CONSULTATION ON THE PROPOSED APPROACHES TO INTRODUCE THE NEXT GENERATION OF MOBILE SERVICES

Submission by **Arete M Pte Ltd**

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1. EXECUTIVE SUMMARY

Arete M Pte Ltd ("Arete") appreciates the opportunity to comment on spectrum allocation for 5G development in Singapore.

Arete M is an infocomm services company aims at providing innovative telecommunication systems and solutions in the enterprise sector. We are a Facility Based Operator licensed by Infocomm Media Development Authority of Singapore as well as provide Internet broadband connectivity managed solutions to corporate clients in Singapore and Asia. Arete M also develops Intellectual Properties and knowhow in designing, deploying and operating Private LTE Network for mission critical and Industrial IOT applications. Currently, Arete M is the First Mover Innovator in using the 1.79GHz-1.80GHz the central guard band to deploy Private LTE in Singapore for enterprises.

Arete M, as a private TD-LTE network operator and solution provider, has many in-depth discussions with vertical industries which show great interests in using private LTE network as well as Low Power Wide Area IoT service applications through unlicensed 900MHz spectrum band. We believe private LTE has a significant role in elevating 5G traffic and will like to request IMDA to consider setting aside spectrum for the private LTE in the 5G spectrum planning exercise.

2. COMMENTS

2.1 Response to questions

Question 1

IMDA would like to seek views and comments on the estimated timeline for the deployment of 5G. Besides ensuring that spectrum is made available in a timely manner, what other regulatory measures could assist in facilitating the deployment of 5G technology and applications? What other use case should IMDA take note of when developing the regulatory framework?

Comments: 5G network is focusing on boosting the capacity of 4G network to support rising cellular data traffic demand, and maintaining communication capability, supports vertical market demand on industry IoT, Internet of Vehicle, Intelligent Robot, private industrial network as well as HD AV/VR and other applications which require high data capacity and in some cases low latency requirement. Arete M requests IMDA to consider setting aside part of the frequency band with lower spectrum fee to make private network deployment possible and viable in order to encourage local product development and innovation in the private LTE/private 5G NR and IoT spaces for enterprises as well as alleviate the traffic load on the 5G network.

Question 2

To facilitate and understand potential spectrum requirements for IoT deployments in Singapore, IMDA would like to seek views on the following:

(i) Based on the current spectrum allocated for mobile services in the sub-1GHz frequency bands, are there further suitable spectrum resources that could be released to support both IoT and LTE services?

Comments: Arete M, as a private TD-LTE network operator and solution provider, has many in-depth discussions with vertical industries which show great interests in using private LTE network as well as Low Power Wide Area IoT service applications through the unlicensed 900MHz spectrum band. Currently the ISM band at 920-925MHz has limited use for enterprise applications. Arete M requests the ISM band be widened to 915-925MHz if available.

(ii) How will future generations of mobile networks (e.g. high capacity, low latency) support the growth of IoT and what would be the spectrum requirements?

Comments: Arete M believes mission critical industrial IoT applications require low latency, ultra reliable connectivity and/or high capacity. To fulfill these mission critical communication requirements, there is a need for private network where performance and coverage are optimized locally to meet customized application requirements. In addition, some of these private network can be protected by very high level of cyber security that can also be customized and tailored to the specific needs of specific operating locations rather than depending on the telco cloud.

Hence, there is a need for private LTE/5G to complement public LTE/5G. IMDA should consider setting aside some spectrum resources to enable private LTE/5G network implementations in Singapore.

Question 3

IMDA would like to seek views and comments from industry on what they consider will be the key technologies for 5G and whether current regulatory frameworks sufficiently facilitate the deployment of such technologies.

Comments: 5G is expected to be a Network of multiple Networks on multiple frequency bands to serve the various needs of enhanced data capacity, low latency and ultra reliability. There is a need to have a new regulatory framework to enable FBO licensees to deploy and operate multiple wireless and wired networks to serve different user groups with different usage requirements. IMDA should also need to have a regulatory framework to facilitate shared spectrum usage and to allocate higher priority and be prepared to take higher risk to promote innovation to enable local companies to be First Mover Innovator.

Question 4

IMDA would like to see views and comments on whether going forward, there is a need for further spectrum below 1GHz to be identified and release for mobile services?

Comments: Being a small country, the mobile communication coverage challenges are largely resolved while the challenge for Industrial IoT is emerging. Hence, more low frequency bands should be allocated for Industrial IoT and private LTE/5G network deployment.

