

Response to IDA Consultation Paper

**“Deployment of Wireless Broadband Technologies in
Singapore”**

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1. Introduction

1.1 Pacific Internet Corporation Pte Ltd is a wholly owned subsidiary of Pacific Internet Limited and is licensed as a facilities-based operator by the IDA. Pacific Internet Corporation (PIC) strongly supports IDA’s decision to make available the 2.3 Ghz and 2.5 Ghz spectrum for commercial deployment and trials of wireless broadband access (WBA) technologies in Singapore.

1.2 WBA technologies offer PIC and potential new facilities-based service providers a strategic opportunity to rapidly rollout an alternative high-speed “last mile” broadband network in Singapore to offer innovative services to residential and corporate consumers and to compete with the existing ADSL and cable modem broadband networks.

1.3 A conducive and robust regulatory framework is instrumental to whether the promise and potential held by WBA technologies could be fully realized and exploited. As such, we welcome the opportunity provided by IDA to comment on the technical, spectrum allocation and competition issues relating to the deployment of WBA technologies.

1.4 PIC’s response to IDA’s consultation paper is set out below.

2 Potential of Wireless Broadband Technologies

2.1 As with regulators in many other jurisdictions, IDA’s central policy approach in liberalizing the telecommunications sector is to promote facilities-based competition. IDA believes that facilities-based competition is the best means of achieving effective and sustainable competition in the long term and enhancing competition along the service value chain. As such, IDA’s policies are designed to encourage facilities-based operators (FBOs) to rollout telecommunication networks and to discourage FBOs from leasing the incumbents’ networks, except where there are technological, market or other impediments that could hamper the FBOs’ ability to build.

2.2 In reality, given the scale of investment required and the small population of Singapore, it is economically unviable to rollout and operate a wireline broadband network in Singapore with comparable reach to the incumbents’ networks. As a result, there has been very limited build out of alternative wireline broadband facilities in Singapore since the market was liberalized in 2000. In the broadband market, competing ISPs still depend primarily on the resale or leasing of upstream broadband service from the wireline operators in providing their retail broadband services. We believe that

effective competition is impeded under this arrangement due to the high wholesale prices and the little control which resellers can exercise over product and service features.

2.3 Given the impracticability of rolling out an alternative wireline network in Singapore, we look forward keenly to the strategic opportunity offered by the recent rapid advancements in WBA technologies for deployment of a facilities-based WBA network in competition with the wireline networks. Under a conducive regulatory framework, the WBA technologies allow a potentially quicker and less costly means of rolling out an alternative broadband network in Singapore, hence fostering deeper competition at the upstream broadband network level. In this regard, the potential benefits of WBA technologies to consumers and service providers in the broadband market in Singapore are far reaching and strategically significant.

2.4 To fully realize and reap the significant potential benefits of WBA technologies, a set of sound and conducive regulatory policies is necessary. At this critical stage of introduction of WBA technologies in Singapore for commercial deployment, it is important that the regulator work with the industry to identify and address the issues that may potentially hinder the full realization of the benefits of WBA technologies and hence lay a solid foundation for further development of effective competition in the broadband market via WBA technologies. Some of these fundamental issues include the appropriateness of auction as a mechanism for allocating spectrum and the impact on competition of the eligibility of existing broadband infrastructure providers. They are discussed in detail in later sections of the paper.

2.5 In regard to likely services/applications, the telecommunication industry is developing many wireless services and applications that can be deployed over the WBA network to enable seamless connectivity. We expect that services and applications including broadband Internet services at different speeds on demand, VOIP services and multimedia services will be deployed over the WBA network.

2.6 We are optimistic that the demand for wireless services deployed over WBA networks will exceed expectations. As with mobile phone and laptop technologies, WBA technologies liberate users from the desk and enable them to access information anytime at any place. This ability presents tremendous benefits and opportunities for service providers and consumers and will drive wireless services rollout and adoption.

3 2.3 Ghz and 2.5 Ghz Spectrum

3.1 Where a TDD system is deployed together with a FDD system, it is recommended that guard band of at least 4MHz is necessary at each end of the frequency block to ensure co-existence of the two systems.

3.2 In terms of frequency planning, a typical Point-to-Multipoint deployment consists of a 6-sector cell using two 6 MHz channels (f1 and f2).

