PROPOSED APPROACH TO FIXED-WIRELESS BROADBAND NETWORK DEPLOYMENT AND SERVICE PROVISIONING IN SINGAPORE

A Consultation Document

16 February 2000

1 INTRODUCTION

1.1 Singapore's telecommunication market will be fully liberalised from 1 April 2000. With this move, the Info-communications Development Authority of Singapore (IDA) welcomes the entry of new and innovative players to enhance both facilities-based and services-based competition. This will spur the rapid deployment of advance and leading-edge infrastructure as well as the proliferation of new, innovative and quality services to consumers and businesses. Of particular interest to IDA will be broadband-capacity infrastructure which will facilitate the rollout of broadband-based services.

1.2 IDA will continue to adopt a technology neutral approach towards the licensing of facilities-based operators. The technology platform (wired or wireless) adopted and the configuration of the system deployed will be left to the choice of the licensee, subject to spectrum and other physical constraints. This will give operators maximum flexibility in running and optimising their networks and ensure that they will continue to innovate and respond competitively to meet the needs of users and help Singapore position itself as a key info-communications hub.

1.3 There has been significant interest expressed by both local and foreign operators to deploy fixed-wireless broadband technologies such as Local Multipoint Distribution System (LMDS), Multichannel Multipoint Distribution System (MMDS) and Microwave Video Distribution Systems (MVDS) for the provision of interactive broadband multimedia (IBBMM) services in Singapore. The rapid advancements in wireless technologies and the growing demand for fast-speed data services have given rise to numerous opportunities for new service providers to enter markets quickly, rollout their networks rapidly and offer an entire suite of innovative broadband value-added services to business and consumers. In view of the interest shown by potential new entrants and considering IDA's aim to proliferate IBBMM services and usage in Singapore, IDA is in the process of formulating an appropriate licensing framework for the deployment and development of fixed-wireless broadband networks and service provision in Singapore.

1.4 However, the adoption and use of IBBMM services is still nascent. There are numerous uncertainties with regard to the development of the fixed-wireless broadband market, in particular, technology, usage/bandwidth demands and the type and range of services that could be offered. This in turn would have implications on the amount of spectrum needed by each operator, the number of operators that could be licensed, and ultimately the potential for the future development of the market. This document seeks the views and comments of the industry and members of the public on the future development of fixed-wireless broadband networks and services, the spectrum requirements for an operator for the types of services to be offered, and the appropriate licensing/spectrum allocation frameworks to be adopted. This document also seeks views and comments on the difficulties and problems of fixed-wireless broadband network deployment and suggestions on how these issues can best be addressed by parties concerned, including relevant government agencies.

2 CONSIDERATION OF ISSUES ARISING

2.1 Potential of Fixed-Wireless Broadband Technology

2.1.1 Parties interested in rolling out fixed-wireless broadband networks have given feedback to IDA that the deployment of such wireless broadband technology will result in numerous advantages for a new facilities-based entrant planning to enter Singapore's telecommunication market. The deployment of fixed-wireless technologies would enable cost effective and rapid rollout of alternative high-speed, fully interactive, broadband local loop infrastructure. It will overcome the traditional barriers of building out the last mile with minimal economic and social disruption.

2.1.2 Because of the lower infrastructure cost and the more rapid return on investment, this could potentially translate to lower broadband access prices to businesses/consumers and in turn redefine the potential for high bandwidth interactive applications. Examples include video conferencing, video-on-demand, fast residential Internet access, home shopping, tele-medicine, on-line gaming and highly flexible networked computing. The ability of the technology to support integrated service

offerings would fuel the convergence trend and place added competition at both the infrastructure and service levels. This in turn would place further pressure on both existing and new players to offer even more innovative pricing, services and customer support packages, thus further spurring the adoption of broadband services by end-users.