Question 5

IMDA would like to seek views and comments on the following:

(i) The frequency arrangement that is better suited for adoption in Singapore for the L band (i.e. SDL, TDD or FDD) and the supporting reasons; and

Comments: In view of industry demand on private LTE network's performance and security advantage, Arete M would suggest IMDA to reserve at least a few blocks of 20MHz of frequency in L band for private LTE deployment. Arete M would be interested to apply the 20MHz block in L band for private LTE development as part of our continuous effort to serve the industry once it is being assigned. Nevertheless, we will like to request IMDA to consider the economics of the license fee to make the operation viable and be mindful of the intangible benefits of our local players to develop products and solutions for the enterprises. Since frequency spectrum is limited, we will encourage IMDA to issue TDD spectrum for maximum flexibility in spectrum assignment and to enable multiple uplink: downlink ratios that are needed by the different industries and usages.

(ii) The timeline for access to the L band and the availability of the equipment (specifically whether it will be available earlier or later than 2020)

Comments: L band equipment availability will be earlier than 2020 for trial and deployment.

Question 6

Considering the spectrum bands within the range of 1-6 GHz to support the deployment of enhanced mobile broadband services, IMDA would like to see views on whether all the 91 MHz of spectrum in the L-band should be allocated for IMT to address Singapore's data demand and growth.

Comments: Secure Private LTE network can be used for vehicle control, USV (Unmanned Surface Vessel) and UAV control, secure industry IoT, intelligent Robot, eHealth etc., which require more data bandwidth, IMDA should consider reserving at least a few 20MHz blocks of TDD frequency for secure private network use to serve vertical industry and to alleviate some 5G data load.

Question 7

If it is only the extended C-band that is considered for IMT, would the migration of existing satellite users to the other parts of the C-band (i.e. 3.7 – 4.2 GHz) impact their service provisioning?

No comments

Question 8

Considering the challenges of co-channel deployment of FSS and IMT services in the extended C-band, IMDA would like to see views and comments on the coexistence measures for adjacent bands and cross border operations.

Comments: Since Private Network has a clearly defined and smaller coverage zone, with careful RF design and deployment, it should have minimum impact to cross border operations.

Question 9

IMDA would like to seek views and comments on whether there are other frequency bands in the 1-6 GHz frequency band that IMDA should consider IMT/5G.

Comments: Arete M suggests IMDA to reserve a few 20MHz blocks at 1.4GHz and/or 3.6GHz for the development of Secure Private LTE Network. The building of a secure private 5G solution will complement the public 5G network in alleviating IoT traffic as well as critical applications not possible with public 5G network.

Question 10

IMDA would like to seek your views and comments on the following

(i) The role mmWave bands will play in delivering the vision of 5G, in particular, what services could not be delivered by alternative frequency bands and/or technologies;

(ii) The amount of spectrum required in the mmWave spectrum bands to meet 5G applications that will require higher bandwidth; and

(iii) The specific mmWave bands that you consider should be a priority in Singapore for IMT services and why?

Comments: mmWave can be allocated in very large block hence enabling very high data capacity and low latency network. Some possible usages could be in high value-add operations and processes that are highly automated where command and control of robotics are necessary. For these applications, private 5G network might be more appropriate than public 5G as the performance and the deployment of the network can be fully customized in the localized environments.

Question 11

Considering that there are 11 candidate bands under consideration at WRC-19, how would making available the 28GHz band help in the deployment of 5G services in Singapore? Would this band play a significant role in achieving the targets set out for 5G (i.e. higher throughput, ultra-low latency)?

No comments

Question 12: If the 28 GHz band is opened for IMT services in Singapore, would there be any future competing services that may be deployed in this band which may cause interference issues?

Comments: Part of the 28GHz spectrum can be allocated for deployment of Private 5G NR to serve high capacity, high speed and very low latency applications in vertical industries. Besides allocating a big block for Public 5G NR deployment, we suggest that a few smaller blocks should be allocated for Private 5G NR deployment with sufficient safe guard put in place for optimum spectrum utilization and acceptable tolerance and guidelines for adjacent band interference.

Question 13

IMDA seeks views and comments on the estimated spectrum demand of 3360 MHz by 2025 and whether this estimate is realistic?

