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**Re: Canada Gazette Notice No. SLPB-006-17 – Consultation on the Spectrum Outlook
2018 to 2022**

Attached, please find the comments of Cisco System, Inc. (Cisco) in response to *Canada Gazette*, Part I, October 6, 2017, *Consultation on the Spectrum Outlook 2018 to 2022* (SLPB-006-17).

Cisco thanks the ISED-Canada for the opportunity to provide input on this important issue.

Yours truly,

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Attach.

Canada Gazette Notice No. SLPB-006-17

Consultation on the Spectrum Outlook 2018 to 2022

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Comment of Cisco Systems, Inc.



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I. Introduction.

1. Cisco Systems, Inc. (“Cisco”)¹ is pleased to provide Innovation, Science and Economic Development Canada (“ISED”) with the following comments in response to SLPB-006-17: Consultation on the Spectrum Outlook 2018 to 2022 (the *Consultation*), published in the Canada Gazette, Part I, October 6, 2017.
2. Cisco commends ISED for taking this critical step towards releasing new spectrum. As Cisco has long advised, the demands on radio spectrum in the digital age are unprecedented. A confluence of four factors – faster network speeds (wired and wireless), proliferation of devices and device types, device capability, and the rising tide of video as the preferred application of consumers and business – has created a strong need for regulators to proactively tee up new spectrum bands for allocation, and, if applicable, assignment. Whether a radio is tethered by Wi-Fi to a fiber optic or coaxial cable or is connected via LTE technology to a mobile operator, from an industry perspective the goal is now the same – gigabit per second speeds will soon be the new requirement to meet consumer demand in digitized economies like Canada. With each passing year, the number of devices per person is rising as homes and businesses become increasingly networked, and device processing power and battery life increase, helping us consume more data. Video – including advanced video technologies – is king. Cisco estimates that total Internet video traffic will be 74 percent of all Internet traffic in Canada by 2021.
3. 5G technology is a clear example of industry driving toward gigabit capacity. As 5G standards develop, it has become clear that 5G service will be provided over a wide range of spectrum bands – low-, mid-, and high-band. Not only that, 5G will integrate different radio access networks, including unlicensed ones. Therefore, 5G spectrum will be regulated under all types of regulatory regimes – licensed, license-exempt, lightly licensed, and shared frameworks. Combined, this variety of spectrum bands and licensing regimes will address 5G gigabit capacity and coverage requirements and enable the deployment of a wide range of 5G services, which in turn will unleash innovation and opportunity. The 3GPP Release 15, the global technical standards for 5G, will come in 2018, with the first 5G networks closely following.²
4. Regulators often discuss licensed and license-exempt frameworks as different, and sometimes competing, regimes. However, that is not necessarily the case from a technology perspective, and certainly is not the case when it comes to 5G. Through standards development work, the industry has already taken the first steps toward

¹ Cisco is deeply committed to Canada. In operation since 1990, Cisco Canada has approximately 1700 employees across the country and offices in Toronto (HQ), Ottawa, Kanata, Montreal, Vancouver, Calgary, Edmonton, Winnipeg and Halifax. Cisco’s Kanata R&D facility is home to approximately 600 employees and is one of only four R&D facilities for Cisco globally. Cisco’s Toronto Innovation Centre, which opened in January 2016 and is focused on digital innovation, is one of nine for Cisco worldwide and the only one in North America.

² 3GPP approved the first Non-standalone 5G NR specifications in December 2017 and plan to complete Release 15 by June 2018. See 3GPP, *First 5G NR Specs Approved* (Dec. 22, 2017), http://www.3gpp.org/news-events/3gpp-news/1929-nsa_nr_5g.

integrating license-exempt networks with licensed networks and will continue to actively evaluate emerging approaches to further integrating Wi-Fi, other unlicensed, and 3GPP-based networks. Already, license-exempt capability (and in particular Wi-Fi capability) embedded in consumer devices shoulders an enormous load and delivers more packets than any other wireless technology.³ As Canada pushes forward to 5G, it must recognize that allocations of license-exempt and licensed bands are not an either/or proposition. Both will be necessary to enable a seamless consumer experience.

5. To this end, and as discussed in more detail below, Cisco views additional mid-band allocations as a key step in providing spectrum for a digitized economy. In the United States, the Federal Communications Commission (“FCC”) is currently considering expanding licensed use of the 3 GHz band (specifically, 3.7-4.2 GHz) as well as license-exempt use in the 5.925-6.425 and 6.425-7.125 GHz bands (“*FCC Mid-Band Proceeding*”).⁴ Cisco supports both of these initiatives, and has been particularly active in evaluating the 6 GHz band (5925-7125 MHz), which Cisco sees as a crucial band for the future of license-exempt applications, particularly Wi-Fi. Cisco urges Canada similarly to consider using the 6 GHz band for license-exempt technologies. If ISED were to permit Wi-Fi and other license-exempt services in the 6 GHz band, it would create additional wide gigabit-capable channels, which are needed both to accommodate next generation services and to help address the increasing congestion in existing license-exempt bands.
6. With regard to other spectrum priorities, there is emerging global consensus that mid-band spectrum, especially bands below 5 GHz, will play an integral role in delivering wide-area capacity and achieving multi-gigabit speeds for 5G enhanced mobile broadband deployments starting globally in 2019.⁵ Cisco strongly supports ISED’s decision to expand its consultation on 3.5 GHz to include a review of 3400-4200 MHz and urges Canada to act quickly to bring those frequencies to market.⁶ As Canada’s neighbor to the south noted recently, “it has become increasingly apparent that the 3.5 GHz Band will play a significant role as one of the core mid-range bands for 5G network deployments throughout the

