16-Sep-2013

Ms. Aileen Chia
Deputy Director General (Telecoms and Post)
Infocomm Development Authority of Singapore
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Dear Ms. Chia,

CONSULTATION ON PROPOSED REGULATORY FRAMEWORK FOR TV WHITE SPACE OPERATIONS IN THE VHF/UHF BANDS

Microsoft Corporation, Mediatek Inc, and 6Harmonics Inc., welcome and appreciates the opportunity to comment on the above that was released on 17 June 2013. We congratulate IDA on its leadership in regulatory innovation in advancing spectrum sharing technologies and policies such as the TV White Space (TVWS). We hereby submit our responses to the questions raised in the public consultation paper in the following pages.

We would like to highlight our support to IDA's adoption of a license-exempt approach and the use of spectrum database for the TVWS operations. As demonstrated by the tremendous success such as the Wi-Fi ecosystem, a license-exempt access regime is far more effective and efficient as a means of utilizing both unassigned and under-used spectrum than various licensed-based alternatives. The TVWS database paradigm can bring dynamism, flexibility, and control to spectrum management and allocation. Correctly structured databases can generate new mechanism to calibrate operational parameters, allowing regulators to optimise the algorithms to suit their national requirements. In the longer run, the database can provide immense freedom, an opportunity to manage spectrum into abundance and high levels of spectral efficiency. In this respect, Singapore is ideally positioned to demonstrate global leadership.

We keenly look forward to continuing our support to IDA's development of the regulatory framework for TV White Spaces operations. If you have any clarifications please do not hesitate to contact us.

Yours Sincerely,

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RESPONSE FROM
MICROSOFT CORPORATION
MEDIATEK
6HARMONICS
TO
CONSULTATION PAPER ISSUED BY
THE INFO-COMMUNICATIONS DEVELOPMENT AUTHORITY OF SINGAPORE
ON
PROPOSED REGULATORY FRAMEWORK FOR TV WHITE SPACE OPERATIONS IN THE VHF/UHF
BANDS

16, September, 2013

Question 1:
IDA invites views on adopting a licence-exempt approach for WSDs in Singapore, subject to the devices meeting the conditions set by IDA.

Microsoft supports the licence-exempt approach as it has been demonstrated as the best means to encourage innovation in the key areas of WSDs, network architectures and WS services and applications. A licence-exempt approach will help minimize regulatory overhead costs and facilitate international harmonization since it matches with the policies of the United States Federal Communications Commission (US FCC) and the United Kingdom Office of Communications (UK Ofcom).

In a recent research paper, Richard Thanki (*The case for permissive rule-based Dynamic Spectrum Access* http://research.microsoft.com/en-us/projects/spectrum/case-for-permissive-rule-based-dynamic-spectrum-access_thanki.pdf - has shown that a rule-based dynamic access regime is far more effective and efficient as a means of utilizing both unassigned and under-used spectrum than various licensed-based alternatives. The recent history of innovation in wireless applications and services is predominantly in these frequencies and will continue to be so to meet the rising demands of wireless data and the Internet of Things. For example, in 2013 the number of devices featuring licence-exempt communication technologies *exclusively* (such as Bluetooth, NFC, zigbee, and apps such as baby monitoring, door locking, etc.) will for the first time exceed those incorporating licensed connectivity technologies. Already 69% of total Internet traffic generated by smartphones and tablets is carried over WiFi and the overall volume of Internet data carried over licence-exempt WiFi exceeds that of cabled communications and licensed mobile networks combined.

Question 2:
IDA invites views on designating a restricted number of TVWS channels to support the deployment of services that require certainty of spectrum access.

Microsoft recognizes that the IDA may, from time to time, determine to assign a high priority to some WSD services, for example, in the case of an emergency requiring priority given to first responders or to deal with a particular incident interrupting vital public services. Such prioritization should be done only on an *exceptional*, dynamic and temporary basis, using the TVWS DB as a tool to moderate, and under the assumption that there will still be enough "white spaces common" left for WSDs at large. We are of the opinion that if the system is engineered correctly, there should not normally be a need to require prioritized access.

Question 3:
In the event where IDA designates channels to support such services, IDA invites views on the appropriate regulatory approach in designating and managing these TVWS channels and the regulatory framework for the operations of prioritised WSDs.

