

**STARHUB'S RESPONSE TO IDA'S CONSULTATION PAPER
ON
DEPLOYMENT OF WIRELESS BROADBAND TECHNOLOGIES IN SINGAPORE**

StarHub Pte Ltd ("StarHub") makes this submission in response to the consultation paper issued by IDA on 2 April 2004 in regard to the deployment of wireless broadband technologies in Singapore ("Consultation Paper").

StarHub welcomes the opportunity to comment on the development of wireless broadband technologies in Singapore. As an info-communications company providing a full range of information, communications and entertainment services over fixed, mobile and Internet platforms, StarHub is actively involved in the deployment of wireless broadband services in Singapore. StarHub is a founding member of the Wireless Broadband Alliance, which comprises of wireless broadband (WLAN) operators around the world. As evident from its participation in the Alliance, StarHub is fully committed to spearheading a global effort to provide and expand the convenience and experience of wireless broadband connectivity through a worldwide common framework.

StarHub Mobile Pte Ltd ("StarHub Mobile") was also awarded a 3G FBO Licence and the associated Spectrum Right by IDA in April 2001 and will have its 3G network ready by end 2004.

1 Executive Summary

- 1.1 StarHub respectfully submits that the proposals cited in the Consultation Paper are premature and inappropriate given the current state of development of the wireless broadband industry. As rightly noted by IDA in the paper, adoption and use of wireless broadband technologies is still in the early stages, and there are major uncertainties with regard to development of the wireless broadband market such as technology, service offerings and spectrum requirements of operators.
- 1.2 To date, there is still a lack of clarity as to the frequency band and other technical attributes that will eventually be adopted as the industry standard for wireless broadband technologies. In particular, StarHub notes that the spectrum identified by IDA in the Consultation Paper is not in any of the priority spectrum identified by the WiMAX ("Worldwide Interoperability for Microwave Access") Forum. StarHub is therefore of the view that IDA's proposed licensing of spectrum in the 2.3 GHz and 2.5 GHz bands is premature. There would be serious consequences for the industry and end-users should this attempt to pre-judge market outcome fail.
- 1.3 StarHub is extremely concerned with IDA's proposal to issue more licences for wireless broadband services when mobile operators in Singapore have incurred significant costs on 3G FBO licences and the associated spectrum rights, in addition to their investment in network infrastructure. StarHub respectfully submits that any new facilities-based entrant to the wireless broadband market must enter on the same footing vis-à-vis 3G FBO Licensees, given Singapore's small geographical area and dense demography resulting in great similarities in the technical performance between 3G and wireless broadband technologies.
- 1.4 Consistent with IDA's technology neutral stance, StarHub strongly believes that IDA must not impose any restriction on the technologies that could be deployed by 3G FBO Licensees in their 3G spectrum bands. Similarly, there is no basis for IDA to impose any limit on the

amount of wireless broadband spectrum that existing 3G and broadband infrastructure providers could bid for, or refuse participation by any of these parties in spectrum allocation exercises on wireless broadband network rollout.

StarHub provides herein its specific response to the questions raised by IDA in the Consultation Paper.

2 StarHub's Specific Response To Questions Raised In The Consultation Paper

2.1 *IDA welcomes views and comments on the potential of and benefits arising from the deployment of wireless broadband technologies, the likely services/applications to be deployed and the potential demand from businesses and consumers.*

StarHub supports IDA's policy objective to proliferate broadband services and usage in Singapore. StarHub has, since August 2002, began its deployment of Wireless Fidelity, or WiFi, hotspots in 300 locations across Singapore. StarHub is also the industry leader in establishing the global Wireless Broadband Alliance (www.wirelessbroadbandalliance.com), which as of December 2003 has a membership of 18 global industry players. Through such partnerships and strategic alliances with local and global service providers, StarHub has been able to further extend its wireless broadband service coverage to the enjoyment of local end-users and inbound broadband roamers.

Coupled with the impending launch of 3G networks and services in end 2004, wireless broadband service adoption is poised to become even more widespread in Singapore.

StarHub believes that IDA is on track to attain its stated policy objective to proliferate broadband services and usage in Singapore, taking into account the impending rollout of 3G networks and services in end 2004. In working towards this objective, StarHub respectfully submits that IDA should, apart from the consequential impact on end-users, consider its obligations and responsibilities to its existing licensees, in particular 3G FBO Licensees.