³ According to Cisco’s 2017 Visual Networking Index (“VNI”), in Canada 54.1 percent of Internet data traffic traveling on fixed links will utilize Wi-Fi in 2021. For mobile networks, consumers are offloading a majority of traffic through their devices to Wi-Fi. The VNI predicts that number will go from 54 percent in 2016 to 65 percent in 2021. See Cisco, *Cisco Visual Networking Index: Forecast and Methodology, 2016-2021*, White Paper (June 6, 2017) (“Cisco White Paper”), <https://www.cisco.com/c/en-us/solutions/collateral/service-provider/visual-networking-index-vni/complete-white-paper-c11-481360.pdf>; Cisco, *VNI Complete Forecast Highlights for Canada* (2016) (“Cisco VNI Forecast”), https://www.cisco.com/c/dam/m/en_us/solutions/service-provider/vni-forecast-highlights/pdf/Canada_2021_Forecast_Highlights.pdf.

⁴ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017) (“*FCC Mid-Band Proceeding*”).

⁵ See Dean Brenner, *On the path to opening more spectrum for 5G in the U.S.*, Oct. 4 2017, Cisco Blogs (Oct. 4 2017) (“*Brenner Blog*”), <https://www.qualcomm.com/news/onq/2017/10/04/path-opening-more-spectrum-5g-us>.

⁶ ISED, *Consultation on the Spectrum Outlook 2018 to 2022*, SLPB-006-17, at para 142 (Oct. 2017) (“*Consultation*”).

world.”⁷ Globally, countries are actively pursuing similar frequency ranges for early 5G deployment. For example, Japan is looking at 3.6 GHz to 4.2 GHz,⁸ China at 3.3 GHz to 3.6 GHz,⁹ and South Korea at 3.4 GHz to 3.7 GHz.¹⁰ Meanwhile, the European Union is looking at 3.4 GHz to 3.8 GHz¹¹ and the United Kingdom is exploring 3.4 GHz to 3.8 GHz.¹²

7. Cisco strongly supports ISED’s commitment to explore the 3.5 GHz band as one of the key bands for future 5G networks. Greater global harmonization leads to better economies of scale for equipment and the ability to have global roaming for 5G. Canada should not delay making the 3400-4200 MHz band available for 5G spectrum.
8. While 3.5 GHz is likely to be crucial to early 5G deployment, high-band millimeter wave spectrum also needs to be allocated for licensed and license-exempt 5G use. In 2016, the United States adopted new rules for the 28 GHz and 39 GHz bands.¹³ More recently, the FCC made an addition 1.7 GHz of new spectrum available for flexible wireless use.¹⁴ Globally, there is interest in 28 GHz with South Korea, and Japan considering 5G uses in that band.¹⁵ Likewise, the 26 GHz and 39 GHz bands have received international

⁷ *Promoting Investment in the 3550-3700 MHz Band*, Notice of Proposed Rulemaking, 32 FCC Rcd 8071, 8072 ¶ 2 (2017) (“FCC 3.5 GHz NPRM”).

⁸ See Ministry of Internal Affairs and Communications, *Japan’s Radio Policy to Realize 5G in 2020* (June 28, 2016), https://www.gsma.com/spectrum/wp-content/uploads/2016/08/MIC_Spectrum-for-5G-MIC-Kuniko-OGAWA.pdf.

⁹ See Patrick Gahan et. al, *The 4G and 5G Spectrum Guide 2017*, at 135-36, PolicyTracker (Oct. 2017), <https://www.policytracker.com/wp-content/uploads/2017/10/4G-and-5G-spectrum-guide-2017-sample.pdf>.

¹⁰ See Business Korea, *South Korean Government to Secure 40 GHz Frequency Width for 10 Years* (Dec. 23, 2016), <http://www.businesskorea.co.kr/english/news/ict/16837-strategic-securement-south-korean-government-secure-40-ghz-frequency-width-10-years>; ZDNet, *South Korea to auction 5G spectrum in June 2018* (Dec. 28, 2017), <http://www.zdnet.com/article/south-korea-to-auction-5g-spectrum-in-june-2018/>.

¹¹ See European Commission, *Radio Spectrum Policy Group Strategic Roadmap Towards 5G for Europe*, at 3 (2016), http://rspg-spectrum.eu/wp-content/uploads/2013/05/RPSG16-032-Opinion_5G.pdf.

