PROPOSED ALLOCATION OF SPECTRUM FOR INTERNATIONAL TELECOMMUNICATIONS ("IMT") AND IMT-ADVANCED SERVICES AND OPTIONS TO ENHANCE MOBILE COMPETITION

Submission by StarHub Mobile Pte Ltd to the Info-communications Development Authority of Singapore

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Contact Details:	StarHub Mobile Pte Ltd 67 Ubi Avenue 1 #05-01 StarHub Green Singapore 408942 Phone: +65 6825 5000 Fax: +65 6721 5002 Tim Goodchild Email: timothy@starhub.com

Introduction

1. StarHub Mobile Pte Ltd ("**StarHub**") thanks the Info-communications Development Authority of Singapore (the "**Authority**") for the opportunity to comment on its proposals for allocation of spectrum for IMT and IMT-advanced services, and the options to enhance mobile competition in Singapore.

2. StarHub believes that the Authority's consultation on spectrum allocation is timely, to enable the industry to have a clear understanding of the Authority's roadmap for spectrum availability. Given that several spectrum bands are already available for allocation today, or will be available in the near future, we urge the Authority to finalise its decision on the matter as soon as practicably possible.

3. As for the options to enhance mobile competition in Singapore, StarHub notes that the Authority has not identified any market failures in the mobile services market, which could justify the proposed regulation of access to the mobile operators' networks. Rather, the Authority has repeatedly stressed that the mobile services market is competitive. StarHub would therefore question the need for any regulatory intervention in this area. StarHub also believes that there are serious technical and commercial issues with the Authority's proposal to implement inter-operator Heterogeneous Networks ("**HetNets**") in Singapore. If these are unaddressed, it could have the potential to cause significant disruptions to the mobile services market in Singapore.

4. StarHub's detailed comments and responses to the Authority's queries are attached below. We sincerely appreciate the Authority's consideration of StarHub's comments, and we would be happy to meet with the Authority to discuss our comments in greater detail.

Questions on spectrum allocation:

Question 1
IDA seeks views on whether the 700 MHz band should be allocated as a standalone, or coupled with other bands such as the 900 MHz, 800 MHz or the 1.9/2.1 GHz bands.

5. StarHub believes that the 700 MHz band is extremely important to the future of 4G services in Singapore, and should be released as soon as possible. Given the growth in mobile data traffic in Singapore[1], it is critically important for all available spectrum bands to be made available for IMT and IMT-advanced services as soon as practically possible. While the mobile operators have already obtained spectrum holdings in the 1800 MHz and 2.5 GHz bands via the Authority's 2013 4G spectrum auction, there is still an immediate and pressing need for more spectrum to be made available, to meet growing customer demand.

6. Nonetheless, we understand that the Authority may not be able to provide confirmation on the exact availability of the 700 MHz band in the short-term, as this is dependent on our neighbouring countries. Therefore, it may be more suitable for the 700 MHz band to be allocated on a standalone basis, after the Authority can confirm when the band will be available.

7. In the meanwhile, the remaining spectrum bands should be allocated in a timely manner. Specifically, the existing rights to the 900 MHz band are expiring on 31-March 2017. It is imperative that the Authority finalise the allocation framework for the 900 MHz band as soon as possible, to avoid any disruptions being caused to existing users of the spectrum.

Question 2
IDA seeks views on:
(a) whether the 800 MHz band should be re-farmed for mobile services;
(b) the band plan that should be preferred by Singapore and the underlying reasons;
(c) details of transitional issues to migrate existing services and systems in the 800 MHz band to the revised band plan;
(d) possible impact to end users of digital trunked radio and SRD/RFID, if, as a result of the eventual 800 MHz band plan: (i) the end users do not have to be migrated but will have to coexist with mobile broadband services; or (ii) the end users have to be migrated; and
(e) possible co-existence issues between mobile broadband, and digital trunked radio and SRD/RFID.

8. Given the strong customer demand for mobile data services, StarHub believes that the 800 MHz band should be re-farmed for mobile services. Ideally, the trunk radio and SRD/RFID services should be relocated to a less valuable spectrum band, as it is not possible for these services to co-exist with mobile services in the same band.

[1] According to the Authority's own studies: "*mobile data traffic in Singapore would grow exponentially from around 3.1 Petabytes in 2010 to around 37 Petabytes in 2015, representing a CAGR of 64%*".

9. Nonetheless, StarHub recognises the difficulties in shifting out live services, particularly the trunk radio services, from the 800 MHz band. Hence, StarHub proposes that the Authority adopt the 3GPP Band 5 for the 800 MHz band, but less the existing allocations in the 900 MHz band (i.e., from 880 MHz onwards). We believe that this is the ideal band plan, as it:

- Allows the existing trunked radio services to continue in the band until such time as a suitable alternative spectrum band can be found; and

- Ensures that there are no disruptions to the existing 'live' mobile services being provided over the 900 MHz band.

