for more spectrum to be made available for license-exempt use, including for WLAN use. Having a single large contiguous block of spectrum in the 5925-7125 MHz range to support the coming generations of Wi-Fi is essential to support continued growth in connectivity needs of Malaysia and the expanding uses that Wi-Fi supports within enterprises.

The proliferation of additional, ever more powerful WLAN devices, and higher bandwidth broadband networks, such as the deployments under Malaysia's National Broadband Initiative, is enabling richer and more productive applications. Cisco's Annual Internet Report[3] highlights that for Asia Pacific, the devices and connections per capita will grow from 2.1 in 2018 to 3.1 in 2023. There will be 6.6 billion network devices in Asia Pacific by 2023, up from 4.7 million in 2018 (7.2% CAGR). There will be 6.9 billion wired and Wi-Fi connected devices by 2023, up from 4.0 billion in 2018 (11.7% CAGR), with 51% of all networked devices in Asia Pacific having a wired or Wi-Fi connection. Moreover, these are not just devices that connect people to the Internet, but include an increasingly broad array of "things" from consumer products (like connected appliances, television sets, security systems and gaming consoles) to vehicles and industrial machines.

In addition, Wi-Fi is also part of the technology enabling today's smartphones, first introduced in 2007. Mobile devices are getting more powerful with every generation, consuming more data with increases in processing power, screen resolution, more use of video in applications, and the mobile networks themselves transitioning from 3G to 4G and now, 5G. "Offloading" of mobile traffic to Wi-Fi networks means that 60 to 70% of data utilizes a Wi-Fi/fixed broadband instead of a mobile connection, preventing congestion and enabling mobile operators to more easily adjust to demand spikes.

Every part of the broadband ecosystem is speeding up in response to changing consumer demand. Broadband networks, whether fibre or wireless, are becoming more powerful. Through the transition from 3G to 4G, the use of license-exempt spectrum has continually grown, and will continue to grow as 4G transitions to 5G. In the same period, while Malaysia has transitioned to a national broadband network and mobile to 4G and now 5G, WLAN demand continued to grow without provision for more license-exempt spectrum capacity.

Regulators globally are seeing the benefits of opening 6 GHz to WLAN use. The economic value of doing so is estimated at US$4.8 trillion globally by 2025, assuming

[3] https://www.cisco.com/c/en/us/solutions/executive-perspectives/annual-internet-report/air-highlights.html#

major economies open the 6 GHz band to WLAN.[4] The main reasons for Wi-Fi's ability to deliver economic value lie in its ability to provide easy and readily available Internet access at home and on the go, along with productivity increases in enterprises as they increasingly rely on WLAN in their business operations. From Cisco's perspective, enterprises (governmental, non-profit or for profit) are still early in the process of digitizing their operations with wireless connectivity. However, one of the outcomes of the global pandemic of the past year has been an acceleration of digital transformation initiatives. It is now recognised that what can be delivered digitally, now *must* be delivered digitally.

We therefore believe there is a huge demand for spectrum for Wi-Fi in the 6 GHz frequency band.

***Question 2**: MCMC seeks your views and comments on the emerging technologies utilising the 6 GHz frequency band*

We believe allocating the 6 GHz band as a license-exempt band will encourage innovation and enable new emerging technologies to emerge, whether leveraging Wi-Fi or other license-exempt technologies. The IEEE has extended the latest Wi-Fi standard, 802.11ax (also known as "Wi-Fi 6") to include the 6 GHz band. The standard is complete and has been published. In addition, the 7th evolution of the Wi-Fi standard, IEEE 802.11be, is in development for indoor and outdoor operation with stationary and pedestrian speeds in the 2.4, 5 and 6 GHz frequency bands. In addition, 3GPP-based licensed-exempt technologies are also in standards development, with New Radio-Unlicensed included in Release 16 covering the full 6 GHz band.