¹² See Ofcom, *Ofcom sets rules for mobile spectrum auction*, (July 11, 2017) <https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2017/ofcom-sets-rules-for-mobile-spectrum-auction>; Ofcom, *Improving consumer access to mobile services at 3.6GHz to 3.8GHz* (July, 28 2017), https://www.ofcom.org.uk/data/assets/pdf_file/0017/103355/3-6-3-8ghz-statement.pdf (confirming Ofcom’s intention to expand spectrum access for mobile services in the 3.6 GHz to 3.8 GHz band as the band has been identified by the UK and EU as part of the primary band for 5G).

¹³ *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016).

¹⁴ *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988 (2017). In his accompanying statement, FCC Commissioner Michael O’Rielly notes “I expect [an order in the first half of next year] would deal with the remaining bands that were in the 2016 notice, such as 32, 42, and 50 GHz, and an accompanying notice should, at a minimum, tee up 26 GHz, a band that is highly popular for 5G internationally.” *Id.* at 11122.

¹⁵ Cho Jin-young, *South Korea to Conduct 5G Frequency Auction Next Year*, Business Korea (Nov. 8, 2017), <http://www.businesskorea.co.kr/english/news/ict/19753-5g-frequency-allocation-south-korea-conduct-5g-frequency->

attention.¹⁶ Cisco supports Canada's exploration of the 28 GHz, 37-40 GHz, and 64-71 GHz bands for 5G.¹⁷ While these millimeter wave bands will be vital in the long term, quickly allocating mid-band will be the key to unlocking 5G in the near term. Millimeter wave spectrum will require more time to explore the propagation characteristics and design new chipsets for broad commercial use.

II. Responses to Specific Questions

A. Demand for license-exempt spectrum for all applications – including mobile applications – is growing.

9. The *Consultation* emphasizes that demand for radio frequency spectrum continues to rise, and Cisco is in complete agreement with that assessment. As ISED notes, the Cisco Visual Networking Index ("Cisco VNI")¹⁸ forecasts large growth in IP, smartphone, and Internet traffic between 2016 and 2021.
10. The Cisco VNI concludes that global IP traffic will increase nearly threefold over the next five years. The number of devices connected to IP networks will be three times as high as the global population in 2021. Accelerated in part by the increase in and capabilities of those devices, IP traffic per capita will reach 35 GB by 2021, up from 13 GB per capita in 2016. Also, by 2021, global fixed broadband speeds will reach 53.0 Mbps, up from 27.5 Mbps in 2016. As discussed in the following paragraphs, the forecast trends in Canada are on the same track.

Q2 –Do you agree with the above assessment on demand for commercial mobile services in the next few years? Is there additional information on demand, which is not covered above, that should be considered?

11. As the *Consultation* correctly concludes, "the main driver of mobile data traffic growth is the increasing adoption of smart devices and the bandwidth-intensive application they enable."¹⁹ In addition to seeing mobile data traffic in Canada grow five-fold between 2016 and 2021, the Cisco VNI forecasts that mobile data traffic in Canada will grow 2 times

[auction-next-year](#); Diana Goovaerts, *SoftBank, Ericsson Team Up on 28 GHz 5G Trial in Tokyo*, Wireless Week (Mar. 24, 2017), <https://www.wirelessweek.com/blog/2017/03/softbank-ericsson-team-28-ghz-5g-trial-tokyo>.

¹⁶ See, e.g., Mark Jackson, *Ofcom Refines their UK Choices for Future 5G Mobile Spectrum Bands*, ISP Preview (Feb. 8, 2017), <https://www.ispreview.co.uk/index.php/2017/02/ofcom-refines-uk-choices-future-5g-mobile-spectrum-bands.html>; *Brenner Blog*.

¹⁷ ISED, *Consultation on Releasing Millimetre Wave Spectrum to Support, 5G*, SLPB-001-17, at para 1 (June 2017).

¹⁸ Cisco White Paper; Cisco VNI Forecast.

¹⁹ *Consultation* at para 35 (citation omitted).

faster than Canadian fixed IP traffic from 2016 to 2021.²⁰ Twenty percent of all networked devices in Canada will be mobile-connected in 2021.²¹ While this growth in mobile data traffic is mainly attributable to smartphones, which constitute the bulk of devices, and use of those smartphones on 4G networks – there is a growing diversity of use cases that licensed mobile networks are going to need to serve in the future – use cases that 5G is designed to accommodate.

12. Mobile video applications already consume a majority of traffic on Canadian mobile networks. In 2016, already 64 percent of mobile traffic in Canada is used for video,²² and that use continues to climb.²³ Nevertheless, over the next five years, these same mobile networks will also have to service an explosion in M2M devices. Of the 81 million mobile-connected devices that will be in use in 2021, 45 million will be M2M compared to 30 million smartphones.
13. Cisco agrees with the *Consultation* that an increased number of M2M devices will have a significant impact on mobile subscribership.²⁴ The Cisco VNI forecasts that by 2021 M2M modules will account an additional 17 percent of all networked devices in Canada.²⁵ M2M traffic is very different from the typical consumer smartphone use case. While the Cisco VNI projects the growth curve in M2M traffic will be quite large,²⁶ the amount of traffic those devices will consume is a fraction of what consumers will use on smartphones.
14. Additionally, the *Consultation* is correct that the “majority of IoT devices are expected to use licence-exempt spectrum to communicate” with other devices.²⁷ As these use cases grow – connected cars, telemedicine, wearable technology, smart cities, and other IoT and M2M applications – and consumers begin to rely extensively on these devices and applications, there will be more diversity in the ways consumers use mobile networks. Each of these cellular connected applications has varied requirements in terms of bandwidth, latency, security and continuous network availability for communication.²⁸ Canada should promote access to a diverse range of frequency bands and different types of licensing schemes in order to meet the growing commercial mobile service demand.