10. As for the possible allocation framework, we note that there is a significant overlap between the 800 MHz and 900 MHz bands. It is therefore logical for these two bands to be allocated together. This would allow the industry to have a holistic view of the entirety of the spectrum available.

11. Nonetheless, we would reiterate that the 900 MHz band should be allocated as soon as practically possible, given the short time-frame until the expiry of the existing rights on 31-March 2017. If the 800 MHz band is available within the short-term, it can then be bundled together with the 900 MHz band. If not, the 900 MHz band should be allocated on a stand-alone basis.

Question 3
IDA seeks views on the allocation approach for the 900 MHz spectrum band, particularly:
(a) whether the band should be re-allocated as a standalone band in a market-based allocation framework, and if so, the preferred timeframe for such an allocation exercise;
(b) whether the band should be coupled with other spectrum bands for allocation, and if so, which bands and the preferred timeframe for such an allocation exercise; and
(c) the underlying reasons for your views on the above.

12. As mentioned above, the allocation of the 900 MHz band should take place as soon as practically possible. In fact, StarHub had earlier proposed that the 900 MHz band be allocated during the Authority's 2013 4G spectrum auction. This would have provided greater certainty to the industry, and allowed the mobile operators more time to carry out any needed changes to their networks.

13. If the 900 MHz band is not allocated soon, the mobile operators may have insufficient time to make changes to their network to accommodate any shifts in the spectrum holdings. This could result in unnecessary disruptions to the existing users of the band.

14. As for the Authority's other proposals for the allocation of the 900 MHz band, StarHub would disagree with the following:

- Bundling the 900 MHz band with other spectrum bands whose availabilities are either uncertain (i.e., the 700 MHz band), or which are expiring only in the longer-

term (i.e., the 3G bands in 2021). Such an allocation exercise could result in a significant amount of uncertainty, as the mobile operators would have to make decisions on spectrum holdings well in advance of the spectrum rights being available for use; and

- Any short-term allocation of the 900 MHz band, to align the availability of the 900 MHz band with the other sub-1 GHz bands. This does not provide any certainty to operators on their long-term holdings in the band. Furthermore, as StarHub currently only has 5 MHz of spectrum in the 900 MHz band, it would be unfair to StarHub if the Authority decided to extend the existing allocations for another few years.

Question 4
IDA seeks views and proposals on the technical issues relating to the allocation of the Sub-1 GHz bands for mobile broadband services, in particular, the guard band requirements between the adjacent bands (e.g., 700, 800 and 900 MHz bands) for mobile broadband services.

15. Any guard band requirements will depend heavily on the final assignments decided by the Authority. Following its decision, the industry will need to conduct detailed trials in order to determine the appropriate guard bands.

16. Nonetheless, as mentioned above, StarHub prefers 3GPP band 5 of the 800 MHz band, but leaving the 900 MHz band untouched.

Question 5
IDA seeks an indication of any industry interest in the use of the 1.4 GHz band.

17. StarHub believes that the 1.4 GHz band will be a useful band for mobile services in the longer-term. It is therefore important for the Authority to advise the industry when this spectrum band will be made available.

Question 6
IDA seeks views on IDA's proposal to allow the deployment of 4G and IMT-Advanced systems and services in the 3G bands.

18. StarHub agrees that the Authority should allow 4G and IMT-Advanced services to be deployed in the 3G bands. As a general comment, StarHub believes that spectrum usage should be technology neutral, and the Authority should not pre-judge the technologies that should be implemented within any spectrum band. StarHub believes that market forces will provide the necessary incentives for spectrum winners to deploy services which meet the needs of their customers.

Question 7
IDA seeks:

(a) indications of industry interest in the allocation of long term rights in the TDD bands, as well as planned services (including small cells) and target market segments for the use of these bands;
(b) views on whether the use of the TDD bands solely for the deployment of in-building TDD systems is feasible, and the underlying considerations thereof;
(c) views on whether the use of TDD bands for partial deployment of outdoor and in-building TDD systems is feasible, and the underlying considerations thereof;
(d) views on the use of TDD bands for small cell deployment as part of a HetNet;
(e) views on the mitigation techniques requirement for co-existence (e.g., separation distance, transmit power, and UL-DL configuration21);
(f) views on the implication of the TDD bands on a half-band sharing basis with neighbouring jurisdictions; and
(g) views on the implication of the TDD bands on a full-band sharing basis (primarily for in-building deployment) with neighbouring jurisdictions.