Microsoft favours a dynamic and temporary assignment of channels approach, including for certain designated high priority services (e.g., police, emergency response, etc.). WSDs should by *de fault* access the database on the basis of normal channel allocation, and high priority should only be assigned after specified, exceptional criteria have been met. At all other times WSDs should be able to access all vacant channels only as in normal WSD operations. The TVWS DB can be used as a tool to moderate the "designated" channels and prioritized WSDs. Such designated channels should be limited to a small portion of total white space channels that are available and priority should be given to emergency responses and other public services, when they are dealing with particular incidents, over commercial applications and services.

Microsoft believes it is premature at this time to specify all the mechanisms by which prioritization might be achieved other than by a temporary directive. There might be other circumstances to warrant prioritization but these issues require more deliberation and should be based upon the actual experience of how the database management system works in practice and upon lessons learned that may come from other jurisdictions.

Question 4:
IDA invites views on allowing operation of WSDs in the 694 MHz – 806 MHz band until IDA allocates these frequencies for IMT deployment.

Microsoft strongly supports the idea of allocating TV channels during periods of non-use by broadcasters. IMT deployment in the 694 MHz to 806 MHz band, implicating reallocation of incumbent licensees and assignment to new licensed operators, may take another 7-8 years. In the meantime, IDA should put to good use the unused portions of this spectrum, with license-exempt devices under the control of databases. IDA can enable companies to test various market WSD services on a commercial and license-exempt basis and provide IDA with a clearer picture of the potential future demand for WSD services and WSD technology's ability to convert vacant spectrum into economic value. None of this will prevent the eventual allocation of the band to licensed IMT deployment.

Question 5:
IDA invites views on adopting a database approach as the mandated method to access white space spectrum.

Microsoft supports the mandatory use of a database approach as a simple system which gives predictable protection and is easily implemented. Microsoft also supports on a non-mandatory basis the collection by the database of sensing data from WSDs and any other relevant data collection to provide value-added services, for example, signal strength, by the commercial operators of the databases

Question 6:
IDA invites views on the proposed general requirements for the database query and registration.

Microsoft supports the general requirements for database query and registration, but consideration should be given to ways to cover portability such as WSDs in moving vehicles. See Q7.

Question 7:
IDA invites views on the three situations in which a WSD must query the database. In particular, IDA invites views on defining 50m as the maximum distance that WSDs are allowed to move from its original location, without contacting the geolocation database.

Microsoft supports the view that 50m is too restrictive in the context of Singapore where the number of primary users and events requiring wireless microphones is usually quite limited and well documented. Microsoft therefore proposes 100m as adopted by the FCC, allowing for advanced queries from devices, queries by region, and allowing the client to make multiple queries.

Microsoft notes that under FCC regulations, a Mode ll device may download local channel availability at multiple locations so as to create a wider boundary area within which to operate on the same frequencies, and is only required to consult the DB when it moves beyond the boundary area or within the time limit specified by the FCC (24 hours). Microsoft suggests similar flexibility for Singapore.

Question 8:
IDA invites views on the output power transmission of WSDs as shown in Table 2.

Microsoft supports the output power as shown in Table 2

Question 9:
IDA invites views on allowing the Fixed Devices to have tuneable output power that is capped at a maximum of 4Watts EIRP.

Microsoft supports a more flexible approach allowing WSDs to have a variable upper power limit rather than a fixed 4W EIRP max. This could be used boost distance and bandwidth, for example, on point-point backhaul links using highly directional antennas – where the incumbent protection criteria can still be met.

Question 10:
IDA invites views on the requirement of a Unique WSD Identifier and for this identifier to be based on standards developed by recognised standards organisations.

Microsoft supports the idea of a unique WSD identifier for the purposes of tracking, monitoring and regulatory oversight.

Question 11:
IDA invites views on the proposed maximum transmission level of 100mW EIRP for WSDs operating in channels adjacent to a local broadcast channel.

Microsoft agrees with this proposal. Microsoft supports the view that in the event of a max 100mW EIRP for WSDs in channels adjacent to a local broadcast channel, fixed and even nomadic (relatively stationary) devices should also be included as both these categories of WSDs have less uncertainty of positioning than mobile Mode 1 and 2 WSDs

Question 12:

IDA invites views on the proposed OOB emission limit of -56.8dBm, which will be imposed on WSDs operating in channels that are directly adjacent to a local broadcast service.