As a result and as discussed below, equipment is available to consumers and businesses in Malaysia as soon as license-exempt use is permitted in the 6 GHz band. WLAN operations can be introduced with mitigations to ensure that existing users are not adversely impacted, enabling countries to maximize benefits from the band without enduring the hardships of relocating incumbents. Enterprise, industrial, and governmental needs today and in the future also can be more easily met with the new generation of technologies designed to operate throughout the entire 6 GHz band.

Standards are ready

The IEEE has extended the latest 802.11ax Wi-Fi standard (i.e. Wi-Fi 6) to include the 6 GHz band. The standard is complete and has been published. In addition to the IEEE standard, Europe's ETSI BRAN EN 303 687 has reached a "stable draft", providing further

[4] "The Economic Value of Wi-Fi: A Global View (2021-2025)" by Telecom Advisory Services on behalf of the Wi-Fi Alliance (2021) available at https://www.wi-fi.org/download.php?file=/sites/default/files/private/Economic_Value_of_Wi-Fi_Highlights_202102_0.pdf

support for standards-based deployments. 3GPP-based licensed-exempt technologies are also in standards development, with New Radio-Unlicensed included in Release 16 covering the full 6 GHz band.

In addition, both the Wi-Fi Alliance (for IEEE 802.11) and WInnForum (for 5G NR-U) are engaged in projects to standardize the interfaces between Standard Power access points (APs) and Automated Frequency Coordination (AFCs). Standardization of the interface helps simplify AFC implementation because the two interfaces will be known and documented, creating built-in incentive for AFCs to utilize the standards. Standard Power APs can be manufactured and used with the confidence that the equipment will interface with any standards-compliant AFC.

Interoperability testing is ready

The Wi-Fi Alliance has named Wi-Fi 6 products capable of operating in the 6 GHz band as "Wi-Fi 6E" devices and released a certification plan for global interoperability as of January 2021. Interoperability testing has become the hallmark of technologies that use license-exempt spectrum, because it ensures that consumers can purchase devices with the confidence that the device will work with their router and with other devices. Multiple product vendors are already announcing Wi-Fi 6E devices that use super-wide 160 MHz channels and uncongested bandwidth in 6 GHz to deliver multigigabit, low latency Wi-Fi. Per the Wi-Fi Alliance, "Wi-Fi CERTIFIED™ provides a standards-based approach for product vendors to introduce secure and interoperable Wi-Fi 6E products throughout the world, helping to create a diverse device ecosystem." The first set of products already have been certified for interoperability.

6 GHz license-exempt equipment is entering the market

The United States FCC published its test requirements for the 6 GHz band, and the first devices have completed test review and approval. Then-FCC Chairman Ajit Pai marked the certification of the first device in December 2020 with the following statement:

> We expect Wi-Fi 6[E] to be over two-and-a-half times faster than the current standard. This will offer better performance for American consumers at a time when homes and businesses are increasingly reliant on Wi-Fi. During the COVID-19 pandemic, we've all seen how Wi-Fi has enabled everything from work-at-home to telehealth to remote learning to streaming and gaming. Wi-Fi 6[E] will turbocharge each of these and more, and will also complement commercial 5G networks. Bottom line: The American consumer's wireless experience is about to be transformed for the better.

With 6 GHz equipment testing rules now available, manufacturers can proceed to test equipment, and Telecommunications Certifications Bodies that receive the test reports prior to the certification application proceeding to the FCC laboratory can begin their

review of manufacturer testing and begin independent testing. Dozens of successful 6 GHz equipment certifications have been completed, with significantly more expected this year.

Similarly, in Europe, with the ETSI standard reaching the stable stage, and with the first stage of the European process reaching completion, equipment is entering the European market as individual countries complete steps to adopt the European findings into national rules. The Republic of Korea's National Radio Research Institute has also announced its revision of the test method for conformity assessment of radio equipment for the 6 GHz band. The Wi-Fi Alliance now projects that 340 million Wi-Fi 6 (802.11ax) devices will be sold in 2021 globally, with about 20% of them (or 68 million devices) 6 GHz-ready. Shipments of 6 GHz-capable Wi-Fi 6 devices are expected to ramp up very quickly in 2022 and beyond.