Usage of the TDD bands

19. StarHub is interested in the use of the TDD bands for the provision of TD-LTE services. As parts of the TDD bands are currently unused and available, StarHub believes that the Authority should allocate this spectrum as soon as practically possible.

20. StarHub also believes that there should not be any restrictions on how the TDD bands should be used. Limiting the use of the TDD bands solely for the deployment of in-building TDD systems, or imposing any other restrictions on the use of the bands, would severely limit the application and usefulness of these bands. Consequently, this will have an adverse impact on the commercial valuations of the bands, and the willingness of operators to pay to use the bands.

21. In terms of using TDD bands for small cell deployment as part of a HetNet, StarHub would note that HetNets are a longer-term development, and that clear technical standards for HetNets are not yet established. As there is little certainty over the implementation of HetNets, StarHub would strongly disagree with any restrictions on the TDD spectrum (or any other spectrum bands) just to cater for HetNets. We have also provided our detailed comments on the Authority's proposed HetNets in a later part of this submission.

Technical issues

22. StarHub has assessed this matter and would note that (based on the 3GPP recommendations) a minimum guard band of 10 MHz is required between a FDD and TDD band. Within the TDD band, a minimum guard band of 2.5 MHz is required. To facilitate efficient use of spectrum, StarHub therefore proposes that the Authority establish 2570 – 2580 MHz and 2610 – 2620 MHz as the guard band between FDD and TDD in the 2.5 GHz band.

23. Further trials will need to be conducted to ascertain the necessity of other mitigation techniques. StarHub would be happy to participate in any industry trials conducted by the Authority.

Full-band sharing

24. We believe that the Authority should allow full-band sharing for the TDD bands without any restrictions on the usage of the bands. This allows the maximum usage of the bands, and is consistent with the operation of the other spectrum bands used for mobile services. As for managing interference issues, StarHub believes that this is best done via negotiations at the Government-to-Government level. We do not believe that it is practical to restrict usage of the TDD bands to in-building solutions to manage interference as:

- this will severely reduce the attractiveness of the TDD bands; and
- in-building solutions may still cause interference issues (depending on the height and location of the building).

Question 8
IDA seeks:
(a) indications of industry interest in the allocation of long term rights in the 3.5 GHz band, as well as planned services and target market segments for the use of these bands;
(b) views on whether the use of the 3.5 GHz bands solely for the deployment of in-building mobile systems is feasible, and the underlying considerations thereof;
(c) views on possible impact to end users of FSS and TVRO, if (i) the end users do not have to be migrated; or (ii) the end users have to be migrated; and
(d) views on possible co-existence issues between TDD systems, and FSS and/or TVRO systems.

25. StarHub believes that there will be interest in using this band for mobile services in the longer-term. Based on current standards, this band is likely to be used for the deployment of TDD services. Nonetheless, the planned services and target market segments will depend greatly on future developments in equipment and devices.

26. We would again highlight that there should not be any restrictions on how operators can utilise spectrum bands allocated for mobile services. Restricting the 3.5 GHz band to in-building solutions would significantly reduce the attractiveness of the band, and limit its full potential.

27. Based on our review it is not possible for FSS / TVRO services to co-exist with mobile services within the 3.5 GHz band. If the Authority decides to open-up this band for mobile services, it must therefore allocate an alternative band for existing FSS / TVRO services.

28. As a general comment for any future spectrum allocation exercises, StarHub would encourage the Authority to set spectrum caps, which take into consideration an operator's holdings in all available spectrum bands. We note that in the Authority's 2013 4G spectrum auction, the Authority had set spectrum caps for the 1800 MHz and 2.5 GHz bands. However, these caps only applied for the two bands, and did not provide clarity on what caps may be set, in future, for other bands, such as the 900 MHz and 3G bands.

29. Setting clear spectrum caps for all available spectrum bands would:

- Provide clarity to the industry as to the Authority's longer-term view on spectrum limits, allowing them to bid with certainty for the spectrum they want in each spectrum allocation exercise; and

- Prevent any one operator from amassing the majority of spectrum in Singapore. This is particularly important in the LTE-Advanced environment, where an operator with a significantly larger spectrum holding would be the only operator which could provide the highest-speed mobile services in the market. This would have a detrimental impact on the industry as an operator with the financial resources would be in a position to corner the market to the detriment of smaller operators, thereby reducing the level of competition in the market.

30. StarHub would be happy to discuss this matter in greater detail with the Authority.

Question on HetNets:

Question 9
IDA seeks:
(a) views on key policy areas related to technical, service provisioning or end-user impact that should be considered in the deployment of HetNet; and
(b) other policy implications that may arise with HetNet.