²⁰ See Cisco VNI Forecast.

²¹ *Id.*

²² In 2016, 47 petabytes/month in 2016 was used for video out of a total of 73.2 petabytes/month. See *id.*

²³ By 2021, Cisco forecasts that 224 petabytes/month out of a total of 340 petabytes/month will be used for video. See *id.*

²⁴ *Consultation* at para 33.

²⁵ See Cisco VNI Forecast.

²⁶ The Cisco VNI predicts that M2M traffic is expected to have a 77 percent Compound Annual Growth Rate in Canada.

²⁷ *Consultation* at para 46.

²⁸ Shruti Jain, *Imagining 5G: The Future Network of “Things.” The Evolving Landscape of IoT and Wearables*, Cisco Blogs (Apr. 12, 2017), <https://blogs.cisco.com/sp/imagining-5g-the-future-network-of-things-the-evolving-landscape-of-iot-and-wearables>.

Q5 – Do you agree with the above assessment of demand for licence-exempt spectrum in the next few years? Is there additional information regarding demand, which is not covered above, that should be considered? If so, please explain in detail.

Q8 – Will the trend for offering carrier-grade or managed Wi-Fi services continue to increase over the next five years? If so, will this impact congestion in Wi-Fi bands and which bands would be most affected?

15. Cisco applauds ISED for its recognition of the importance of license-exempt spectrum. Cisco agrees with ISED that license-exempt spectrum plays a critical role in enabling connectivity, particularly because of mobile offload.²⁹ In recent years, there has been rapid growth of Wi-Fi-enabled devices, and Wi-Fi traffic will continue to increase as that growth escalates. Indoor use cases and indoor demand continue to be the heaviest uses of Wi-Fi technologies, but outdoor use is critical for applications such as smart city networks. Therefore, Wi-Fi technologies need both more “megahertz” – access to bandwidth – followed closely by more “milliwatts,” for outdoor use that requires more power.³⁰
16. Today, the Wi-Fi capability embedded in consumer devices is responsible for a tremendous amount of mobile data delivery. As the *Consultation* notes, by 2021, 75 percent of Canada’s mobile data traffic will be offloaded, which is a four percent increase over 2016.³¹ The amount of traffic offloaded from smartphones will be 78 percent by 2021, compared to 69 percent at the end of 2016. Smartphone users, who represent the significant majority of devices and traffic on mobile networks, will become even *more* reliant on license-exempt spectrum.³²
17. Not only will mobile offload continue to place pressure on the spectrum available for license-exempt use, other demands for license-exempt spectrum are on the rise. Of all IP traffic (fixed and mobile) in Canada, by 2021, 55 percent will be Wi-Fi, while only 38 percent will be wired, and 7 percent will be mobile.³³ M2M modules will account for 67 percent (271.4 million) of all networked devices in 2021, compared to 50 percent (115.5 million) in 2016.³⁴ One recent study concluded that, by 2025, nations should be looking to

²⁹ *Consultation* at para 45.

³⁰ Comments of Cisco Systems, Inc., GN Docket No. 17-183, at 5 (Oct. 2, 2017) (“Cisco Comments to *FCC Mid-Band Proceeding*”), <https://www.fcc.gov/ecfs/filing/100293260257>.

³¹ *Consultation* at para 50.

³² While less important as there are less tablets equipped for mobile use, the amount of traffic offloaded from tablets will be 84 percent by 2021, compared to 87 percent at the end of 2016. *See* Cisco VNI Forecast.

³³ This is an increase from 2016 when 42 percent was Wi-Fi, 54 percent was wired, and 4 percent was mobile. *Id.*

³⁴ *Id.*

add between 500 MHz and up to 1 GHz of spectrum for license-exempt technologies to satisfy the “widely expected growth in traffic.”³⁵