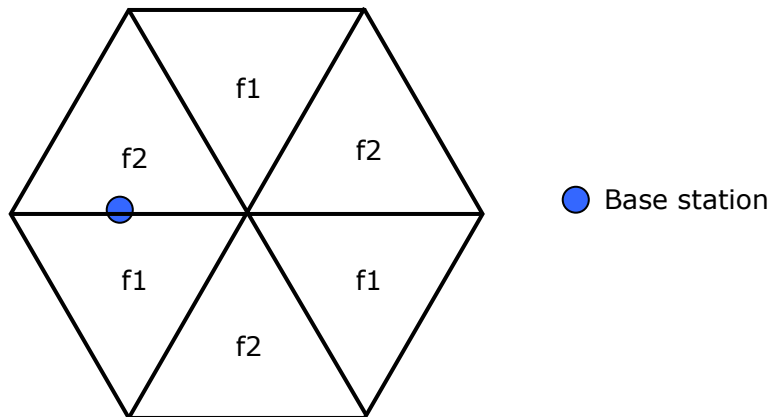


Figure 1. A 6-sector cell

For an island-wide deployment, a total of 6 cells are required. As shown in Figure 2, six different frequencies are needed. Therefore, 36MHz is required for the Point-to-Multipoint deployment. In addition, each base station will be connected back to the central office using a Point-to-Point equipment. This is indicated in Figure 2 by the 3 coloured lines. This requires an additional 3 channels of 6 MHz.

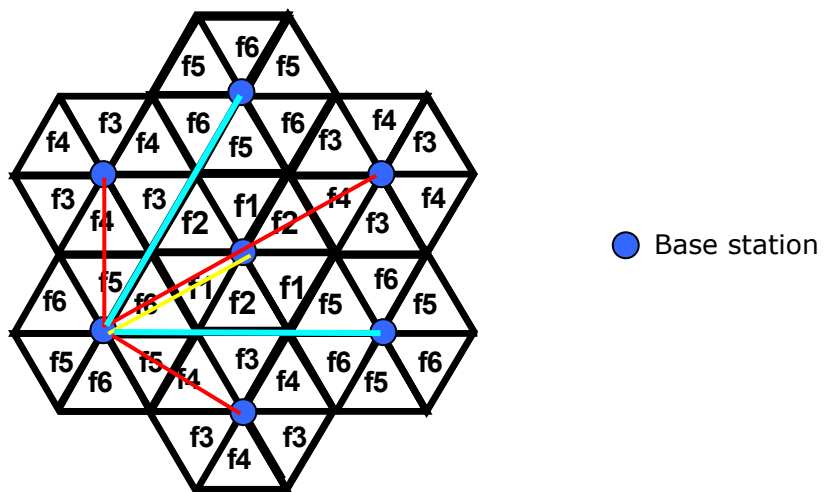


Figure 2. A country-wide deployment

Therefore, the total amount of frequency required for an island-wide deployment is about **62MHz**.

Point-to-Multipoint	= 6 x 6 MHz	= 36 MHz
Point-to-Point	= 3 x 6 MHz	= 18 MHz
Guard Frequency	= 2 x 4 MHz	= 8 MHz
Total	= 36 + 18 + 8	= 62 MHz

3.3 PIC is currently conducting a technical trial on the WBA technologies. We will provide IDA with further feedback on technical issues as the technical trial progresses. In general, we would like to request IDA to adopt the principle of flexibility and neutrality in regards to the technology used in WBA network deployment.

4 Market Based Allocation Approach

4.1 While a market-based approach to allocating spectrum via auction is generally favoured by regulators in many jurisdictions given that it is generally regarded as a means of putting spectrum in the hands of those who value it most, it may not be the most appropriate mechanism for promoting competition in the broadband market in Singapore.

4.2 Firstly, allocating spectrum to the bidder who placed the highest bid may not achieve the best outcome in terms of development of competition. A potential new entrant may not possess the financial resources to place the highest bid, but its entry would benefit society in terms of introducing competition to existing broadband infrastructure providers. On the other hand, an existing broadband infrastructure operator provider may possess the financial means to potentially outbid aspiring new entrants but consumers as a whole would not be able to benefit from the entry of a new service provider. In this way, the auction mechanism generally favours the incumbents, and potentially deters the development of additional facilities-based competition, which is one of the key potential benefits of WBA technologies.

4.3 Secondly, an auction presents a risk of a very high and economically unviable final auction price. Under this scenario, the potential new entrant may experience difficulties in raising the capital to pay for the spectrum and also rollout the network. Essentially, a high spectrum price could take away capital from investments and marketing. Even if the capital can be raised, the high price of spectrum would eliminate the low cost advantages offered by WBA technologies, thus destroying the value of the WBA technologies substantially. The high spectrum price would ultimately be borne by consumers.