31. HetNets are a relatively new development, where standards and equipment are still being developed. In proposing to deploy HetNets in Singapore, we note that the Authority is considering a national wireless network, akin to how the Next Generation Nationwide Broadband Network (NGNBN) has provided a nationwide fixed-line access network.[2] This is envisaged to bring together multiple wireless networks belonging to different operators, allowing all customers to seamlessly move between the various networks.

32. We believe that the definition of HetNets is a critical issue. Globally, HetNets are meant for a single mobile operator to integrate multiple technologies (such as macro cells, small cells, distributed antenna systems ("**DAS**") and Wi-Fi) together, to provide their own customers with an improved service experience. In this way, a mobile operator can control the Quality-of-Service ("**QoS**") experienced by customers over those technologies. StarHub is unaware of HetNets being deployed on a large-scale inter-operator basis.

33. While intra-operator HetNets could well bring benefits to operators and consumers, StarHub foresees significant regulatory, commercial and technical issues with inter-operator HetNet. These issues include:

1) Large-scale inter-operator Het-Nets deployments have not been carried out anywhere else in the world. Given the dense and built-up environment of Singapore, it would be extremely difficult to predict what issues will occur during the implementation of HetNets in the local environment. Extensive trials will therefore need to be conducted.

   While StarHub would be happy to participate in any preliminary trials, we would recommend that Singapore should not be the first, or amongst the first, countries to try to implement inter-operator HetNets. Operators who attempt to be the first to implement new technologies / equipment will also be the first to experience the problems caused, and will not be able to draw on the experiences of other countries.

   In addition, it is necessary for Singapore to be a standards-taker, following standards that have been globally tried, tested and accepted. We would advise against seeking to position Singapore as a standards-setter. Even if usable inter-operator HetNet standards could be established in Singapore, there are no guarantees that such standards can, or will be adopted globally. Seeking to establish HetNet standards for

[2] As stated by the Minister for Communications and Information in his speech to Parliament on 10-March 2014.

Singapore could ultimately lead to standards that are incompatible with the rest of the world. This would lead to higher costs and lower capabilities.[3]

StarHub notes that some device manufacturers are already attempting to develop technologies to support "HetNet" like features. For example, some of the latest smartphones attempt to allow concurrent downloads to take place via multiple networks. The Authority should let this natural technology progression take place, and not seek to predict future developments.

2) StarHub foresees that the key component in any inter-operator HetNet is the overarching "intelligence", which will be the systems and processes needed to seamlessly move customers between the various networks run by different operators. This "intelligence" must not only take into consideration the load on each network, it must also ensure efficiencies in the routing of customers. Without a thoroughly-tested "intelligence", the switching of customers between various networks in an inter-operator HetNet would either fail to be seamless, or could result in disruptive traffic flows between networks.[4] We do not believe either of these scenarios would meet the Authority's objectives. At this time, we do not believe that the technology for such an overarching "intelligence" is available in the market. Given the lack of any globally deployed inter-operator HetNets, there is no indication that this technology will be available anytime in the foreseeable future.

   From an operational standpoint, it is also unclear who would be responsible for operating and maintaining this "intelligence". Given that the operator of the "intelligence" would need to have oversight over multiple networks, and the customers of all networks, there needs to be a clear regulatory framework in place to govern this operator. Potential issues include how the "intelligence" operator could interface between the various HetNet operators, whether there would be inter-operator charges, and how the "intelligence" operator would be allowed to use the data it obtained through its role. StarHub therefore foresees significant regulatory challenges in the setup of any inter-operator HetNet.

3) The Authority is correctly concerned about ensuring mobile customers can enjoy a minimum QoS standard. However, setting QoS standards in an inter-operator HetNet environment will be nearly impossible, given that this would involve:

   - A customer transiting between multiple networks, including Wi-Fi networks (for which no QoS standards are set), in a single voice or data session;

[3] E.g., global equipment manufacturers may be unwilling to support standards used only in a small number of countries. Higher costs will therefore be needed to produce equipment, and there will be a lack of interest to conduct the necessary R&D to improve existing equipments.

[4] E.g., a less capable "intelligence" could attempt to swap large groups of customers in between networks at the same time, thereby causing massive (and disruptive) traffic loads swinging from one network to another.

- Interfaces between multiple operators, which means that a customer's experience will be beyond the control of his "home" operator; and

- An "intelligence" system that operates over the network layer, and which could also be the cause of any QoS issues faced by the customer.

4) We also believe it would be extremely challenging for operators to handle customer feedback on poor user experience. Customers may not even know which operator they are "roaming" on at any point in time. Given this ambiguity, it would also be unclear which operator should be responsible for addressing customers' complaints, or making changes to their systems to address any network-related issues.

5) From a commercial perspective, setting prices (both for customers as well as inter-operator prices) will be very difficult. This is particularly the case if the Authority envisages that **any** wireless network operator is free to participate in the inter-operator HetNet.