Question: *IDA seeks comments on the potential of and benefits arising from the deployment of fixed-wireless broadband network, the likely services/applications to be deployed and the potential demand from business and consumers.*

2.2 Competing Demands for Fixed-Wireless Broadband Technology

2.2.1 IDA recognises that there are numerous competing demands for the available spectrum, namely:

- As a complementary wireless alternative to the traditional wired local loop by existing facilities-based operators
- As a substitute to replace the leased circuits connecting base stations and mobile switching centres by the mobile operators
- To provide an alternative to fibre, cable and ADSL infrastructure for the provision of fast Internet and broadband access by Internet access service providers
- To provide broadcast services by cable TV operators as an alternative to the cable network

2.2.2 Given the varied applications of fixed-wireless broadband technology, the corresponding spectrum demands for different operators may differ significantly. This in turn would influence the amount of spectrum allocated to each operator and IDA's spectrum allocation process as well. There is a need to balance the competing demands for spectrum and to establish the most optimal method of allocating the spectrum (e.g. auction, beauty contest, first-come-first-serve) to ensure that the spectrum is put to the most effective and efficient use. IDA would therefore wish to have a better understanding of the different needs and requirements from the various interested parties so that we can assess, from a public interest perspective, the best economic and social use of the scarce spectrum resource. A key deliverable of this consultation exercise is to formulate a set of objective criteria to help us determine

who and when to license, how much of the spectrum to allocate to each licensee and how the spectrum allocation process should be implemented. Given the spectrum scarcity, as a matter of priority, IDA is of the view that preference should be given to operators who deploy the spectrum for nationwide fixed-wireless IBBMM network rather than for localised applications such as wireless links where there are already other alternatives.

2.2.3 Regardless of the eventual use of the spectrum, IDA would require the successful operator(s) to interconnect its fixed-wireless broadband network to the networks of any other service provider licensed by IDA and to offer fair and equitable open access to any content or service providers. End-users should be able to choose, use and access the services of any content/service provider in a transparent and seamless manner, regardless of the network to which they are directly connected. The successful applicant would also be required to comply with the minimum Quality of Service (QOS) standards issued by the IDA from time to time.

Question: *IDA seeks comments on the possible uses for the fixed-wireless broadband technology, and how the competing demands for the spectrum be managed, including the allocation process, the timing of the process and criteria to be used. IDA also seeks comments on whether there are interconnection and access issues that may pose problems to achieving IDA's objective of transparent and seamless interconnection and open access; and how these may be practically and realistically addressed. IDA further seeks comments on the type and level of QOS standards, including both network and customer QOS standards, that will be appropriate to benchmark the quality of the network and services deployed.*

2.4 Spectrum for Fixed-Wireless Broadband Services

Spectrum Availability

2.4.1 IDA has reserved a total of 3.55GHz in the following frequency ranges for the provision of terrestrial fixed-wireless broadband:

- 25.25 - 27.00 GHz

- 27.50 - 28.60 GHz
- 29.10 - 29.50 GHz
- 31.00 - 31.30 GHz

Considering the potential growth of satellite services in the region, IDA is of the view that there should be provision of spectrum for satellite services. As such, in line with the decision adopted at the 1995 World Radiocommunication Conference (WRC-95), IDA has set aside the band 28.6 – 29.1 GHz (Earth-to-space) for use by non-Geostationary Satellite Orbit (NGSO) fixed-satellite service (FSS) networks.

Question: *IDA seeks comments on the amount of spectrum that should be made available for terrestrial fixed-wireless broadband versus satellite services, including the timing for review of spectrum reservation and allocation, where appropriate.*

Spectrum Bandwidth Per Operator and the No. of Operators to License

2.4.2 The network demands of IBBMM services and usage are still uncertain as broadband usage is still in the early stages. It is therefore difficult to determine the minimum or most optimal level of bandwidth required by each operator. The practices of countries so far (with the notable exception of Hong Kong) have been to allocate approximately 1GHz to a single operator, on a regional basis, in view that the network would be used to carry high volume IBBMM services. In a variation to the above approach, the US had auctioned off its LMDS spectrum in 2 separate blocks per basic trading area (1,150MHz in the 1st block and 150MHz in the 2nd block). Hong Kong on the other hand has allocated 600MHz per operators (300 MHz upon grant of licence and 300MHz for future expansion).