We believe this limit to be lower than necessary to avoid interference and lower than obtainable by some WSDs. While this requirement aligns with the FCC rules and with Ofcom, -56.8dBm is a hard-to-achieve target for OOB emission for most radios and may drive device cost higher. Microsoft suggests that IDA relax this requirements to the neighbourhood of -40dBm to be comparable with LTE.

Microsoft notes that in Singapore, there is only one local broadcast channel, hence only two adjacent channels. Radio device vendors may choose to avoid adjacent channels in order to relax the OOB emission requirements and make devices cheaper. However, such approach would limit the total number of channels available and therefore limit the devices' use in markets where much of the white spaces fall into adjacent channels to those of primary services.

Question 13:
IDA invites views on defining the OOB emission limits for WSD to WSD operations.

Microsoft supports IDA's view on not defining OOB emission limits for WSD to WSD operations. The industry has the inherent incentive to make sure that interference among WSDs is managed via industry-defined technical measures, to allow large-scale WSD deployment and co-existence.

Question 14:
IDA invites views on the proposed approach to manage coexistence between a WSD and the other secondary services within the TVWS channels.

Microsoft agrees that the locations of Mode 1 devices can be estimated from the range of Fixed or Mode 2 devices. Microsoft agrees with the view that secondary devices should be allocated the same TV channel to maximize the channels available for WSDs. Microsoft also supports the idea of safe harbour provisions for wireless microphones.

Question 15:
IDA invites views on the proposed propagation model and parameters used to determine the maximum transmission power level of a WSD

Microsoft accepts that the Hata Okumura propagation model should be used to start with. In addition, Microsoft supports guidelines similar to Ofcom for determining the height of the WSD as the height of the antenna and not of the device itself.

Question 16:
IDA invites views on its proposal for the protection of licence-exempt and licensed wireless microphones. IDA also invites views and comments on the optimal number of safe harbour channels required to ensure that licence-exempt wireless microphones can continue to be used once WSDs are deployed.

Microsoft opposes the establishment of safe harbour channel set asides for license-exempt wireless microphones, which will lead to inefficient spectrum utilization. Although the US FCC has set aside safe harbour channels for license-exempt wireless microphones, that decision is currently being revisited. Microsoft has proposed that license-exempt wireless microphones be required to share access to any safe harbour channel with other license-exempt devices, including white space devices.

Question 17:
IDA invites views on the need to develop a registration process for users of licence-exempt wireless microphones that require additional channels beyond the safe harbour channels

Microsoft supports the idea of registration of licence-exempt wireless microphones where an additional TV channel is required and the event is sufficiently important to justify this. The most efficient use of TV channels is essential for the successful deployment of WSDs and services

Question 18:
IDA invites views on whether the proposed demarcation zone approach is sufficient in terms of managing cross border interference issue and if there are any other factors IDA should consider.

Microsoft is of the view that the noise floor level at the borders should be reciprocal with neighbouring countries, and therefore should be at -115dBm, rather than the proposed -120dBm, which is unnecessarily stringent. Microsoft further supports a suitable delineation of the border area by the database based upon noise floor levels to maximize the permissible areas of deployment.

Question 19:
IDA invites views on the aggregate interference effect of WSD and whether any adjustment in terms of technical requirement is needed.

Microsoft notes that multi-vendor testing with multiple applications is only just beginning and supports the IDA proposal not to limit the number of WSDs that can operate at any one location. The geolocation database approach enables regulators to review and adjust the operating parameters for WSDs as the market develops and experience is gained.

Question 20:
IDA invites views on using GPS as the method to determine location accuracy, and on whether 50m is a sufficient location accuracy requirement for the operation of WSDs.

Microsoft is of the view that the method of location not be mandatory, but left to industry to decide. For large area networks a determined accuracy of 100m (aligning with that set by Ofcom) should be sufficient.

Question 21:
IDA invites views on allowing the manual input and internal storage of geographic coordinates for indoor Fixed Devices.

