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DSA
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To: Infocomm Development Authority of Singapore (IDA)
Attn: Ms Aileen Chia
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From: Dynamic Spectrum Alliance

Date: June 18, 2014

Re: Comments for IDA Consultation on Proposed Allocation of Spectrum for International Mobile Telecommunications ("IMT") and IMT-Advanced Services and Option to Enhance Mobile Competition

About the Dynamic Spectrum Alliance

The Dynamic Spectrum Alliance is a global, cross-industry alliance focused on increasing dynamic access to unused radio frequencies. The membership spans multinational companies, small- and medium-sized enterprises, academia, research, and other organizations from around the world, all working to create innovative solutions that will increase the utilization of available spectrum to the benefit of consumers and businesses alike.[1]

Introduction

Usage of wireless networks both in Singapore and globally is skyrocketing. The Cisco Visual Networking Index predicts that mobile IP traffic globally will increase eleven-fold over the next five years, and traffic from wireless devices will constitute the majority of all IP traffic by 2016.[2] Meeting this demand is essential to promoting technological innovation and economic growth. To enable the next wave of innovation in the wireless sector and in the broader global economy and to address growing consumer demand for voice, video, and data applications, IDA should support policies that enable robust access to hundreds more megahertz of both licensed

[1] A full list of members is available at www.dynamicspectrumalliance.org/members.html.

[2] *See* Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update: Forecast and Methodology, 2013–2018, http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html; Cisco Visual Networking Index: Forecast and Methodology, 2012–2017 at 1-2 (May 29, 2013), *available at* http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.pdf.

and unlicensed (or "license-exempt") spectrum both above and below 1 GHz and that enable dynamic spectrum sharing as a way of improving spectrum utilization.

1. Policies should enable robust access to both licensed and unlicensed spectrum.

Enabling access to both licensed and unlicensed spectrum is key to meeting increasing spectrum demands. In the past, a balanced approach has fueled the wireless economy, benefiting consumers, innovators, and investors. Exclusive access to licensed spectrum provides the certainty major operators need to make large investments in their wide-area networks, while broad eligibility for access to unlicensed spectrum fosters widespread contributions to innovation and investment in emerging technologies. For instance, because unlicensed devices are "free from the burden of normal delays associated with the licensing process," manufacturers can design equipment to "fill a unique need [that can] be introduced into the market quickly."[3] Thousands of new unlicensed devices are certified each year. Wi-Fi devices are the best known, but Bluetooth,[4] Zigbee,[5] and RFID[6] devices have all also experienced rapid growth in the last several years. Machine-to-machine technologies, which often rely on unlicensed spectrum, represent a large and growing market as well.

Unlicensed use also complements licensed use. For example, "the availability of Wi-Fi networks in many locations . . . enable[s] users to take much of their data off of a licensed network," benefiting users by enabling faster service and reducing congestion for licensed operators.[7] For smartphones and tablets in particular, Cisco has found that "daily data consumption over Wi-Fi is four times that of cellular."[8] This ability to offload data from cellular networks to Wi-Fi has saved mobile network operators billions of dollars in network deployment costs.[9] The Wi-Fi experience also makes clear that greater availability of unlicensed spectrum

[3] Kenneth R. Carter, Ahmed Lahjouji, & Neal McNeil, United States Federal Communications Commission, *Unlicensed and Unshackled: A Joint OSP-OET White Paper on Unlicensed Devices and Their Regulatory Issues*, OSP Working Paper Series at 5 (May 2003).

[4] Bluetooth is a standard facilitating hands-free operation of music players, mobile phones, and other devices.

[5] Zigbee powers technologies that benefit from ad hoc and mesh networking solutions, such as home automation.

[6] Radio Frequency Identification (RFID) technologies are used in a variety of industries to track inventory or other objects.

[7] Federal Communication Commission, *The National Broadband Plan* 95 (2010), *available at* www.broadband.gov.

[8] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update: Forecast and Methodology, 2013–2018, at 20.

[9] Mark Cooper, Efficiency Gains and Consumer Benefits of Unlicensed Access to the Public Airwaves, at iii, 15-18 (Jan. 2012) (finding that offloading lowers operator costs by approximately $26 billion per year); European Commission, *Study on the Importance of Wi-Fi & the Socioeconomic Benefits of Using Small Cell Infrastructures*, Aug. 1, 2013, *available at* http://ec.europa.eu/digital-agenda/en/news/study-importance-wi-fi-socioeconomic-benefits-using-small-cell-infrastructures, at 5 (finding that offloading

increases both demand for and the utility of licensed spectrum. Wi-Fi availability has enabled consumers to use their phones and tablets more intensively to access online content and services. Use and development of these online services in turn drives demand for licensed and unlicensed network access, creating a virtuous cycle of investment in content, services, and applications.

For all these reasons, policy should support robust access to both licensed and unlicensed spectrum at a variety of high, medium, and low frequencies. Just as licensed and unlicensed access are complementary means of meeting growing spectrum demand, access to spectrum at different frequency ranges is essential to meeting users' varied needs. Lower frequencies enable non-line-of-sight transmission over longer distances, through walls, foliage, and other obstructions. Higher frequencies are ideal for greater transmission capacity over short distances. With a variety of licensing approaches over a range of frequencies, hardware developers and service providers can better and more cost-effectively meet the needs of businesses and consumers, and use spectrum more efficiently.