18. As ISED considers allocating more spectrum for license-exempt use, it may be worthwhile to note that the average Wi-Fi speeds are slower in Canada than in the United States. While the technology shipping into Canada is no different from that going to the United States, in 2016 Canada saw an average Wi-Fi speed of 21.8 Mbps to the U.S.’s 28.1. Forecasting to 2021, Cisco predicts that Canada may see speeds of 47.4 Mbps to the U.S.’s 55.5 Mbps. Cisco believes there are two reasons for the discrepancy between these speeds. First, the United States revised its rules for the 5 GHz Band in 2014 to make the band more flexible for license-exempt use at 5150-5250 MHz as compared to Canada’s 5 GHz Band rules. For example, in contrast to rules in the United States, Canada’s rules allow service providers to use higher power and operate outdoors, but no other category of user can do so.³⁶ ISED opened a consultation on revisions to 5 GHz spectrum in January of 2017.³⁷
19. Second, average Wi-Fi speeds in Canada are slower than in the United States because Canada has allocated 5600-5650 MHz solely for weather radars, and has not been willing to entertain a conversation about whether a modified form of dynamic frequency selection (“DFS”) used in the United States or other regulatory approaches could open that band to shared license-exempt use. As a result, equipment that could use 80 MHz-wide or even 160-MHz wide channels in the United States must drop back to 20 MHz wide or 40 MHz wide channelization in Canada to accommodate the weather radars. Canada lacks contiguous spectrum that can support existing 802.11ac and future 802.11ax, both of which use 80/160 MHz wide channels. As we pointed out in previous comments before ISED, “Canadian consumers today have access to only five 80 MHz wide channels, and no contiguous 160 MHz channels are available for use outdoors. In addition, the 80 MHz channel contained within the 5150-5250 MHz band is today permitted only at very low power. Canadians are therefore only able to make limited use of the latest generation of Wi-Fi.”³⁸
20. Cisco noted in its *5 GHz Consultation* comments that “[d]istinguished economists have studied regulatory systems that support widespread Wi-Fi, and found that such regimes contribute to positive changes in Gross Domestic Product. Consumers and businesses alike demand robust Wi-Fi, and the technology has become key to business operations as varied

³⁵ See Steve Methley & William Webb, *Wi-Fi Spectrum Needs Study Final Report*, Quotient Associates (Feb. 2017), https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi%20Spectrum%20Needs%20Study_0.pdf.

³⁶ ISED, *Consultation on the Technical and Policy Framework for Radio Local Area Network Devices Operating in the 5150-5250 MHz Frequency Band*, SMSE-002-17, at para 21 (Jan. 2017) (“*5 GHz Consultation*”). In Cisco’s comments it urges ISED to “reform its rules for indoor operations to allow devices to operate up to 1W conducted power.” See also Comments of Cisco, Canada Gazette Notice No. SMSE-002-17, at 23 (Mar. 29, 2017) (“*Cisco Comments to 5 GHz Consultation*”), [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-002-17-Cisco.pdf/\\$FILE/smse-002-17-Cisco.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-002-17-Cisco.pdf/$FILE/smse-002-17-Cisco.pdf).

³⁷ See *5 GHz Consultation*.

³⁸ Cisco Comments to *5 GHz Consultation* at 11.

as manufacturing to banking to agriculture.”³⁹ As demand for Wi-Fi continues to soar, Cisco respectfully urges to ISED to take opportunities to expand access to license-exempt spectrum suitable for the evolving demands of IEEE 802.11ac and 802.11ax.

Q21 – Are there any other bands that should be considered for release in the next five years for commercial mobile, fixed, satellite, or licence-exempt that are not discussed above? Provide rationale for your response.

Q22 – Are there specific frequency ranges/spectrum bands that should be made available for specific applications?

B. Opening the 6 GHz Band for a broad range of license-exempt uses is critical to supporting mobile networks, Wi-Fi, and IoT applications in the near term.

21. As noted above, Cisco recommends that ISED consider releasing the 6 GHz Band for broader license-exempt use between 2018 and 2022. By opening the 6 GHz Band (5925-7125 MHz) to license-exempt use, ISED can support innovation and investment stimulated by access to license-exempt spectrum – which will play an increasingly important role the world moves toward 5G.⁴⁰ As stakeholders work toward next generation wireless standards and devices, ISED and other regulating bodies should provide regulatory certainty as to the available spectrum for license-exempt uses – regulatory certainty that will promote harmonization, increased innovation, and economies of scale.
22. The *Consultation* notes that the C-band (3.5 GHz-7 GHz) is used extensively for the delivery of satellite services and backhaul. Additionally, the *Consultation* states, “[as] a result of these [downward] trends, and the expectation of a surplus of C-band capacity in Canada, there is an opportunity to consider how C-band will be used in the future.”⁴¹ Cisco commends ISED for its ongoing exploration of alternative uses in the 3.5 GHz Band⁴² and recommends that Canada also consider allocating the 6 GHz band to license-exempt use.
23. Allowing Wi-Fi and other license-exempt services in the 6 GHz band would create the wide gigabit-capable channels needed for next generation services – currently lacking in Canada – and would address the increasing congestion as existing licensed and license-

³⁹ *Id.* at 3.

⁴⁰ See 5G Workgroup, *5G Networks - The Role of Wi-Fi and Unlicensed Technologies*, White Paper, Wireless Broadband Alliance (Sept. 2017), <https://www.wballiance.com/resources/wba-white-papers/>; Intel, *Alternative LTE Solutions in License-exempt Spectrum: Overview of LWA, LTE-LAA and Beyond*, White Paper (2016), <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/unlicensed-lte-paper.pdf>; 5G Americas, *Wireless Technology Evolution Towards 5G: 3GPP Release 13 to Release 15 and Beyond* (Feb. 2017), http://www.5gamericas.org/files/3214/8833/1313/3GPP_Rel_13_15_Final_to_Upload_2.28.17_AB.pdf.

⁴¹ *Consultation* at para 75.