***Question 3**: MCMC seeks your views and comments on the frequency range within the 6 GHz frequency band that could be considered for Wi-Fi under the Class Assignment in Malaysia. Should MCMC consider allowing Wi-Fi to operate in the entire 1200 MHz (5925 MHz to 7125 MHz frequency band) or only in the 500 MHz (5925 MHz to 6425 MHz frequency band)?*

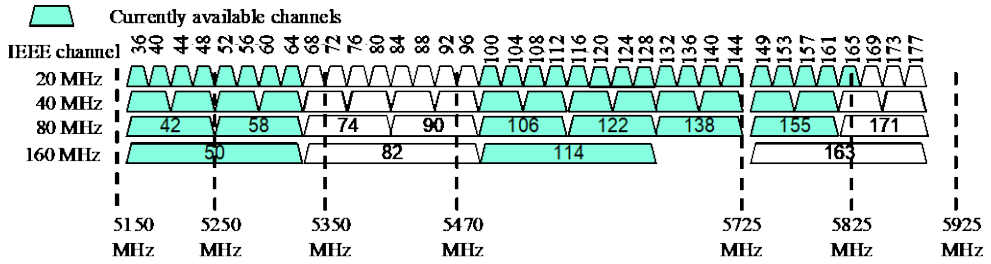
Cisco believes MCMC should make the entire 1200 MHz license-exempt, and allow Wi-Fi to operate in it, along with other license-exempt technologies.

At these growth rates highlighted in our response to Question 1 above, the WLAN industry faces two fundamental challenges:

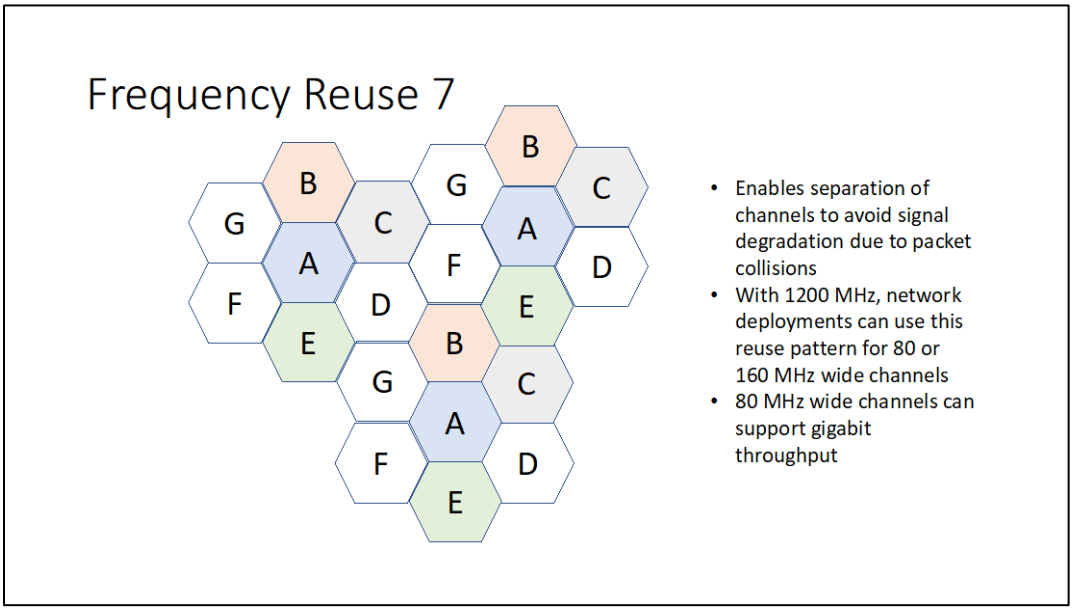
(1) The existing license-exempt spectrum in the 2.4 and 5 GHz bands originally allocated 15 years ago to support Wi-Fi are reaching their capacity limits and becoming heavily congested, particularly in venues with larger number of users, such as enterprises, schools, transportation hubs and other public places; and
(2) WLAN technology itself needs an overhaul to address future networking challenges.