No Comments

Question 14

Noting that several regulators have made available mmWave bands for IMT services, IMDA would like your views and comments on whether access to the mmWave spectrum should be provided earlier than 2022 for commercial network deployment?

Comments: Arete M would like to participate in deploying private 5G network for certain industrial applications and services that require Ultra Reliability, Low Latency and higher throughput within a smaller coverage zones. Such demand should happen before 2022 and there will be some eco-system available in this band from 2018 onward due to the trial deployments in Japan and Korea.

Question 15

Considering the current regulations/policies for license-exempt use and the possibility of LTE-U interfering with Wi-Fi users, IMDA would like to seek views and comments on the following:

(i) The adoption of LBT to facilitate sharing of license-exempt spectrum and whether there would be any implication arising from such requirement;

(ii) The need for further technical requirements and regulatory measures to facilitate the sharing of license-exempt spectrum in an efficient and fair manner; and

(iii) The need for companies with commercial LTE-U networks to upgrade to LAA once the software/hardware products are commercially available.

Comments: Arete M is of the opinion that it is necessary for IMDA to limit deployment of LTE-U network to only FBO license holder in order to limit the uncontrolled usage of LTE-U. With this control in place, transmission power can be increased from current 100mW to 1000mW to encourage compelling industry deployment with wider coverage area to reduce deployment cost and encourage innovative applications. We are also of the opinion that the FBO licensee must inform IMDA if it is to deploy LTE-U networks in the public areas and to show the deployment meets co-existence so that the regulator may take actions if serious interference issue arises with existing deployments.

Question 16

During the interim period before regulations are finalized, IMDA plans to facilitate industry trials for LAA/LTE-U technologies. As such IMDA would like to seek views and comments on the following:

(i) Besides the information listed in Para 80, should MNOs/MVNOs interested in conducting LTE-U trials submit any further information for IMDA's assessment;

Comments: LAA/LTE-U is a supplementary technology to provide extra capacity and wider coverage area than WiFi for un-licensed LTE operator, Arete M is considering adopting LAA/LTE-U for high capacity CCTV surveillance video transmission usage with wider coverage range to

provide quality and better security coverage in Singapore. Arete M is also exploring using LTE-U to control and manage unmanned machines and unmanned vehicles.

(ii) and

(iii) To minimize impact to Wi-Fi users, should IMDA limit LAA/LTE-U trials to parts of the 5GHz licence-exempt spectrum?

Comments: Arete M suggests not to limit the use of LTE-U on 5GHz license exempt spectrum in order for IMDA to access the potential impact of LAA/LTE-U to the WiFi users during the trial period. Arete M is of the opinion that it is necessary for IMDA to limit only FBO license holder to deploy high power LTE-U network. FBO license holders should inform IMDA if the deployment is at public area and test report has to be submitted to IMDA.

As LAA requires licensed frequency band, IMDA needs to ensure there are sufficient licensed bands to allocate to FBO licensee for LAA implementations.

Question 17

IMDA would like to seek views and comments on the following:

(i) The possibility of deploying LAA and / or MuLTEfire in other frequency bands besides the license-exempt 5GHz band; and

(ii) The regulatory and coexistence measures that should be adopted for MuLTEfire

Comments: Current eco-system only supports 2.4Ghz and 5Ghz ISM bands. Coexistence measures might be needed for the high power 1000mW deployment.

Question 18

Considering that the LWA approach would not create coexistence issue with Wi-Fi users, would this approach be better suited for countries with extensive Wi-Fi usage?

Comments: Very few devices and terminals has LWA capability.

Question 19

IMDA would like to seek views on how the above approaches (i.e. LAA, MuLTEfire and LWA) would enhance the capacity of the mobile network in ways that Wi-Fi offloading is not able to achieve.

Comments: Please refer to Q16 item iii of our response.

3. CONCLUSION

Arete M sincerely requests IMDA to open up more frequency spectrum for private LTE/5G network deployment in order to encourage industry players to continue with innovative applications and product development for the benefit of achieving Singapore's vision of a Smart Nation. Arete M also see the needs of using 5.0GHz unlicensed spectrum for high bandwidth applications with the use of LTE-U, LAA and MuLTEfire technologies to complement the private and public 5G/LTE network, and hope IMDA could allow such deployment using 1000mW transmit power to only FBO license holder in private coverage zone with minimal or no restriction. This is to ensure Guarantee QOS can be achieved with minimum interference from adjacent deployments where some coordination among FBO licensees might be necessary.