4.4 Thirdly, auction is susceptible to manipulation by bidders. Collusive bidding, speculation and predatory bidding could take place to raise the spectrum price and to deter entry of potential new entrants.

4.5 In addition to the imperfections of the auction mechanism highlighted above, we are concerned that the allocation of spectrum by IDA to more than one player would result in a fragmented WBA network market as well as a fragmented broadband infrastructure market in Singapore. As highlighted earlier, Singapore's small population

is not likely to be able to support multiple broadband infrastructure players, given that economies of scale is critical in this razor thin profit margin industry. Industry experience indicates that multiple small players are highly unlikely to provide effective competition to large incumbents. Eventually the small players will exit the market or be acquired, leaving the incumbents to continue to be dominant in the broadband market.

4.6 In view of the above, we submit that it would be in the best interest of promotion of competition in the broadband market in Singapore to allocate available spectrum to a single facilities-based player (who is not an existing broadband infrastructure provider) via an administrative process at a fair and reasonable price. Without the potential encumbrances of an economically unviable spectrum price and dilution in scale of operations and customer base posed by an auction mechanism and a fragmented WBA network respectively, the single facilities-based WBA network provider is more likely to succeed at bringing about more competition in the broadband market. IDA could impose requirements on the single WBA network provider to open its WBA network for access by services-based operators to facilitate competition at the services level when the network technology has stabilised. Additional conditions to be imposed may include a commitment to a nationwide or faster network rollout. As such, we strongly urge IDA to allocate the 2.3Ghz and 2.5Ghz spectrum to a single facilities-based operator on the merits of the applicant including whether the applicant will introduce additional independent facilities-based competition in the broadband market in Singapore and the track record of the applicant in being a long term player committed to the Singapore broadband market.

4.7 In the event that IDA decides to adopt auction as a mechanism to allocate spectrum, we strongly urge IDA to take measures to mitigate the problems presented by an auction mechanism. We propose that in addition to the existing mitigating mechanism proposed by IDA, i.e. limit the amount of spectrum that an existing broadband infrastructure operator and/or 3G operator can bid for, further competition safeguard in the form of prohibiting existing 3G and broadband infrastructure operators to deploy WBA technologies in the 2.3Ghz and 2.5Ghz spectrum for an initial 3 years be introduced. The proposal is discussed in detail in a later section of the paper.

5 Key Characteristics of Spectrum Auction Design

5.1 In the event that IDA decides to adopt auction as the mechanism to allocate spectrum, we would like to request IDA to take into consideration the following comments:-

Reserve Price

5.2 In regard to the proposal to set the reserve price on a cost recovery basis, we would like to comment that the relevant costs to be considered in the computation of cost should be IDA's incremental costs in administering the 2.3 Ghz and 2.5 Ghz spectrum.

Duration of Spectrum Rights

5.3 The duration of spectrum rights should be set at a level that justifies the recovery of investments in the deployment of WBA network. In addition, there needs to be a restriction for a period, for example three years, against offering of new spectrum for deployment of WBA technologies. Otherwise, the value of the spectrum awarded in this round would be significantly reduced.

Rollout coverage

5.4 We strongly support IDA's proposal to allow successful spectrum bidders to elect to rollout WBA network on a regional basis. A requirement for national rollout would represent a high barrier to market entry. Moreover, at this stage of market liberalization, there is no compelling reason to require new broadband infrastructure players to rollout a national network given that the existing ADSL and cable broadband networks operators already provide national coverage to meet the needs of users in Singapore. Further, the advantages of economies of scale would be a natural push for new wireless broadband network players to rollout the WBA network to more areas once they have established the business case for doing so.

Rollout Schedule

5.5 In terms of the proposed requirement on successful bidders to rollout WBA services within 2 years of obtaining the spectrum from IDA, we would like to request IDA to exercise this requirement flexibly for new entrants into the WBA market. Unlike a number of existing operators who already have rooftop access either due to legacy reasons or from the provision of mobile phone services, a new player will be severely disadvantaged by the need to negotiate for rooftop access with building owners. We envisaged that one of the major obstacles to the successful rollout of WBA network would be difficulty in gaining timely access to rooftops. In fact, it is important that the government introduces regulations to mandate building owners to open rooftop access to WBA network operators for installation, operations and maintenance. Without the necessary regulations, network rollout would be a slow and tedious process, thus defeating the rapid deployment advantage of WBA technologies.

Others

5.6 Finally, we urge IDA, when selecting a spectrum auction design, to adopt the principle that auction rules should be grounded in credibility, clarity, simplicity and transparency (especially in regard to information on bidder's identities, bidders' current eligibility, etc). In addition, there should be an open process with strict rules against collusion, speculation and predatory bidding. Payment terms should be strictly adhered to.