6) Mandating inter-operator HetNets could cause significant "moral hazard" issues.[5] There may be little incentive for individual operators to invest in the resiliency / quality of their networks if customers can simply roam onto other networks with better QoS standards. In the long-run, this may worsen customer experience as all operators are incentivised to reduce their own investments.

7) Today, the mobile operators have the flexibility of using different equipment vendors. They also have to flexibility to offer unique services to differentiate themselves from their competitors. It is not clear if, in an inter-operator HetNet environment:

   - All the mobile operators will need to use the same equipment to ensure system compatibilities. This will inevitably reduce competition in the equipment services market.

   - All operators need to standardise their service offerings, to ensure that their services will continue to work on each other's networks. Without such standardisation, customers could find that their services suddenly fail when they roam onto a different network, which would lead to unnecessary customer frustration and dissatisfaction.

   We foresee that any standardisation of equipment / services will significantly reduce the incentive by operators to innovate, and to create a unique market brand. This further increases the moral hazard issue. Since no operator can differentiate itself from its competitors, each operator will simply choose to reduce their own investments and rely on other operators for resiliency and quality.

[5] I.e., a situation in which a party is more likely to take risks because the costs that could result will not be borne by the party taking the risk.

8) StarHub foresees that it would be extremely difficult to carry out the network planning of any inter-operator HetNet. At any one time, operators will be unable to predict the maximum number of customers that may roam onto their networks. Essentially, network planning could only be carried out by a single party with oversight of the entire network.

9) It is unclear if there will be customer confidentiality issues associated with inter-operator HetNets. From a StarHub perspective, we will need access to non-StarHub customers' information, in order to allow them to roam onto our networks. Similarly, other HetNet operators would also need information about StarHub's customers. Clear regulatory frameworks must be in place to govern how such information can be used. Policing the usage of such information would also be difficult, and would increase in difficulty with each additional operator added to the envisaged inter-operator HetNet ecosystem.

10) If the Authority wishes to facilitate HetNets (whether inter or intra-operator), it could ensure that there is sufficient space set-aside for the deployment of the HetNet infrastructure (e.g., small cells, DAS, Wi-Fi hotspots etc). Such space will also need to be adequately supplied with power and transmission backhaul. Today, the mobile operators already face issues obtaining space for our mobile equipment. For example, in order to site equipment on publicly-owned land, the mobile operators may need to turn to multiple different Government agencies. The Authority may therefore wish to consider setting-up a single point of contact within the Government for all wireless infrastructure deployment requirements. This will greatly facilitate the deployment of mobile infrastructure in Singapore.

34. StarHub strongly believes that any set-up of HetNets should be driven by the private sector, taking into account global standards and overseas deployments.

35. It is unclear whether the establishment of the HetNet would be voluntary, or would be a regulatory requirement. We do not believe that regulatory requirements should be imposed on inter-operator HetNets. The mobile services market is already competitive (as detailed below), and there does not appear to be any market failure which would justify regulatory intervention in this area. We would therefore submit that any establishment of inter-operator HetNets should be commercially-negotiated between willing parties.

Questions on proposed MVNO framework:

Question 10
IDA seeks:
(a) views and comments from potential MVNOs on their level of interest to enter the mobile market and the target market segments of potential MVNOs (e.g. pre-paid or post-paid, niche or general consumer segments); and
(b) views from the industry on the interest and viability for a new MNO to enter the market, and whether the market environment, or technology or spectrum developments have changed since the 2013 4G spectrum auction that have made the business case attractive for a new MNO to enter.

Grounds for regulatory intervention

36. We note the Authority's statements that it is considering steps to promote further competition in the mobile services market. If the Authority is looking to offer grants or other incentives for the mobile operators to voluntarily host MVNOs, we would need details of this, in order to provide our assessment.

37. However, StarHub would be greatly concerned by any proposals to implement regulatory measures, such as mandating access to the mobile operators' networks, or setting mandated wholesale rates for MVNOs. These are highly intrusive and disruptive regulatory measures, which can only be reasonable when applied in uncompetitive markets, and on Dominant Licensees able to exercise significant market power. Such regulatory measures are entirely unsuitable for markets which are competitive.

38. It is therefore imperative that the Authority carefully consider the following:

- The level of competition in the mobile services market in Singapore; and
- Whether there have been any fundamental changes to the market which suggest a market failure, and necessitate the need for such heavy-handed and intrusive regulatory intervention.