⁴² *Id.* at para 142.

exempt bands strain under the pressure of exploding demand. An indisputable need for more license-exempt spectrum exists in order to support the growing reliance on such spectrum by consumers.⁴³ The 6 GHz band presents an opportunity to extend license-exempt technology from the 5 GHz to the 6 GHz band, thereby enabling users to take advantage of the wider channels that are needed to support new technologies.⁴⁴

24. Now is a crucial time for ISED to consider opening the 6 GHz band to license-exempt. The next generation of Wi-Fi is currently under development.⁴⁵ If regulatory bodies act swiftly to acknowledge an intent to make 6 GHz spectrum available for license-exempt, 6 GHz standards work can continue to incorporate the band into the Wi-Fi IEEE 802.11ax standard in the near term, thus hastening widespread consumer adoption. Wi-Fi throughout the 6 GHz band could be integrated into unified 5/6 GHz chipsets, which reduce the cost of devices by eliminating the need for multiple chips in the same device.⁴⁶
25. Harmonization, where possible, promotes investment in technology through economy of scale. Currently, the United States is considering changes to the 6 GHz Band and has sought comment on potentially expanding the use of the lower and upper parts of the band (5.925-6.425 and 6.425-7.125 GHz respectively).⁴⁷ Across the board, the license-exempt industry supports opening the entire 6 GHz Band for license-exempt use and suggests that sharing and mitigation techniques can protect important incumbent operations.⁴⁸ These companies recognize that access to the 5925-7125 MHz is essential to meeting demand for the next generation of wireless broadband services. Cisco urges ISED to follow that proceeding and consider adopting a similar approach allocation in Canada.

⁴³ See Cisco VNI Forecast.

⁴⁴ See, e.g., Reply Comments of Cisco Systems, Inc., GN Docket No. 17-183, at 4 (Nov. 15, 2017) (“Cisco Reply Comments to *FCC Mid-Band Proceeding*”), https://ecfsapi.fcc.gov/file/11151194522534/6%20GHz%20Cisco%-20Reply%20Comments%20FINAL_FILED.pdf.

⁴⁵ The Task Group recently voted to extend coverage to the 6 GHz Band. See Rich Kennedy, Abstract, IEEE P802.11 Wireless LANs: P802.11ax PAR Modification (July 12, 2017), <https://mentor.ieee.org/802.11/dcn/17/11-17-0913-02-00ax-parmodification-to-support-6-ghz-band.docx>.

⁴⁶ Comments of Broadcom LTD, GN Docket No. 17-183, at 9 (Oct. 2, 2017), [https://ecfsapi.fcc.gov/file/-1003282087421/Broadcom%20Mid%20Band%20NOI%20Comments%20\(Oct%202%202017\).pdf](https://ecfsapi.fcc.gov/file/-1003282087421/Broadcom%20Mid%20Band%20NOI%20Comments%20(Oct%202%202017).pdf).

⁴⁷ See generally *FCC Mid-Band Proceeding*, 32 FCC Rcd 6373.

⁴⁸ See, e.g., Reply Comments of Apple Inc. et al., GN Docket No. 17-183, at 3-4 (Nov. 15, 2017) (“Reply Comments of Apple et al. to *FCC Mid-Band Proceeding*”), [https://ecfsapi.fcc.gov/file/1115055714181/Mid%20Band%20-NOI%20Reply%20Comments%20\(final\).pdf](https://ecfsapi.fcc.gov/file/1115055714181/Mid%20Band%20-NOI%20Reply%20Comments%20(final).pdf) (citations omitted) (“A broad group of industry leaders, including broadcasters, mobile and wireless service providers, chip and device manufacturers, technology companies, standards bodies, trade organizations and alliances, and the public and non-profit sectors support the Commission’s proposal to open additional mid-band spectrum for wireless broadband.”); Cisco Reply Comments to *FCC Mid-Band Proceeding* at 3 n. 2.

26. Commenters in the *FCC Mid-Band Proceeding* point out that “[u]nlicensed broadband operations are especially well suited to operating in the 6 GHz band.”⁴⁹ Furthermore, those commenters note that adding license-exempt broadband use would allow incumbent backhaul and satellite services to “grow and manage their networks in the future without imposing any new coordination obligations or other limits on licensees – while substantially increasing the overall use and value of the band, due to its proximity to the widely used 5 GHz [license-exempt] bands.”⁵⁰ They further note, quite correctly, that license-exempt services have an extensive track record of sharing with a wide range of incumbent users, and they have a successful history of implementing mitigation measures.⁵¹ All of these observations are as true with respect to Canada as they are for the United States.
27. In the *FCC Mid-Band Proceeding*, Cisco is part of a coalition of companies that propose a framework for license-exempt use of the 6 GHz band.⁵² Something similar to the framework proposed by the coalition could also work in Canada. Specifically, the coalition proposes that fixed outdoor operations should be permitted in 5925-6425 MHz, 6525-6875 MHz, and, subject to further inquiry, 6875-7125 MHz, with a different set of proposed rules for low power, high power, and highly directional operations, including fixed point-to-point and steerable point-to-point devices.⁵³ Meanwhile, low-power fixed outdoor operations should be permitted subject to highly protective, but simple-to-implement technical restrictions as a fixed gain limit and an antenna height restriction that will ensure that low-power deployments do not extend above the roofline.⁵⁴ In addition, to protect terrestrial incumbents, higher-power outdoor devices should implement a mechanism for affirmatively verifying, before transmitting, to determine whether they could operate on a given channel, in a given location, without causing harmful interference to incumbent licensees.⁵⁵ For indoor access points and other fixed devices, the coalition suggests that fixed indoor operations should be permitted at power levels higher than low-power fixed