To date, 3G FBO Licensees have made significant investments in spectrum right payments to IDA as well as in network infrastructure rollout. With this in mind, it is important that IDA must not disregard the rights and interests of 3G FBO Licensees in its efforts to spur new technological innovation in the industry. Any new facilities-based entrant to the wireless broadband market must enter on the same footing vis-à-vis 3G FBO Licensees, given Singapore's small geographical area and dense demography resulting in great similarities in the technical performance between 3G and wireless broadband technologies. In particular, new facilities-based wireless broadband licensees should pay the same licence fees and spectrum right payments, and face the same rollout obligations, as 3G FBO Licensees.

As IDA rightly noted in the Consultation Paper, adoption and use of the wireless broadband technologies identified in the paper is still in the early stages, and there are uncertainties with regard to development of the wireless broadband market such as technology, service offerings and spectrum requirements of operators. Given this backdrop, StarHub is concerned that the proposals cited by IDA in the Consultation Paper to allocate more spectrum for wireless broadband technologies are premature.

The Consultation Paper proposes to allocate spectrum in the 2.3 GHz and 2.5 GHz bands for wireless broadband technologies via auction similar to the allocation of 2G spectrum in 2001.

StarHub believes that such a proposal would be inappropriate in the context of spectrum allocation for emerging technologies such as wireless broadband, given the uncertainties surrounding the development of a harmonised standard for such technologies. IDA risks jeopardising the development of a vibrant wireless broadband market and stifling innovation in the industry should it introduce any premature licensing and regulation of wireless broadband technologies and services.

In the absence of critical information such as inter-operability among the various technologies available in the market today, IDA's proposal to license specific spectrum for wireless broadband may result in over-commitment by parties eager to secure spectrum without having considered in detail the technical and commercial viabilities of the underlying technologies (in particular, the ability to inter-operate with other wireless broadband technologies). This is not only detrimental to the parties that would have paid a dear price for the spectrum, but also to consumers who could be locked into an inappropriate and limited wireless broadband technology.

2.2 IDA welcomes views and comments on the allocation of the 2.3 GHz and 2.5 GHz bands for wireless broadband technologies and the harmonisation of spectrum at the border areas.

What are the coexistence issues that need to be considered with regards to the deployment of systems (FDD & TDD) in the same geographical area in adjacent frequency blocks, and the deployment of systems across geographic boundaries in the same frequency blocks?

What are the technical assessment and methodology to be used for the deployment and coordination of systems, including separation distances, power spectral flux density limits, out-of-band-emission limits, frequency guard bands etc, to ensure coexistence of system operations?

What are the mitigation techniques that could be employed in case of co-channel interference between systems operating in adjacent geographical areas?

Does the 5 MHz, 5.5 MHz or 6 MHz channeling plan for the 2.3 GHz band and the 2.5 GHz band meet industry requirements?

What is the appropriate duplex separation (Transmit/Receive) for the FDD wireless broadband technologies in the 2.3 GHz and 2.5 GHz bands respectively?

What is the minimum, as well as optimal amount of spectrum required by an operator for specific geographical deployment or nationwide deployment?

Please provide supporting reasons for each comment and proposal made.

StarHub understands that wireless broadband equipment available in the market today typically operates in the following frequency bands:

- i. 2.4 GHz
- ii. 3.5 GHz
- iii. 5.2 – 5.3 GHz
- iv. 5.8 GHz

In particular, 3.5 GHz and 5.8 GHz bands have been identified as the priority spectrum for Phase 1 Profile Tests at a WiMAX Forum. The forum also agreed to delay profile testing at the 2.5 GHz band to subsequent phases.

In view that there are (and potentially will continue to be) a limited number of vendors offering equipment in the frequency bands proposed by IDA in the Consultation Paper (i.e. 2.3 GHz and 2.5 GHz), and given the small domestic market, StarHub is concerned that end-users in Singapore may ultimately be burdened with higher equipment cost due to the need for customisation and a reluctance by vendors to absorb the customisation cost owing to limited purchase volume.