Effective competition in the mobile services market

39. The mobile services market in Singapore is mature and competitive. Today, customers can enjoy innovative services at attractive prices, and competition drives efficient outcomes in the market. This high level of competition has been achieved through intense facilities-based competition between all three mobile operators in Singapore, and is a fact that has been **repeatedly acknowledged** by the Authority:

1) As early as 2004 and 2005, the Authority had already stated that "*there is effective competition in … mobile phone services*"[6] and that the "*the mobile market in Singapore is mature and competitive*";[7] and

2) In 2009, the Authority stated that "*effective and sustainable competition will be best achieved through facilities-based competition*", such as in the mobile services market where "*IDA has encouraged facilities-based competition*". Given the state of competition in the mobile services market, the Authority noted that its existing approach had "*proven effective* [and] *IDA does not intend to depart from this policy*".[8]

40. It is therefore unclear to StarHub what has changed in the competitiveness of the mobile services market, which would necessitate the Authority considering intrusive regulation of the mobile operators' networks. As recently as 2013, the Authority had explicitly rejected the imposition of mandatory wholesale obligations to be imposed as part of the 2013 4G spectrum auction. In doing so, the Authority acknowledged that "*none of the existing mobile operators have been classified as dominant licensees under the Telecom Competition Code*" and that "*several Mobile Virtual Network Operators ("MVNOs") exist today through wholesale arrangements with existing mobile operators which have been commercially negotiated*".[9]

41. Any imposition of heavy-handed regulations would be contrary to the Authority's position of "*minimising regulation in markets that are effectively competitive*" and allowing "*market forces to play out as much as possible and interven*[ing] *only when there was market failure, to safeguard market interests or when specific consumer interests had to be addressed*".[10] StarHub notes with concern that the Authority has not identified any market failures in the mobile services market to justify its regulatory proposals.

Current MVNO framework

42. We would also draw the Authority's attention to its earlier statements regarding facilitating access to MVNOs into the market.[11] As it noted, "*regulating the timing of entry and setting charging principles*" could "***unduly distort the commercial decision-making of market players***", and that while regulatory intervention "*helps to facilitate the entry of MVNOs,* ***it does not create sustainable and cordial partnerships***" (emphasis added).

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[6] Link: https://www.ida.gov.sg/About-Us/Newsroom/Media-Releases/2004/20050713144714.

[7] Link: https://www.ida.gov.sg/About-Us/Newsroom/Media-Releases/2005/20050712123200.

[8] Link: http://www.ida.gov.sg/~/media/Files/PCDG/Consultations/20091123_SecondTriennialReview/TCC2ndConsultation.pd.

[9] Link: http://www.ida.gov.sg/~/media/Files/PCDG/Consultations/20120410_4Gtelecomm/Decision4GSpectrum.pdf.

[10] Link: http://www.ida.gov.sg/blog/insg/special-reports/transparent-and-balanced-decision-making/.

[11] Link: http://www.ida.gov.sg/~/media/Files/Archive/Policies%20and%20Regulation/Policies_and_Regulation_Level2/MVNOs/3G_MVNO_Framework.pdf.

43. StarHub strongly believes that these concerns are still clear, applicable, and appropriate. In particular, the Authority has required the mobile operators to comply with stringent resiliency and QoS standards. This has necessitated heavy investments by the mobile operators in the Singapore market. Requiring mandatory access to the mobile networks is not only unfair, it will have a chilling effect on future network investments by the mobile operators.

44. We also refer the Authority to the article in the TODAY newspaper on 31-May 2014[12], which highlighted similar concerns regarding the effect of excessive regulation on telecoms investments. As noted by independent analysts, "*Telcos need to invest in infrastructure, as usage seems to be doubling every year*", and the Authority must "*tread a careful line between creating competition to benefit consumers and eroding the telcos' ability to sustain services that are increasingly important for the development of the overall economy*".

Unproven benefits of MVNOs

45. While the Authority has claimed that the entry of MVNOs has benefitted the mobile services market of some countries, we do not believe there is any definitive proof that MVNOs can bring about sustainable price competition or improve service innovation. We note that there is also no evidence to suggest that catalysing MVNO entry is suitable for all markets around the world. We would caution the Authority against looking towards success stories in certain countries to claim that facilitating MVNO entry will inevitably end-up benefiting customers in Singapore.

46. The Authority will be aware that Virgin Mobile, one of the most globally successful MVNOs, failed to establish a commercially-viable MVNO business in Singapore. Virgin Mobile had exited the market in July 2002, citing that the market was "*competitive*" and "*too saturated*".[13] It is therefore not clear that facilitating entry of MVNOs today, in a market which is even more saturated than the one in 2002, will bring about the outcomes desired by the Authority.