For a decade and a half, the Wi-Fi industry has been innovating new generations of technology on spectrum that was identified for license-exempt 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, industry learned to deploy dense networks of the type found in convention centers, stadiums, college campuses, and transportation hubs. We learned, for example, that the minimum practical distance between access points in a network is 12m, because anything less does not contribute to the overall throughput needs, and in fact diminishes them. 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

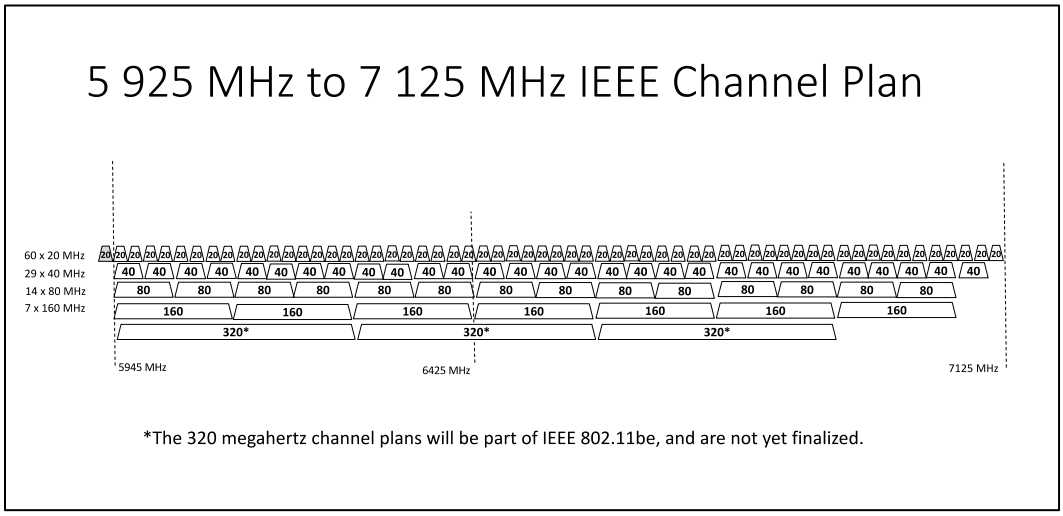
networks. While the Wi-Fi 5 generation could take advantage of 80 or 160 MHz wide channels, there simply are not enough of these wider channels to enable a networked deployment, as is shown in the following 5 GHz channel plan. For that reason, enterprise networks have continued to operate using 40 MHz wide channels.



As 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, 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 license-exempt equipment is highly complementary to the incumbent licensed services in the band – coexistence with the right mitigations is possible. 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, we 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 alternative result – where administrations allocate just 500 MHz instead of 1200 MHz for license-exempt WLAN – leaves license-exempt users in a predicament. With just 500 MHz, deployments will be stuck at 40 MHz channels. While the lower 6 GHz spectrum is greenfield in that there are no prior generations of Wi-Fi operating in it,[5]

[5] 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

there are not enough 80 MHz channels for an enterprise deployment using a frequency reuse 7 model. As a result, the channel size cannot support the gigabit throughput needed.

Cisco is well aware that MCMC is or will be hearing from 5G vendor interests who would like a deferred decision on the upper 700 MHz of spectrum (6425-7125 MHz) so that regulators may evaluate ITU-R coexistence studies to be conducted in Region 1 looking at IMT's ability to coexist with fixed satellite or microwave fixed services. We understand that this argument is generally made with an appeal to "balance" the interests of the technology camps. Cisco is a big supporter of 5G and we have in our offerings for mobile core and transport enabled the advancements that 3GPP has promulgated for the 5G era. However, "balance" to us is about regulators finding a way for each technology to succeed on its own merits. At 500 MHz, Wi-Fi 6E will not succeed in its efforts to address the networking needs of governmental entities and enterprises. In our view, license-exempt WLAN needs the full 1200 MHz by sharing that band with long-time incumbents who continue to have superior spectrum rights.

Cisco strongly urges MCMC to consider opening the full 6 GHz band now.