Question: *IDA seeks comments on the optimal amount of spectrum to be allocated to each operator, including the detailed assumptions/basis/calculations used to derive the proposed spectrum bandwidth, and the timing of allocation where appropriate. IDA also seeks comments on the optimal number of operators that can be licensed, bearing in mind the future growth of the broadband market in Singapore.*

Spectrum Allocation-cum-Licence Award Approach

2.4.3 There are varied means of allocating the spectrum and award of licences. Given the scarcity of the spectrum resource, and hence constraints on the number of licences that may be awarded, the objective of IDA is to grant the spectrum to operators who can optimise usage, provide a wide range of competitively priced and innovative IBBMM services to meet the needs of end-users and the economy. Four broad approaches are currently being studied:

(a) A pure auction-based approach whereby the spectrum and licence would be assigned and awarded to the party with the highest monetary bid;

(b) A beauty-contest tender approach, as was adopted for the licensing of past mobile communications services such as public mobile cellular telephone services and public radio paging services by IDA. Applicants would be invited to submit business and technical proposals for evaluation by IDA against a list of pre-determined criteria. Spectrum fees payable under this approach would likely be on a cost-plus basis;

(c) A combination auction-beauty contest approach where applicants would be assessed on their monetary bids and business/technical proposals; or

(d) The allocation of the spectrum on a per-link basis or on a needs basis. Spectrum fees payable under this approach would likely be on a cost-plus basis

2.4.4 On a related issue, IDA is also considering whether the entire spectrum bandwidth should be assigned to the successful operators at the outset, or whether the spectrum would be better assigned in a phased manner, with IDA reserving a certain proportion for future expansion.

Question: IDA seeks comments on the most appropriate licensing and spectrum allocation approach to adopt. Views are also sought on whether spectrum should be assigned in a phased manner or allocated fully to the operator at the grant of licence. Should

there be a separate component for licence fees payable in addition to spectrum fees payable?

Provision of Broadcasting Services

2.4.5 Given the high capacity provided by fixed-wireless broadband networks, there is a possibility that the spectrum could be utilised by broadcasters to provide broadcasting services to their subscribers. These would require large amounts of bandwidth to be available for long periods. In view of the uncertainty of the capacity demand that could arise from IBBMM services and the rate of adoption for these services, it is IDA's view that broadcasting services should not be provided over the band indicated in para 2.4.1. Rather, IDA is considering setting aside the 40GHz band, within which there is potentially a large amount of bandwidth available, for the transmission of broadcasting services.

Question: *IDA seeks comments on whether the proposed spectrum band in para 2.4.1 should be reserved primarily for IBBMM services or whether they should also be assigned for broadcasters' usage.*

2.5 Licence Conditions

Duration of Licence

2.5.1 The duration of the licence should be suitably long for operators to roll-out their networks, recoup their investment and earn reasonable rates of return as well as sufficient degree of business security and continuity for them to invest in the Singapore market.

Question: *IDA seeks comments on the appropriate licence duration for the provision of fixed-wireless broadband services*

Licence Award and Service Launch Date

2.5.2 IDA plans to award the licence by the 3rd quarter of 2000, taking into account the time needed for IDA to arrange the comparative selective exercise and for potential entrants to prepare their applications and/or bids.

Question: *IDA seeks comments on the timeframe for award of licence as well as the time needed by the operators to roll-out their networks and offer commercial services to the public.*

2.6 Technical Considerations

Climatic Considerations

2.6.1 A key concern is whether Singapore's climatic conditions (with frequent tropical thunderstorms) would be suitable for such high frequency technology and whether quality of service standards can be sustained.

Question: *IDA seeks comments on how the issues of rain attenuation and compliance with QOS standards would be addressed.*

In-Building Coverage

2.6.2 Potential operators would need to consider the issues involved in deploying their own in-building wiring for high-rise residential apartments and commercial buildings. There are various options for rolling out the internal wiring, these range from fibre, Hybrid Fibre Coaxial[1] and ethernet cables. IDA will leave the choice of technology used to the commercial decision of the operator.