2. To meeting increasing demand IDA should encourage spectrum sharing.

Given the rapidly increasing demand for spectrum to support wireless services, policymakers will not be able to meet urgent needs solely through clearing and repurposing spectrum. As it considers making more licensed spectrum available on an exclusive use basis for IMT, IDA should also consider enabling expanded dynamic access to unassigned or otherwise unused radio frequencies, to the extent technically feasible. For example, the IDA should consider enabling dynamic access to unused 3.5 GHz frequencies in a manner similar to what has been proposed by the Federal Communications Commission in the United States. Likewise, IDA should also allow unlicensed access to the guard bands in the 700 MHz frequencies, with technical rules similar to those being consider for the TV white spaces and for the 600 MHz frequencies. In doing so, IDA can benefit from the economies of scale in devices being manufactured for other markets.

Spectrum sharing is an attractive supplement to spectrum clearing for several reasons. First, sharing allows efficient use of spectrum. For example, as the United State Federal Communications Commission has recognized through its efforts to open up the television white spaces for unlicensed use, its decision to enable nationwide unlicensed access to guard bands in the 600 MHz frequencies, and its proposal to enable spectrum sharing in the 3.5 GHz band,[10] sharing does not displace existing users; it allows new devices and services to take advantage of spectrum that otherwise would be unused. Spectrum sharing strategies, such as dynamic

reduced the network costs of European network operators by 35 billion euros in 2012, with savings expect to rise to as much as 200 billion euros in 2016).

[10] *See generally* Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Docket No. 12-268, *Notice of Proposed Rulemaking*, 27 FCC Rcd 12357 (2012) (Incentive Auction NPRM); Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Docket No. 12-268, *Report and Order*, FCC 14-50 (rel. Jun. 2, 2014) (Incentive Auction Report and Order); Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket No. 12-354, *Notice of Proposed Rulemaking*, 27 FCC Rcd 15594 (2012).

frequency sensing, geo-location databases, and other techniques, thus make the most of a limited resource.

Likewise, other regulators, such as UK Ofcom, Industry Canada, and Singapore IDA, as well as the European Commission's Radio Spectrum Policy Group, have recognized the economic and social value that can be derived from increased dynamic access to finite spectrum resources. Through trials and pilots, many other regulators around the world are looking at whether and how to enable opportunistic access to unused frequencies. Moreover, with critical support from Singapore, at the World Telecommunications Development Conference, the Member States of the International Telecommunications Union – Development Sector adopted a modified resolution (Resolution 9) which resolves to consider new spectrum-sharing approaches and "compile case studies and collect best practices regarding national uses of shared spectrum access, including DSA, and study the economic and social benefits arising from the effective sharing of spectrum resources."

Second, spectrum sharing can make additional spectrum for wireless services available relatively quickly. The process of clearing incumbents and auctioning exclusive licenses can be lengthy and complicated. Spectrum sharing minimizes delays by leaving incumbent operations in place. Further, spectrum sharing can be utilized in times of transition between clearing and auctioning—for example, databases can enable temporary access to available spectrum before new licensed services become operational.[11] This flexibility has been demonstrated recently in the Philippines, where the Philippine Government has deployed TV white space radios and connectivity in aid of earthquake and typhoon recovery in Bohol and Tacloban, respectively.[12]

Third, spectrum sharing is proven. Networks relying on shared spectrum have been deployed successfully in the United States.[13] In South Africa, Google's Cape Town trial delivered broadband over vacant broadcast spectrum with a minimum data rate of 2.5 Mbps and peak data rates of 10 Mbps to 10 secondary schools at distances between 3 and 6 kilometers of a base station, without causing harmful interference to incumbent services. Similar and even better performance measurements have been observed in other trials around the world, in locations as diverse as the United States, the United Kingdom, Singapore, Japan, Korea, the Philippines, Kenya, Tanzania, and Malawi. Importantly, these trials and pilots around the world have achieved excellent performance without causing any harmful interference to incumbent licensees.

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[11] *See* Michael Calabrese, *Use it or Share it: Unlocking the Vast Wasteland of Fallow Spectrum* (2011), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1992421; *see also* Incentive Auction NPRM at ¶ 405.

[12] *See, e.g.*, Pia Ranada, *TV White Space connects Bohol fisherfolk to the Net*, Rappler, Apr. 7, 2014, *available at* http://www.rappler.com/nation/54742-tv-white-space-fisherfolk-bohol.

[13] Amar Toor, *North Carolina launches FCC-approved TV White Space network in Wilmington*, Engadget, Jan. 30, 2012, http://www.engadget.com/2012/01/30/north-carolina-launches-fcc-approved-tv-white-space-network-in-w/

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As IDA considers potential updates to its spectrum policies, it should consider those policies' long-term economic impact. Spectrum policies will remain with us for years to come, while technology and innovation are constantly changing. Over the course of the last several decades, there are abundant examples of the tremendous economic growth created through innovation and entrepreneurship when new spectrum is made available – increasingly leveraging dynamic sharing technologies and techniques. The best policies are those that invite and enhance such innovation, economic growth, and competition across wireless applications, devices, and services.[14]

In summary, in order to enable continued growth and innovation in wireless technologies we urge IDA to support policies that increase the amount of unlicensed and licensed spectrum available for wireless use. In particular, IDA should enable unlicensed and licensed spectrum both above and below 1 GHz and support dynamic spectrum sharing as a way to make the most of this finite resource. We look forward to working together on policies that power tomorrow's wireless economy.

Respectfully submitted,

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[14] In making policy, IDA should also recognize that sufficient access to shared or unlicensed spectrum is a critical precondition for successful deployment, just as sufficient access to spectrum is a precondition for the development of licensed services. Device and chip manufacturers hesitate to commit resources to new bands and technologies until there is certainty that sufficient spectrum will be available.