***Question 4**: MCMC seeks your views and comments on:*
i. the coexistence between Wi-Fi and incumbent services (i.e. fixed service and fixed-satellite service); and
ii. the potential interference mitigation between these services.

The issues of co-existence and interference that Malaysia is considering in the decision of when and how to utilize the 6 GHz band is the same one that regulators globally have faced – fixed link incumbents and fixed satellite services uplinks. These issues can be entirely resolved to the extent MCMC follows the now well-established path set by the global regulatory community to require mitigation conditions. Those conditions include power levels (Low Power Indoor or Very Low Power devices), indoor-only operations for LPI, and database-controlled access to the band for higher power indoor and outdoor use (automated frequency control).[6] Please refer to the response to Question 5 for further citations to the technical rationale for allowing band sharing to move forward.

From decisions in the U.K., Canada, the United States, Brazil and Europe (among others), it is evident that there is growing consensus that license-exempt technology can share the band with these incumbents and that doing so achieves important objectives for

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.

[6] Other matters include no permission to utilize 6 GHz license-exempt radios on drones, and limiting aircraft use to above 10,000 feet in altitude.

national broadband connectivity. In fact, with the proper mitigations on WLAN, the incumbents could continue to grow their networks, adding links and earth stations.

The US FCC was explicit in rejecting calls to defer a decision on the upper 6 GHz or to explore an IMT allocation:

> Repurposing large portions of the 6 GHz band for new licensed services would diminish the benefits of such use to the American public. Accordingly, we agree with the unlicensed proponents that we should reject these requests. Similarly, repurposing substantial portions of the band, as CTIA and Ericsson request, would substantially affect existing licensed services in the band. This would be contrary to the Commission's stated goal in this proceeding to ensure that existing incumbents can continue to thrive in the 6 GHz band. Representatives of the incumbent fixed microwave services also raise concerns about the reasonableness and practicality of relocation, and question whether other appropriate spectrum can be found.[7]

Canada's ISED concluded that waiting was not an option:

> ISED has noted the arguments cited by some respondents towards their position for releasing only the 5925-6425 MHz band and withholding the release of the 6425-7125 MHz band in case international momentum develops in favour of commercial mobile use of the 6425-7125 MHz band following WRC-23. However, ISED is of the view that delaying the release of the spectrum would not meet the policy objectives outlined in section 2, as it would hinder access to affordable broadband services for Canadians in rural and urban areas and would negatively impact the opportunities for innovation. Furthermore, ISED notes that through the upcoming 3500 MHz auction and planned 3800 MHz and millimetre wave auctions, significant amounts of spectrum will be made available for licensed commercial mobile services.[8]

In fact, other than a 2017 decision by Europe to evaluate the lower portion of the 6 GHz band, only two countries have opted for 500 MHz – the United Arab Emirates and Morocco. That compares to 10 countries who have considered the issue and opened the full band – Canada, the United States, Guatemala, Honduras, Costa Rica, Chile, Brazil, Peru, Saudi Arabia, South Korea. In addition, both Colombia and Mexico have announced tentative decisions to open the full band.

In the case of Europe, their 2017 decision to pursue 5925-6425 MHz evolved from a discussion among the European national regulators where very diverse views about the size of the band to be studied were aired. In the end, the recommendation to the

[7] FCC, Unlicensed Use in the 6 GHz Band, Report and Order, ET Docket No. 18-295, released April 24, 2020 at para. 205 (footnotes omitted).

[8] ISED, Decision on the Technical and Regulatory Framework for License-Exempt Use in the 6 GHz Band, SMSE-006-21, May 2021 at para. 40.

European Commission was a "lowest common denominator" approach to satisfy the requests coming from member states who at the time were in the process of migrating new fixed links into the upper part of the band, and who did not want to complicate the migration. This rationale simply has no applicability to Malaysia.