In view of the fact that a number of different types of wireless broadband technologies exist in the market today, StarHub proposes that IDA allow more time for assessment of compatibility and coexistence issues that could arise in a multi-system environment. StarHub submits that such a measure is warranted given the climatic and demographic conditions in Singapore, where dense concentration of high-rise buildings with high annual rainfall could pose significant challenges to wideband radio propagation and coexistence of different radio systems, through such effects as signal reflection, refraction and multi-path.

2.3 *IDA welcomes views and comments on the key features and service obligation to be applied for auctioning the spectrum for the deployment of wireless broadband technologies. If the key features are not appropriate, please provide supporting reasons why they are not.*

As set out in paragraph 2.1 above, StarHub is concerned with IDA's proposal to auction spectrum in the 2.3 GHz and 2.5 GHz bands for the deployment of wireless broadband technologies. Such an approach would require significant monetary commitment by service providers in the form of spectrum right and licence fee payments, and network investment at a time when there are still uncertainties as to the technical and commercial viability of the underlying technologies.

StarHub therefore respectfully submits that the proposals detailed in the Consultation Paper are premature and that IDA should postpone the allocation and licensing of more spectrum for wireless broadband technologies until such time there is visibility on a common industry standard that will be widely accepted, as with the case of WiFi (i.e. IEEE 802.11). Such a postponement will ensure that Singapore is well placed to leverage on any benefit of economies of scale when the technological development stabilises and that consumers will consequently enjoy a wide selection of equipment for wireless broadband services and roaming locations when they are overseas.

In order to ensure that Singapore continues to play a pivotal role in the development of wireless broadband technologies, notwithstanding the above proposal to consider further the spectrum identified by IDA, StarHub proposes a further relaxation of the Market Trial Licence Framework to attract more research and development activities in Singapore while harmonisation of standards for wireless broadband is underway. Please refer to StarHub's comments provided in paragraph 2.8 below for details of the proposal.

2.4 *IDA welcomes views and comments on whether spectrum should be auctioned in generic lots or in blocks with specified frequencies; the appropriateness of the lot sizes; and the maximum amount of spectrum to be set.*

Please refer to the comments provided in paragraph 2.3 above.

2.5 ***IDA welcomes views and comments on the deployment of wireless broadband technologies in the 3G spectrum bands. Are there any technical considerations that the IDA should consider? Please provide detailed supporting reasons for each comment and proposal made.***

Consistent with its technology neutral stance, StarHub respectfully submits that IDA should not impose any restriction on the technologies to be deployed in the 3G spectrum bands.

Considering the significant spectrum right payments and network investments already incurred by the 3G FBO Licensees, it will be untenable to the licensees if IDA were to impose any constraint in their implementation of wireless broadband technologies in 3G spectrum, whereas non-3G licensees are given more leeway in their choice of technologies outside the IMT-2000 family of 3G standards.

StarHub submits that any such discrimination on 3G FBO Licensees vis-à-vis wireless broadband service providers would result in serious consequences to the industry. It would discourage investment in 3G services, resulting in slower 3G adoption in Singapore, and less developed service offerings.

2.6 ***IDA welcomes views and comments on the eligibility of existing 3G and broadband infrastructure providers for the 2.3 GHz and 2.5 GHz spectrum, and the limit on the spectrum amount for which they could bid.***

Please refer to the comments provided in paragraph 2.5 above. IDA should not discriminate against any party that is rightfully eligible to partake in any spectrum allocation exercise for wireless broadband network rollout.

Similarly, there is no basis to impose any limit on the amount of spectrum that existing 3G and broadband infrastructure providers could bid for. StarHub respectfully submits that IDA should allow the industry players the flexibility to determine their spectrum requirement based on their respective business case rather than to pre-judge the market outcome and impose restrictions based on hypothetical assumptions that might not reflect actual market situation.

Further, there could be potential for existing 3G and broadband infrastructure providers to make use of newer wireless broadband technologies to complement their service offerings. This would ultimately lead to better consumer choices and user experience, thereby translating to the development of a more vibrant industry and improved benefits for the consumers.

Should IDA be concerned that existing 3G and broadband infrastructure providers could forestall competition by acquiring wireless broadband spectrum at prices that are higher than market value, there is the recourse to impose specific service rollout obligation that commensurate with the amount of spectrum IDA would assign to each party.