Microsoft supports the proposal as a way to save the costs of having to use GPS-enabled devices, and supports the view that this should be extended to both outdoor fixed devices and to nomadic Mode 2 devices which upon their move to a different location are likely to remain static for some time.

Question 22:
IDA invites views on the requirement of an approval process for the installer of indoor Fixed Devices and the necessary conditions for approval.

Microsoft supports the view that a verification process by which the location coordinates of an installation are cross-checked and counter-signed by a second person should be sufficient for both indoor and outdoor auditing without a further approval or certification process requirement.

Question 23:
IDA invites views on the possible types of TVWS network topologies and use case scenarios.

Microsoft supports the view that to encourage innovation in the market topologies should not be mandated. The choice of topology should be an industry decision according to terrain and service requirements, be it master-slave, multi-hops, mesh, mobile-multiple locations, etc. To minimize traffic enquiries to the database, it makes good sense if the TVWS BST, access point or gateway makes enquiries on behalf of all of the WSDs within its scope. This also allows WSDs to be used at lower cost. This is also the proposal of Ofcom where enquiries can be made by a master and relayed to its slaves, and where the slaves can relay to each other but only if they share the same master.

Question 24:
IDA invites views on the payment of fees for the use of database services.

Microsoft notes that the regulator could own, and possibly operate, an FCC-equivalent master DB *which would be limited to consultation by commercial DB's*, but that commercial DB services should be left to the industry.

Microsoft's interest in operating a commercial DB will be decided by the outcome of the regulatory process

Question 25:
IDA invites views on both approaches in managing the database (i.e. industry-managed or government-managed database).

Microsoft notes that both the FCC and Ofcom operate industry-managed databases which aim to be sensitive and adaptable to market requirements as they develop. Microsoft further notes that in any event IDA will manage a master Services List database which a WSD database will consult periodically. IDA should also follow the FCC in requiring some guarantees in the event of market exit.

Question 26:
To better gauge the level of interest from the industry, IDA invites companies that are interested in developing and managing the database for Singapore to register its interest with us and share the following details:
i) Funding for database development and management (i.e. self-funded, cost recovery, etc.)
ii) Business models considered when providing database services
iii) Possible fees involved for TVWS users

Through its current pilot DB provided to the SWSPG projects Microsoft has demonstrated its future interest in providing a DB on a commercial basis, subject to the outcome of the regulatory process. Microsoft therefore encourages the regulator to adopt an open and flexible policy to encourage innovation.

Question 27:
IDA invites views on the proposed preliminary conditions for the operation and administration of the databases

Microsoft proposes that the conditions of operation and administration should be fundamentally based upon the technical parameters DB vendors need to meet, and should not prescribe the business and financial models to be adopted.

Microsoft suggest that the FCC's set of parameters could be used as the baseline and through experience these can possibly be improved upon.

Question 28:
IDA invites views on the proposed approach and communications protocols between the following:
i) WSD and IDA website containing the list of authorised database administrators
ii) WSD and the database

Microsoft recommends that IDA endorse the on-going standards efforts of industry (e.g., through IEFT, PAWs) and encourages the industry to adopt and deploy without mandating a specific set of standards.

Question 29:
IDA invites views on the proposed frequency of update for Time A validity and Time B validity.

Microsoft sees this as an issue of cost-efficiency (longer periods between updates) *versus* granularity (shorter periods) and proposes this should be a parameter of DB management and not a matter of regulation as such. This will permit adaptation based upon empirical experience to achieve an optimization.

Question 30:
IDA invites views on requiring the adjustment of the value for Time A validity and Time B validity, and for this to be within the range of 6 to 24 hours.

Microsoft advocates optimization based upon a flexible and adaptable DB management – see answers to Q29 above

Question 31:
IDA invites views on the benefits and costs of a requirement for WSD to report its operational parameters to the database.

Microsoft takes the view that while the additional information could be useful, for example signal strength, its inclusion should only be considered if the associated overhead costs are low.

Question 32:
IDA invites views on the benefits of including within the TVWS regulations a requirement for WSD to register its contact parameters to the database.

Microsoft proposes that only technical information should be mandated, noting that commercial information should be a decision taken by each DB manager independently and in light of considerations such as the value-added services it may support, conformity to privacy restrictions, etc.