It was not until WRC-2019 that Region 1 committed to a coexistence evaluation as between IMT and band incumbents. Of course, that evaluation is wholly incomplete, but based on the coexistence work completed in the lower portion of the band for license-exempt technologies, new entrant operating conditions for the upper part of the band are going to have to be substantially constrained in ways that appear inconsistent with most IMT use. In Cisco's view, regulators interested in supporting 5G in the 6 GHz band should focus on license-exempt, which supports mobile offloading from devices, permits fixed link expansion for backhaul, and supports NR-U.[9] Nor should Malaysia, in Region 3, be limited by Region 1 commitments.

We encourage MCMC to make the entire 1200 MHz in the 6 GHz band (5925-7125 MHz) available for General User Radio Licence for Short Range Devices (GURL-SRD) WLAN use. Licensed IMT in the 6 GHz band at a minimum reduces the opportunity to utilize the band for fixed microwave services and fixed satellite services uplinks, because licensing implies spectrum rights while license-exempt must not cause harmful interference to incumbent uses.

In Cisco's view, the Saudi Arabia CITC got it right in their consultation:

> "The substantial amount of licensed TDD mid band spectrum already being made available for IMT and 5G. With the release of the 3800 – 4000 MHz band, a total of 890 MHz will be available in large contiguous channels for exclusive IMT use across 2300 MHz, 2600 MHz and 3400 – 4000 MHz. CITC believes that this bandwidth will be sufficient to cover the mid-band spectrum needs of IMT for the foreseeable future. We note that the situation is different in the EU where less exclusive mid-band spectrum (in particular in TDD configuration) is available for IMT. On the other hand, countries with substantial exclusive mid-band spectrum for IMT (such as South Korea) have decided to release the entire 6 GHz band for license-exempt use.
>
> "The existing mid-bands for exclusive IMT use have robust ecosystems already as well as superior propagation characteristics. If mobile operators want to

[9] Further points on this topic were raised in the recent Canada Innovation, Science and Economic Development (ISED) Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band at para 37: "Over 60% of mobile data traffic is offloaded on Wi-Fi technology today and this is expected to increase in the coming years. With the release of the full 6 GHz band for licence-exempt use, existing and emerging commercial mobile operators will be able to increase the ability to offload data traffic from exclusively-licensed bands to this newly released licence-exempt band. Such cost savings could be passed on to consumers in the form of lower prices."

> access the 6 GHz band, they can do so on a license-exempt basis using NR-U (which 3GPP has defined as band n96)."[10]

No country or international body has concluded IMT could be supported in the band consistent with the incumbent uses there. The European regulatory community remains concerned about licensed microwave systems that have only recently migrated into the band. FSS uplink remains a universal concern. Equipment based on 3GPP standards is not available in 6 GHz, and other than NR-U, there are not even standards to support it.

On the other hand, for countries that have authorized a full license-exempt approach for the band, license-exempt equipment is already entering the marketplace and growing quickly, supported by completed IEEE 802.11 standards, interoperability certification through the Wi-Fi Alliance, and device certification testing rules. MCMC would be well served by opening the entire band to license-exempt use with mitigations necessary to protect incumbents.

Question 5*: MCMC seeks your views and comments on the potential technical and operational conditions to be imposed if the 6 GHz frequency band is introduced for Wi-Fi under the Class Assignment. Should part of the frequency band be limited to indoor operation? Should standard power devices operating under the Automatic Frequency Coordination (AFC) system be adopted in Malaysia?*

MCMC should adopt an approach that allows a full range of device classes to enter the market, as Canada has done. Cisco, as a network vendor to enterprises and governments, considers low power indoor and standard power indoor/outdoor device classes to be the most important to our customers.

Standard Power Indoor and Outdoor Devices

Standard power devices (e.g., 36 dBm EIRP) are needed for a range of enterprise use cases, both indoors and outdoors, although the number of outdoor transmitters will be relatively small compared to indoor ones.[11] However, unfettered use of standard power transmitters can create interference issues for fixed link operations. For that reason, industry proposed a database mechanism that would ensure outdoor license-exempt transmitters would not operate co-channel (or adjacent channel) in geographic

[10] CITC, Spectrum Outlook for Innovative and Commercial Use 2021-2023, Public Consultation, January 28, 2021 at page 52.