⁴⁹ Comments of All Points Broadband et al., GN Docket No. 17-183, at 4 (Oct. 2, 2017) (“Comments of All Points, et al. to *FCC Mid-Band Proceeding*”), [https://ecfsapi.fcc.gov/file/10030766909973/Mid%20Band%20NOI%20Comments%20\(10%202%2017\).pdf](https://ecfsapi.fcc.gov/file/10030766909973/Mid%20Band%20NOI%20Comments%20(10%202%2017).pdf).

⁵⁰ *Id.*

⁵¹ Comments of All Points, et al. to *FCC Mid-Band Proceeding* at 10.

⁵² See generally Reply Comments of Apple et al. to *FCC Mid-Band Proceeding*.

⁵³ *Id.* at 18.

⁵⁴ Reply Comments of Apple et. al. to *FCC Mid-Band Proceeding* at 18-19. Low power fixed outdoor operations would operate as an adjunct to an indoor system (e.g., restaurant patio, garden center) and could include antenna security provisions that ensure these devices will be deployed in their intended use case. Cisco Reply Comments to *FCC Mid-Band Proceeding* at 7.

⁵⁵ See Reply Comments of Apple et. al. to *FCC Mid-Band Proceeding* at 19. For example, Cisco notes that for high power fixed access points operating outdoors, an automated mechanism could be designed to ensure higher powered outdoor devices are not placed in proximity to incumbent transceivers such that harmful interference would result. Cisco Reply Comments to *FCC Mid-Band Proceeding* at 7.

outdoor devices.⁵⁶ Meanwhile, client devices could operate at power levels similar to those that currently apply to client devices in 5.150-5.250 GHz.⁵⁷

28. Cisco believes that something akin to this framework would be beneficial to Canadian spectrum policy and is an essential step toward finding additional spectrum to support the growing need for license-exempt applications – including for mobile offload. Although the 6 GHz spectrum is also used for satellite uplink, harmful interference from license-exempt operations is unlikely to affect satellite uplink performance – and the overwhelming benefits Canadians could reap from having additional access to license-exempt spectrum for Wi-Fi make this band worth exploring in the very near term.⁵⁸

C. Canada should diligently promote innovative spectrum models that allow enterprise users to meet future technology and business needs for private, lightly licensed 5G networks.

29. With the explosion of use cases made possible with new technologies, different licensing frameworks are needed to support new and efficient uses of spectrum. Today, enterprises typically use unlicensed spectrum or deploy on licensed spectrum via arrangements with a mobile operator. While enterprise use of licensed and unlicensed spectrum will not be disappearing, enterprises are increasingly encountering a need for private networks – particularly 5G networks – that provide greater quality control and security than is possible when operating either on unlicensed spectrum or on a carrier network.⁵⁹ In a fully digitized economy, enterprises will need to rely more intensively on spectrum to conduct business, and some enterprises may be unwilling to employ shared unlicensed spectrum or outsource that management to third parties because the performance, reliability, and security of the spectrum network will be critical to the success of their business.⁶⁰ Enterprise uses could

⁵⁶ See Reply Comments of Apple et. al. to *FCC Mid-Band Proceeding* at 20.

⁵⁷ *Id.* at 21.

⁵⁸ See Reply Comments of Apple et. al. to *FCC Mid-Band Proceeding* at 19, n.62 (“Aggregation of [license-exempt] emissions and interference from other satellite uplinks – recognizing that other satellite transmissions produce far more energy than [license-exempt] devices would radiate upwards towards space – may, together, pose a somewhat higher, but very low risk of interference.”).

⁵⁹ See, e.g., Gabriel Brown, *The Emergence of Private LTE Networks*, Light Reading (July 10, 2017), <http://www.lightreading.com/mobile/5g/the-emergence-of-private-lte-networks/a/d-id/734418> (“[N]ew scaled-down, designed-for-purpose enterprise LTE systems are now emerging as the preferred wireless platform for enterprises with production-critical automation and mobility needs.”); Bob Brown, *CBRS: Your ticket for building a private enterprise LTE wireless network; Whirlwind of activity around sharing 3.5 GHz spectrum could help pave way to 5G wireless networks*, Network World (Mar. 14, 2017), <https://www.networkworld.com/article/3179784/-mobile-wireless/the-big-cbrs-promise-private-enterprise-lte-wireless-networks.html> (describing the opportunity for private LTE networks in the 3.5 GHz band and the path such 4G networks could provide to 5G and noting that private LTE networks supporting IoT applications in factories and refineries could very well start emerging in 2018).