6 Generic Spectrum Lot Size and Maximum Cap

6.1 In the event that IDA decides to adopt auction as the mechanism to allocate spectrum, we would like to request IDA to take into consideration the following comments:-

Generic Spectrum Lot Size

6.2 We are supportive of setting the generic lots sizes at 6Mhz as well as 5Mhz and 5.5Mhz. In addition, these blocks of frequency should be contiguous in order to minimize inter-operator frequency interferences. If every operator owns dis-contiguous blocks of spectrum, then more frequencies are wasted as guard bands. For every block of frequency, each operator needs to waste the 2 edge frequencies as guard bands. Therefore, the more blocks there are, more guard bands are required, resulting in wastage.

Maximum Cap

6.3 We support the proposed imposition of a cap on the maximum amount of spectrum that each bidder may bid, which would be no higher than the optimum amount of spectrum required for national deployment for the prevention of “hoarding”. We also support IDA’s proposal in Section 6.1 to limit the amount of spectrum that existing 3G and broadband infrastructure providers may bid based on the minimum spectrum technically necessary for specific geographical deployment in Singapore, in the event that IDA decide to go ahead with permitting 3G and broadband infrastructure providers to bid for the 2.3Ghz and 2.5Ghz spectrum. This would ensure that new market entrants have a fair opportunity to compete.

7 Eligibility of Existing 3G and Broadband Infrastructure Providers

7.1 IDA has proposed to allow existing 3G and broadband infrastructure providers to bid for the 2.3 Ghz and 2.5 Ghz spectrum. This proposal has substantial implications on development of competition in the broadband market and must be considered carefully.

7.2 In addition to being 3G operators, the SingTel Group and Starhub Group are the operators of the ADSL network and cable modem broadband network in Singapore respectively. The SingTel Group and Starhub Group command majority market share in the broadband market and as such possess significant market power in this market individually. The SingTel Group and Starhub Group are the de-facto duopoly owners of the broadband networks in Singapore. Allowing these two companies to also operate wireless broadband networks in Singapore is potentially harmful to competition in the broadband market. SingTel and Starhub could potentially leverage on their significant

market power, deep financial resources and broadband market experience derived from their legacy broadband networks to undercut competing wireless broadband operators and cause them to exit the market or deter entry. Furthermore, the participation of these operators would reduce the scale of operations and customer base of the new wireless broadband network operators, which is a critical success factor in the capital intensive and razor thin profit margin broadband market. In this way, the key value proposition of WBA technologies in terms of facilitating rollout of wireless broadband network in competition with the wireline operators would be compromised.

7.3 In view of the above, we submit that the participation of the SingTel Group and Starhub Group in the wireless broadband network market would constitute a significant barrier to entry to new broadband network operators. In this regard, the SingTel Group and Starhub Group should not be allowed to bid for the 2.3Ghz and 2.5Ghz spectrum. This will give new wireless broadband network operators a chance to gain a foothold in the market and build economies of scale. Without such a competition safeguard, there is unlikely to be entry of operators of wireless broadband network other than the SingTel Group and Starhub Group, leaving the current status quo of a duopolistic upstream broadband network market structure unchanged and consumers with limited choice.

7.4 In the event that IDA decides to allow the SingTel Group and Starhub Group to bid for the 2.3Ghz and 2.5Ghz spectrum, we would like to submit that IDA should impose the condition that the SingTel Group and Starhub Group should only be allowed to deploy the WBA technologies in the 2.3Ghz and 2.5Ghz after an initial 3 years. This will give new wireless broadband network operators a chance to gain a foothold in the market and build economies of scale prior to the participation of the incumbents.

8 Interconnection and Access

Rooftop Access

8.1 As mentioned above, suitable consideration should be given by IDA to the issue of how to facilitate rooftop access by FBOs who have no legacy rooftop access rights for mounting of WBA equipment. Leaving the issue to commercial negotiations between the FBOs and rooftop owners will significantly delay the rollout of WBA network as the owners may not have the technical knowledge to fully appreciate the benefits of WBA technologies and may be unduly concerned with issues like interference. Without the government setting out clear guidelines relating to when, where and what charges to allow mounting of WBA equipment, owners are unlikely to have an incentive to allow quick mounting of WBA equipment at a reasonable charge. For cases where the rooftop rights belong to incumbents under legacy circumstances or otherwise, it is highly unlikely that competing FBOs will be given rooftop access at all without intervention from the authorities. This is an example of how the advantages of rapid rollout at low cost can be easily eliminated by practical operational deployment issues and should be carefully reviewed and addressed by IDA.