2.7 ***IDA welcomes views and comments on whether there are issues that may pose problems to achieving transparent and seamless interconnection and open access. IDA further seeks comments on the type and level of QoS standards that will be appropriate and whether the existing set of QoS standards for broadband service***

providers are applicable for service delivery using wireless broadband networks. Please provide supporting reasons for each comment and proposal made.

StarHub submits that there are no issues that might pose problems to achieving transparent and seamless interconnection and open access for wireless broadband services, as with the case for WiFi.

Unlike traditional PSTN networks, IP networks do not require point-to-point connectivity for cross-network communications. Rather, the server-client network architecture adopted by the latter ensures that so long as a party is connected to the Internet, it would be granted seamless access to any website that is publicly available.

Further, operators would be able to leverage on the industry's experience on WiFi such that end-users would be able to enjoy service inter-operability and network roaming, via the tried-and-tested business models that have been established for WiFi services.

On the issue of QoS, IDA may wish to note that wireless broadband technologies are relatively new and deviate greatly among different standards. Many of these technologies are yet to be standardised, either regionally or globally, and currently many of these are manufactured based on different proprietary standards or differing interpretations of a particular standard (e.g. WiMAX). As such, it is inappropriate to adopt the existing QoS standards for wireline broadband access services for their wireless counterpart, or even to define any QoS standards for wireless broadband technologies.

In addition, given the local geographical climate and constraints, it remains to be seen if the wireless broadband technologies are able to perform to expectations of service quality and reliability as claimed by the vendors.

2.8 ***IDA welcomes views and comments on the Market Trial Licence framework and the specific features set out in Annex 2. Is the Market Trial Licence framework conducive in helping market participants test the commercial viability of innovative service? Are there additional issues that IDA should consider? Please provide detailed supporting reasons for each comment and proposal made.***

StarHub provides the following comments in respect of the framework for Market Trial Licence proposed by IDA:

– Operating Conditions

IDA has proposed to require the trial operator to seek its approval prior to any sale or transfer of the operator's network and/or systems to another licensee for any market trial deployment. StarHub respectfully requests that IDA remove this requirement from the Market Trial Licence framework so as to further enhance the commercial viability of the framework.

Through its operation of the market trial, licensees are already committed to and would have undertaken significant business risks in trying out new technologies and/or services. In the event of a failed venture resulting in cessation of the trial, any restriction that would impair the ability of the trial operator to dispose of its assets (including network equipment) is clearly undesirable and would simply add to the operator's burden. Instead,

IDA should allow such asset disposal to occur based on market mechanics (i.e. demand and supply), so long as the acquiring party would not have contravened any of IDA's regulations and/or regulations set by other authorities in following through the asset sale/transfer transaction.

3 Conclusion

- 3.1 StarHub respectfully requests that IDA postpone its proposed licensing of new spectrum for wireless broadband technologies as detailed in the Consultation Paper. Industry efforts to harmonise the various proprietary solutions developed for wireless broadband technologies are currently underway. Given the uncertainties on technology standardisation, StarHub advocates a prudent and measured regulatory approach towards licensing of new spectrum for wireless broadband technologies and services.
- 3.2 Due to the great similarities in technical performance between 3G and wireless broadband technologies as a result of Singapore's small geographical area and dense demography, IDA has to ensure that any new facilities-based entrant to the wireless broadband market shall enter on the same footing vis-à-vis 3G FBO Licensees, in terms of fees and obligations.
- 3.3 StarHub is supportive of IDA's technology neutral stance and accordingly requests that IDA does not impose any restriction on the technologies that could be deployed by 3G FBO Licensees in their 3G spectrum bands. Further, IDA should not discriminate against 3G and broadband infrastructure providers in its allocation of spectrum for wireless broadband technologies and services.
- 3.4 StarHub also supports IDA's policy objective of promoting Singapore as a hub and test-bed for deployment of new technologies. To further enhance the commercial viability of the Market Trial Licence framework, StarHub proposes the removal of the need for regulatory approval in the event of a sale or transfer of the trial operator's network and/or systems.
- 3.5 StarHub would be happy to further discuss this response at IDA's request.