47. In justifying its proposals to intervene in the mobile services market, the Authority has cited examples of regulatory intervention in France and Hong Kong. StarHub has studied the matter and understands the following:

- MVNO regulation in Europe is typically premised on requiring mobile operators with significant market power to provide wholesale access to MVNOs. Many countries within Europe, such as the UK (cited by the Authority as a successful model of MVNO entry), have not imposed access requirements on their mobile operators. The European Commission had also vetoed attempts to impose

[12] TODAY: "*Service more important than price in competition for customers: Telcos*", link: http://www.todayonline.com/singapore/service-more-important-price-competition-customers-telcos.

[13] Link: http://home.singtel.com/news_centre/news_releases/2002.07.08a.asp.

access requirements on mobile operators, where there was a lack of evidence that the mobile operator had significant market power;[14] and

- In Hong Kong, the Authority appears to be referring to a decision by the Hong Kong regulator in 2001, requiring operators to set-aside a certain amount of network capacity as part of the 3G spectrum auction. We do not believe that there have been any further regulatory requirements imposed by the Hong Kong regulator since that time. It may therefore not be relevant for the Authority to cite a ruling made more than 10-years ago to justify any similar requirements being imposed in Singapore today. We would also note that several MVNOs that attempted to enter the Hong Kong market following the decision in 2001 have since pulled out of the market. This includes the Shell MVNO, and Trident Telecoms (which was the first MVNO to be licensed in Hong Kong).[15]

Mobile networks are not the NGNBN

48. It is erroneous to compare the mobile networks in Singapore to the Next Generation Nationwide Broadband Network ("**NGNBN**"). The NGNBN arose out of a Government tender, and was deployed with significant Government funding of up to $1 billion. The NetCo and OpCo of the NGNBN willingly accepted mandated wholesale requirements, in return for the Government funding the establishment of their networks.

49. In comparison, the mobile networks in Singapore are privately-funded. The mobile operators have taken significant commercial risks, in a competitive environment, to invest and deploy 2G, 3G and 4G mobile networks in order to meet market demand. Significant investments have also been carried out in order for the mobile operators to meet the Authority's stringent QoS and resiliency frameworks. Most importantly, the mobile services market is competitive, with **three separate nationwide mobile networks**. None of the mobile operators have been designated as Dominant Licensees, and it is evident that facilities-based competition has succeeded in this sector.

50. Given the vast difference between the NGNBN and the mobile networks, there does not appear to be any justification for using the "success" of the NGNBN model as a basis for heavy-handed regulatory intervention in the mobile sector.

51. We would also refer the Authority to the problems it is currently facing as part of the NGNBN: (a) customer complaints; (b) disputes between the various layers of the NGNBN; and (c) failures by the NetCo to comply with its mandatory QoS standards. Such problems will be even more prevalent if the Authority expects the mobile networks to function as a wireless NGNBN.

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[14] See the example of the European Commission vetoing attempts by the Finnish regulator to impose access requirements on mobile networks in Finland: http://ec.europa.eu/competition/publications/cpn/2005_1_49.pdf.

[15] Link: http://www.telegeography.com/products/commsupdate/articles/2009/09/03/virtually-redundant-hong-kongs-first-mvno-out-of-business/.

Entry of new mobile operator

52. In relation to the issue of whether a new mobile operator could enter the Singapore market, StarHub does not believe that market conditions have changed significantly since the 2013 4G spectrum auction, where no new mobile operator expressed interest in obtaining the set-aside spectrum in the 2.5 GHz band. We would also note that the 2013 4G spectrum auction was not the first time that new entrants have decided not to enter the market. The market has clearly signalled its intent.

53. Rather than seeking to alter the dynamics of the mobile market, StarHub strongly believes that the Authority should seek to address prevailing industry demand. All three existing mobile operators have a use for more mobile spectrum, and StarHub would have strong concerns with any proposal to use any upcoming spectrum allocation frameworks to incentivise entry by a fourth mobile operator into the market, and imposing mandatory wholesale requirements for MVNOs.

Question 11
IDA seeks views on the 'depth' of MVNO deployment envisaged by new entrants, in particular, the viability of a 'Heavy/Full' MVNO deployment model versus the other models, given that the former would have the most flexibility to differentiate its services to compete with the MNOs.

Question 12
IDA seeks views on:
(a) possible mechanisms to implement an MVNO-hosting framework, and the relative merit and usefulness of each of these approaches; and
(b) the viability of a regulatory and/or voluntary commitment approach for MVNO-hosting, and the kinds of regulatory or incentives required and which spectrum bands to tie-in the MVNO-hosting incentives.

54. For the reasons stated above, StarHub would strongly disagree with any mandated MVNO-hosting framework being implemented in Singapore. If the Authority would like to propose any voluntary incentives scheme for hosting MVNOs, StarHub would be happy to review any proposals in detail.