8.2 It is also important IDA continues to mandate SingTel to allow the leasing of in-building wiring to FBOs under the RIO framework. This is to cater to the case where the WBA technologies are used for backhaul purposes, i.e. as alternative to leased lines, and the “last mile” portion is provided via leased in-building wiring for consumers who prefer this arrangement. There is limited space for the installation of additional in-building wiring and associated equipment and it does not make economic sense to install in-building multiple telecommunications systems to provide services to a limited number of users.

8.3 We are supportive of the proposed requirement for WBA network providers to interconnect their WBA networks to the networks of any other service provider licensed by IDA. However, in order to facilitate smooth interconnection, we would like to submit that this requirement should be imposed only after the technologies for the WBA network, which are still evolving, have stabilized.

8.4 We would also like to propose that IDA consider and address interconnection amongst wireless networks, e.g. 2G/GPRS/3G/WiMax to form roaming relationships to drive mass adoption. However, as noted above, mandating open access in such new-age networks is unprecedented and may be premature given that standards and technologies are still evolving. Hence, caution should be exercised.

Quality of Service

8.5 WBA technologies in their present form are relatively new in the market. Technical trials are ongoing in many jurisdictions including Singapore. In setting the quality of service standards for the wireless broadband network, we would like to request IDA to take into consideration the results of the technical trials and the availability of standards-based mechanism for subscribers to request and receive guaranteed QOS.

9 Market Trial Licence Scheme

9.1 We welcome IDA’s proposed market trial licence scheme. The scheme will provide service providers with an opportunity to test the commercial viability of their services prior to actual commercial rollout of the service. Our comments on some of the key features of the Market Trial Licence Scheme are set out below:-

<i>Key Features of Market Trial Licence Scheme</i>	<i>Comments</i>
<ul style="list-style-type: none"> <i>Period of Licence</i> 6 months. IDA reserves the discretion to grant extension of commercial trial period for a maximum of 6 months depending on the merits of the case, e.g. allow smoother transition for 	<p>We suggest that the market trial licence be extended to 1 year. The reason is that wireless technology is highly susceptible to environmental</p>

<i>Key Features of Market Trial Licence Scheme</i>	<i>Comments</i>
commercial operations.	changes such as rain. In order to fully evaluate the feasibility of the technology, the system must be tested over the course of a year due to the seasonal monsoon rains that is experienced in this region. A trial period of only 6 months is not adequate to provide accurate results for our evaluation of the technology.
<ul style="list-style-type: none"> • <i>Licence Fees</i> \$2,500 for 6 months • <i>Other Fees</i> Full spectrum fees for shared band: \$1,750 for bandwidth less than 20 Mhz; \$3,100 for bandwidth more than 20 Mhz 	We would like to request that the Licence Fees and spectrum fees be waived for existing FBO licensees as they already pay FBO licence fees to IDA for operating and providing telecommunication systems and services. FBO should not have to pay additional fees to IDA for trials.
<ul style="list-style-type: none"> • <i>Licence Conditions</i> The trial operator shall provide IDA with any document or information that IDA may by notice require, on a timely basis and at the trial operator's own cost 	The documents or information furnished to IDA should not be released or make known to third parties without the prior consent of the trial operator and should only be used for the purpose of evaluating the trials.
<ul style="list-style-type: none"> • <i>Trial Participants</i> Trial participants are free to opt-out of the market trial at any time and there must be no obligations on trial participants to subscribe to any commercial services offered by the trial operator in future in the event that the trial operator becomes a full-fledge Services-Based Operator or Facilities-Based Operator. 	The trial participants should be required to return any equipment that was offered to him free-of-charge during the trial before he is allowed to opt-out of the trial.
<ul style="list-style-type: none"> • <i>Operating Conditions</i> Any proposed interconnection to a public telephone network or any other telecommunication networks authorized by IDA shall be left up to commercial negotiations Any siting of network equipment/systems in buildings or any other locations shall be left up to commercial negotiations between the trial operator and the premise owners 	We would like to request IDA to help facilitate the interconnection with dominant licensees, siting of network equipment/systems in buildings and liaising with government agencies and departments. Our experience indicates that IDA's assistance in these areas is critical for successful trials

<i>Key Features of Market Trial Licence Scheme</i>	<i>Comments</i>
The trial operator shall be responsible to seek the necessary approvals from all relevant government agencies and departments for the deployment of its networks/systems	