Question: *IDA seeks comments on how operators plan to install their own internal wiring, the potential difficulties faced and the cost of doing so. IDA also seeks comments on how these difficulties can be practically and realistically addressed by potential operators and how IDA can facilitate the installation.*

3 TRIALS

3.1 In the interim, the IDA will allow trials by parties under its trial framework. Parties who are interested to test the technology and operational aspects of fixed-wireless broadband installation and operation are therefore invited to submit their applications in accordance with IDA's trial framework procedures. Trial applicants should note that

[1] To date, Singapore Cable Vision has deployed their hybrid fibre coaxial (HFC) network through 99% of residential property. However, commercial buildings have not been cabled up.

approval for the trial must not be taken to pre-empt any approval from IDA for the trial applicant being licensed to provide any public or commercial service in the future. As IDA plans to award licences for fixed-wireless broadband services by 3rd Quarter 2000, all trial activities must be ceased before then, including a reasonable time for the full recovery of the installed infrastructure, and equipment from users' premises. This is to ensure that successful licensees will not be unduly constrained in their rollout in preparation for commercial services. Given the scarcity of the spectrum and the strong level of interest in fixed-wireless broadband technology, parties that receive approval from IDA to conduct their trials will be required to make public the scope and results of their trial. Any trial information/result which is considered commercially confidential by the party conducting the trial should be clearly marked and brought to the notice of the IDA for consideration.

3.2 Parties interested in trialing fixed-wireless services in Singapore should read IDA's "Terms and Conditions for Telecommunication Trials" and submit the completed trial application form to IDA for evaluation.

4 INVITATION OF COMMENTS

4.1 In summary, IDA would like to seek the views and comments of industry and the members of the public on the following issues and proposals raised in the consultation paper, including the difficulties and problems of fixed-wireless broadband network deployment and suggestions on how these issues can best be addressed by parties concerned, including relevant government agencies:

(a) the potential of and benefits arising from the deployment of fixed-wireless broadband network, the likely services/applications to be deployed and the potential demand from business and consumers.

(b) the possible uses for the fixed-wireless broadband technology, and how the competing demands for the spectrum should be managed, including the allocation process, the timing of the process and criteria to be used. IDA also seeks comments on

whether there are interconnection and access issues that may pose problems to achieving IDA's objective of transparent and seamless interconnection and open access; and how these may be practically and realistically addressed. IDA further seeks comments on the type and level of QOS standards, including both network and customer QOS standards, that would be appropriate to benchmark the quality of the network and services deployed.

(c) the amount of spectrum that should be made available for terrestrial fixed-wireless broadband and satellite services, including the timing for review of spectrum reservation and allocation, where appropriate.

(d) the optimal amount of spectrum to be allocated to each operator, including the detailed assumptions/basis/calculations used to derive the proposed spectrum bandwidth, and the timing of allocation where appropriate. IDA also seeks comments on the optimal number of operators that can be licensed, bearing in mind the growth of the broadband market in Singapore.

(e) the most appropriate licensing and spectrum allocation approach to adopt. Views are also sought on whether spectrum should be assigned in a phased manner or allocated fully to the operator at the grant of licence. Should there be a separate component for licence fees payable in addition to spectrum fees payable?

(f) whether the proposed spectrum band in para 2.4.1 should be reserved primarily for IBBMM services or whether they should be assigned for broadcasters' usage.

(g) the appropriate licence duration for the provision of fixed-wireless broadband services.

(h) the timeframe for award of licence as well as the time needed by the operators to roll-out their networks and offer commercial services to the public.

(i) how the issues of rain attenuation and compliance with QOS standards would be addressed.

(j) *how operators plan to install their own internal wiring, the potential difficulties faced and the cost of doing so. IDA also seeks comments on how these difficulties can be practically and realistically addressed by potential operators and how IDA can facilitate the installation*

4.2 Respondents are also invited to comment on any other issues not covered herein that they consider of relevance in this review.

4.3 IDA will consider inputs submitted and make its policy decision thereafter. IDA will target to announce its policy decision by 2nd Quarter 2000.

4.4 All views and comments should be submitted in writing and in both hard and soft copy (Microsoft Word 97 format), and should reach the IDA on or before 31 March 2000. Respondents are required to include their personal/company particulars as well as the correspondence address in their submissions. Comments and views should be addressed to:

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4.5 IDA reserves the right to make public all or parts of any written submissions made in response to the Consultation Paper and to disclose the identity of the source. Any part of the submission which is considered commercially confidential should be clearly marked and placed as an annex to the comments and views raised. IDA will take this into account when disclosing the information submitted.