[11] Regulators generally estimate less than 5% of all license-exempt WLAN transmitters will be outside because the primary use of the technology is indoor networking, and even at 36 dBm, the signal has limited coverage. As a general rule of thumb, we expect outdoor networking to be mostly delivered by IMT and indoor networking to be delivered mostly by Wi-Fi.

proximity to fixed link receivers.[12] The AFC database system was needed in the US because the US has over 100,000 fixed links, with modifications to those links, and new links being established all the time. Moreover, the FCC has a searchable database of license information that is available to inform an AFC on a regular basis of the existence of an incumbent link and the associated frequencies in use. Canada has also embraced this approach.

In the US, AFCs are in the process now of being established, with significant standards and forum work focusing on technical requirements. The FCC's rules on what AFCs must accomplish can easily be adopted by any administration.[13] The implementation of "how" to achieve the outcomes has been the topic of industry discussions and standards. The US FCC has called for specific written proposals from prospective AFC operators by 30 November 2021. AFCs could become operational as early as late 2022.

Around the globe, there is significant variance between countries on the number of links that are licensed, and how often changes are made. For countries such as Malaysia where link counts may not be large, and where fixed link licensing is relatively static, a database approach such as the AFC is not strictly necessary, although it has operational advantages. The chief advantage is that in the event of interference, the access points in the area of a link can be directed to frequencies that are further removed from the frequencies in use by microwave – testing whether the access point is in fact the cause of interference. Moreover, when AFCs are stood up in the US and in Canada, the software and protocols are universally applicable, and would result in a reasonably low cost to establish such a sharing mechanism in Malaysia. Note that in the US and Canada, it is expected that both vendor-specific, carrier, and third-party AFCs will operate in the band.

Alternatively, MCMC could consider a "light licensing" or registration system (not conferring any spectrum rights, but just for the purpose of creating a coordination requirement and a searchable record). Should a higher priority fixed operator wish to establish a link, it becomes possible to coordinate with the Standard Power registrant to ensure that there is no interference to the fixed service. This approach could also warn higher power device operators from co-channel operations near existing links. As with an AFC approach, some form of geolocational capability is needed. The drawback here is that only more sophisticated users would likely take advantage of such a system, and, due to its manual nature, MCMC would carry more of the burden in administering the system.

[12] In addition to a database mechanism, industry also agreed that a emissions mask on standard power outdoor devices could help long term with coexistence with FSS uplink, limiting their maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon to 21 dBm (125 mW) to protect fixed satellite services.
[13] See generally 47 U.S.C. Section 15.407(k) available at: https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-15

Whether MCMC chooses a registration or AFC approach, either approach ensures that outdoor unlicensed operations will not interfere with FS operations. The key benefit, of course, is enabling use cases to the benefit of Malaysia citizens and business, as standard power operations will have more power capability than low power indoor, and will be available for outdoor deployments across a range of enterprises from stadiums to ports or other industrialized settings.

Low Power Indoor

For Low Power Indoor devices, a power maximum of 33 dBm E.I.R.P. and power spectral density of 8 dBm/MHz are supported by interference studies globally, and best ensure that enterprises with existing Wi-Fi deployments can quickly transition to the 6 GHz band without the need to re-wire for new access points. In the multi-company filing, Cisco supports a maximum power of 30 dBm. Here, we note that there are two power-related rules that can come into play when setting power maximums for Low Power Indoor – one is the power limit, and the other is power spectral density. Regulators in Europe and North America have wielded these tools differently. For example, the United Kingdom[14] set 24 dBm conducted with a maximum power spectrum density of 11 dBm/MHz PSD for a 20 MHz channel (the PSD decreases as the channel size goes up). The U.K. approach puts more emphasis on narrower channels, with the 24 dBm conducted limit enabling an 8 dBm/MHz PSD at 40 MHz channelization. Those power levels and channelizations easily support enterprise networking today. The North American approach emphasizes the use of wide channels – a 5 dBm/MHz PSD limit produces total power ranging from 18 dBm E.I.R.P. for a 20 MHz channel to 30 dBm E.I.R.P. for a 320 MHz wide channel. Moreover, there is concern among US interests that 5 dBm/MHz PSD does not provide sufficient power for many enterprise and residential settings, and for this reason, the US FCC has been asked to raise the PSD limit to 8 dBm/MHz.