⁶⁰ See, e.g., Neville Meijers, *Private LTE networks for industrial IoT – how spectrum sharing will expand the LTE ecosystem*, Qualcomm Blog (May 16, 2017), <https://www.qualcomm.com/news/onq/2017/05/16/private-lte-networks-industrial-iot-how-spectrum-sharing-will-expand-lte>.

be over large areas (a port or corporate campus) or over smaller areas (such as interior offices).⁶¹ For example, the Port of Los Angeles is currently “pioneering the digitization of the maritime supply chain,” but to do so, it needs “the ability to secure and access spectrum.”⁶² Other applications could include connectivity of radar and security equipment, card readers, door sensors, forklifts, or robots and handling equipment. For these reasons, there need to be options within the spectrum plan that allow secure and reliable private network use by large and small enterprises.

30. One key to supporting innovative enterprises is making spectrum available on a lightly licensed basis in footprints other than the wide area networks that mobile operators utilize today. In comments to the FCC, General Electric has noted that obtaining sufficient localized wireless and telecommunications capability is “arguably the most significant obstacle” to the deployment of Industrial Internet of Things (“IIoT”) applications.⁶³ The Citizens Broadband Radio Service (“CBRS”) in the United States is an example of how smaller footprints can support more localized uses. The 3.5 GHz Band currently consists of geographic licenses at the census tract size, which appeals to a variety of users.⁶⁴ The smaller licenses and innovative design of the CBRS framework – with three tiers of licenses managed in real time by Spectrum Access Systems (SAS) and Environmental Sensing Capability (ESC) sensors – will promote the deployment and operation of the 5G private networks that enterprise users will be demanding.
31. Another band that may be ripe for an allocation in Canada is the 7.125-7.250 GHz band. Cisco proposes that this band could be licensed as a site-based, lightly licensed band, with technical rules that would permit the use of license-exempt technology. Cisco believes a

⁶¹ See, e.g., *Nokia Use Case: Private LTE-based networks for terminal operators* (2017), https://onestore.nokia.-com/asset/201798/Nokia_Transportation_Port_Operators_Use_Case_Study_EN.pdf (describing how private LTE-based networks are the only technologies that meet a smart port’s needs).

⁶² Letter from Eugene D. Seroka, Executive Director, The Port of Los Angeles, to Ajit Pai, Chairman, Federal Communications Commission et al., GN Docket No. 17-258, at 1 (Jan. 29, 2018), <https://ecfsapi.fcc.gov/file-/10130175617834/Port%20of%20Los%20Angeles%20Comments--01-29-18.pdf>.

⁶³ See Reply Comments of General Electric Company, GN Docket No. 17-258, at 15-16 (Jan. 29, 2018), <https://ecfsapi.fcc.gov/file/10129963418038/GE%20Reply%20Comments%20filed%20012918.pdf> (“Reliance on self-provisioned private LTE networks is a better option for industrial and critical-infrastructure entities and other enterprises than obtaining services from traditional mobile operators or mobile virtual network operators.”).

⁶⁴ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Notice of Proposed Rulemaking, 30 FCC Rcd 3959, 3991 ¶ 96 (2015). The FCC is currently considering proposals to adjust the geographic size of the licenses as some parties have requested larger licenses to promote carrier-based wide area networks. See *FCC 3.5 GHz NPRM*, 32 FCC Rcd 8071. Many parties oppose the modifications to the census tract geographic licenses. See, e.g., Comments of Google LLC, GN Docket No. 17-258, at 8-9 (Dec. 28, 2017), [https://ecfsapi.fcc.gov/file/1228947009689/Google%203.5%20GHz%20-Comments%20\(FINAL\).pdf](https://ecfsapi.fcc.gov/file/1228947009689/Google%203.5%20GHz%20-Comments%20(FINAL).pdf) (explaining that larger license areas are not economically justifiable investments for potential licensees with geographically targeted services, such as industrial IoT operators and venue owners); Comments of the Rural Wireless Association, Inc., GN Docket No. 17-258, at 2-3 (Dec. 28, 2017), [https://ecfsapi.-fcc.gov/file/12292971521522/RWA%20CBRS%20NPRM%20Comments%20\(12-28-17\)%20FINAL.pdf](https://ecfsapi.-fcc.gov/file/12292971521522/RWA%20CBRS%20NPRM%20Comments%20(12-28-17)%20FINAL.pdf) (noting that larger license sizes would foreclose many new entrants and rural providers, and the lower capital investment associated with smaller service areas promotes innovative, low power uses).

new framework for the 7.125-7.250 GHz band is worthy of further discussion during the period addressed in the *Consultation*.

32. As Canada determines its near-term spectrum plans, Cisco strongly suggests that it consider forms of lightly licensed spectrum for broadband that can be made available in geographic footprints attractive to enterprise users. Meeting future spectrum needs for the greatest number of use cases requires service rules that provide licensees with the ability to restrict unauthorized users but still permits the deployment of today's license exempt technology.

III. Conclusion.

33. Cisco thanks ISED for the opportunity to comment on the *Consultation*. In particular, we commend ISED for its commitment to unleashing spectrum that can be used to support next-generation technologies, and we urge ISED to continue those efforts in consideration of Cisco's comments above.

Respectfully submitted,

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