Question 13
IDA seeks feedback on:
(a) the output/outcome indicators to be imposed on MNOs that would be relevant for MVNOs;
(b) the level of wholesale pricing to the MNO's access network (in unit rates) that would justify the business case for market entry;
(c) the non-price terms and conditions imposed by MNOs, such as minimum volume or revenue commitments, that would be acceptable for a positive MVNO business case;
(d) details of the business and financial model of potential MVNOs;

(e) the ability of MNOs to differentiate classes of service and allow priorities to cater to the needs of government demand or other MNVOs; and
(f) any other relevant considerations that IDA should take into account in structuring a framework to encourage the hosting of MVNOs.

55. The Authority would note that, typically, MVNOs worldwide tend to serve niche groups of customers. For example, in the USA, the largest MVNO, TracFone Wireless, specifically targets the immigrant community. Similarly, in Singapore, MVNOs that succeed tend to focus on specific niches, and enhancing value to customers. MVNOs seeking to enter the market should therefore provide compelling evidence that they can enter the market on their own merits, rather than seeking to compete based on obtaining mandated wholesale rates via the existing mobile networks. It does not appear to be the case that successful MVNOs can only exist if there are stringent regulatory obligations imposed on the mobile operators. Conversely, it is also not clear that stringent regulatory obligations have always facilitated successful MVNOs.

56. StarHub strongly believes that, in effectively competitive markets, the Authority should rely on market forces to determine the competitive dynamics of the market. Regulating access to networks should only take place where there is clear evidence of market failure.

Obligations imposed on MVNOs

57. Apart from seeking views on what benefits MVNOs expect to receive, it is also important for the Authority to specify the obligations it expects MVNOs to comply with.

58. The mobile operators in Singapore are subject to some of the most stringent coverage, QoS and resiliency obligations imposed worldwide. It would only be reasonable for MVNOs, expecting mandated access to the mobile operators' networks, to also comply with minimum service level standards.

59. Allowing MVNOs access to the mobile networks without imposing minimum obligations will only encourage fly-by-night operators to enter the market, while failing to provide any benefit to the market as a whole. When such operators fold, it will only result in unnecessary disruptions to customers and to the market. We understand that the failure rates for MVNOs in general are high (potentially 25% failing within 12 months of entry into the market).[16] Requiring the mobile operators to provide mandated access for MVNOs could therefore result in significant, and unnecessary, disruptions to the mobile services market in Singapore.

[16] As attributed to Informa Telecoms & Media at this link: http://www.fiercewireless.com/europe/special-reports/europes-mvnos-challenged-new-threats-and-opportunities.

Offering classes of service

60. StarHub does not have the ability of offering class of services for voice traffic. It is also important to note that existing mobile customers may not be agreeable to being classified as "low" priority users, whose services may be degraded in favour of MVNO's customers, or for non-essential Government services.

Other considerations

61. We note that the mobile operators today must comply with stringent obligations regarding the registration of prepaid customers. If multiple MVNOs are allowed to enter the market, the Authority may need to review the existing prepaid registration processes. It is unclear to StarHub whether there would be any security issues if large numbers of MVNOs are allowed to register their own prepaid customers.

Conclusion

62. A summary of the key points of StarHub's submission is as follows:

- Given the increasing demand for mobile data services, it is important for the Authority to make spectrum available for mobile services as soon as practically possible;

- It is necessary for the 900 MHz spectrum to be allocated as soon as reasonably practicable, to allow the mobile operators enough time to make any necessary changes to their networks;

- The Authority should set clear spectrum caps, to ensure that operators have a holistic understanding of the Authority's longer-term plans for spectrum availability, and prevent any one operator from obtaining the majority of the spectrum rights;

- While there appears to be benefit in intra-operator HetNets, inter-operator NetNets would raise a range of technical, operational, commercial, and regulatory issues. Inter-operator HetNets have not been deployed on a large-scale anywhere else in the world. Given that the mobile markets are effectively competitive, there is no justification for any mandatory requirement for operators to provide inter-operator HetNets;

- StarHub also submits that the Authority should not seek to set standards for inter-operator HetNets, or to develop Singapore-specific HetNet standards. Such an approach would run the very real risk of leaving Singapore with technologies that are non-compatible with the rest of the world;

- The mobile networks in Singapore are competitive, and there is no justification for heavy-handed regulatory intervention to require entry by MVNOs into the market; and

- It is erroneous to equate the mobile networks with the NGNBN. The mobile networks have been privately-funded and operated by companies which have taken significant commercial risks to deploy infrastructure. In comparison, the NGNBN was a Government project, and funded with significant Government funds. It is incorrect to use the "success" of the NGNBN as a justification to mandate wholesale requirements on mobile operators.

63. StarHub is grateful for the opportunity to comment on this matter. We would welcome the opportunity to discuss in greater detail the Authority's proposals.

StarHub Mobile Pte Ltd
19-June 2014