Both approaches to setting power and PSD limits are predicated on the need to both protect fixed satellite services (FSS) uplink and fixed services (FS) receivers. UK's Ofcom reported in their decision that with respect to FSS, they reviewed the studies undertaken by the organization of European regulators, CEPT,[15] and determined that low power indoor use would not create interference issues for FSS uplink. For FS receivers, Ofcom conducted its own interference analysis, concluding that "…there may

[14] "Improving Spectrum Access for Wi-Fi," Statement, 24 July 2020 available at: https://www.ofcom.org.uk/consultations-and-statements/category-2/improving-spectrum-access-for-wi-fi

[15] See www.cept.org. The studies were performed by the Electronic Communications Committee, which in turn delegated the technical study to "Systems Engineering 45" or "SE 45." SE 45 produced two reports of note – Report 302 "Sharing and compatibility studies related to Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the frequency band 5925-6425 MHz" and Report 316 "Sharing studies assessing short-term interference from Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) into Fixed Service in the frequency band 5925-6425 MHz," available at: https://cept.org/ecc/groups/ecc/wg-se/se-45/client/introduction/

be some scenarios where the fixed link interference criteria could be exceeded, most likely, from a single high-power device located either indoors or outdoors close to the fixed link receiver. We believe these scenarios are very unlikely to arise in practice…." (at Section 4.11)[16]. Similarly, the US FCC decision also concludes that its power and power spectral density will protect incumbents.

Setting a power level or PSD limit is not an exercise that can be completed without reference to the broader regulatory framework for license-exempt devices in the band. For example, the US FCC and Canada took a highly conservative approach to power – even in reference to their own record which supported much higher power levels – but that approach was tolerable in that the regulators simultaneously created a path forward to higher power devices (for the US, to 36 dBm E.I.R.P.) using an AFC mechanism. The AFC will ensure that license-exempt devices will not operate co-channel (or adjacent channel) to fixed links in geospatial proximity to them. Access to higher power is important, and the use of license-exempt will not thrive if conservative power choices for Low Power Indoor are simply borrowed from other nations' decisions without consideration for how to achieve whole home networking or networking for large enterprise spaces. The US outcome of up to 30 dBm can be contrasted with that of South Korea, which imposed a Low Power Indoor maximum of just 2 dBm – a level that does not as a practical matter support license-exempt indoor networking.

***Question 6**: What other key issues need to be considered in introducing Wi-Fi in the 6 GHz frequency range?*

Cisco also urges MCMC to consider the lower band edge protection for Intelligent Transportation Systems (ITS) operating in the adjacent 5.9 GHz band (5850-5925 MHz). For the ITS band to be utilized for critical safety communications between vehicles, the band cannot be subject to harmful interference from adjacent 6 GHz uses. Cisco therefore supports a rule applicable to the very low power (VLP) device class (e.g., 14 dBm) that limits out-of-band emissions for license-exempt devices in the vehicle of -37 dBm/MHz and requires VLP devices to prioritize license-exempt use operations on channels above 6000 MHz before beginning to operate below 6000 MHz. This limit represents a compromise view of Broadcom, Cisco, Facebook, Intel and Qualcomm, and has been submitted to the U.S. FCC, Brazil's ANATEL and Canada's ISED. Compliance with the prioritization rule would consist of a statement filed by manufacturers that their equipment complies. Cisco believes this rule would help promote both license-exempt use technologies and ensure ITS transmissions can perform their intended function.

[16] UK Ofcom, "Improving Spectrum Access for Wi-Fi," Statement, 24 July 2020 at section 4.11.

Conclusion

Cisco appreciates the opportunity to provide the above input to MCMC on the questions raised. This topic is important for the future of Malaysia, for connecting citizens 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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