

**DECISION AND EXPLANATORY MEMORANDUM ISSUED BY INFOCOMM
DEVELOPMENT AUTHORITY OF SINGAPORE ON THE FRAMEWORK FOR
THE REALLOCATION OF SPECTRUM IN THE 900 MHZ AND 1800 MHZ
FREQUENCY BANDS**

ISSUED ON 18 JANUARY 2008

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PART I: INTRODUCTION

1. On 28 July 2007, IDA issued a public consultation on “Proposed Framework for the Reallocation of Spectrum in the 900 MHz and 1800 MHz Frequency Bands” (“Consultation”). The Consultation closed on 24 August 2007.
2. IDA has finalised the framework, and has today released the Information Memorandum on the Auction of Public Cellular Mobile Telecommunication Services Spectrum Rights (“Auction of PCMTS Spectrum Rights”). IDA invites operators and companies to participate in the spectrum allocation process.

**PART II: OVERVIEW OF COMMENTS RECEIVED ON THE PROPOSED
THE FRAMEWORK FOR THE REALLOCATION OF
SPECTRUM IN THE 900 MHZ AND 1800 MHZ FREQUENCY
BANDS**

3. At the close of the Consultation, IDA received comments from seven respondents:
 - i. Ericsson;
 - ii. GSM Association;
 - iii. MobileOne Limited;
 - iv. Singapore Telecom Mobile Pte Ltd;
 - v. Singapore Technologies Telemedia;
 - vi. StarHub Group; and
 - vii. Qualcomm
4. IDA wishes to thank all respondents for their inputs. The respondents in general agreed with the allocation of the 900 MHz and 1800 MHz Frequency Bands (“the Bands”) for Public Cellular Mobile Telecommunication Services (“PCMTS”). Some respondents raised concerns with respect to the proposed ‘greenfield’ allocation approach. IDA has given careful and extensive considerations of the views received. The sections below discuss the key issues raised during the Consultation and IDA’s decision on the final framework for the reallocation of the Bands.

PART III: IDA'S POLICY OBJECTIVES & APPROACH

5. The expiry of the 2G Spectrum Rights on 30 September 2008 will free up valuable spectrum in the Bands for reallocation. IDA seeks to ensure that the spectrum is allocated in a way which makes the most efficient use of Singapore's scarce spectrum resources to promote innovation in, and growth of a vibrant infocomm industry in Singapore. At the same time, IDA recognises that 2G services still form a large part of the cellular mobile services that are offered by the operators, and used by a substantial number of consumers today. IDA has thus also considered the need to minimise disruption to consumers when setting the framework for reallocation.

PART IV: IDA'S DECISION ON THE FRAMEWORK FOR THE REALLOCATION OF SPECTRUM IN THE 900 MHZ AND 1800 MHZ FREQUENCY BANDS

Allowable use for the spectrum

6. In general, the respondents agreed that the primary use of the band should be for the provision of PCMTS, as proposed by IDA in the Consultation. IDA has thus decided to adopt its proposal to require operators using the Bands to provide PCMTS to the public. Based on the feedback received, IDA assesses that there is limited development in Wireless Broadband Access ("WBA") standards in the two bands as well as for low power GSM. Nonetheless, IDA proposes to allow operators to use the Bands to provide other services such as data services, including WBA, as long as they have met the requirement to provide PCMTS.
7. Two respondents were of the view that there would be little benefit to allowing the Bands to be used for 3G services, given that there is already sufficient spectrum in the 1900 MHz band. Nonetheless, IDA notes that there are no strong reasons to limit the use of the Bands to existing 2G technologies, and that there is an international trend, which two other respondents have also highlighted, towards allowing the band to be used to provide 3G. Hence, IDA will allow 2G or 3G technologies, and other technologies which share a similar platform and allow higher speed data services, such as GPRS, EDGE or HSPA, to be deployed in the Bands, as long as the spectrum is used for the provision of PCMTS.

8. Should operators wish to deploy other technologies that may not be classified as 2G or 3G technologies or their evolved versions, but yet are capable of providing PCMTS, operators will be required to seek IDA's approval before doing so. IDA will assess such requests on a case-by-case basis, taking into account issues such as the technical interference between these technologies, technologies deployed in the neighbouring frequency bands, and any other relevant considerations.

Lot size and Guard band

9. In terms of lot size, IDA will allocate the spectrum as paired 5 MHz spectrum lots. This will accommodate the deployment of 3G services in the Bands, if operators decide to do so. The lot size was generally supported by respondents in the Consultation, except for one which preferred smaller lots, given its view to reserve the spectrum for 2G services.
10. In terms of the guard band, the respondents agreed that it is fair to require operators to provide a guard band based on an established principle, though one respondent preferred that the guard bands be pre-provisioned. IDA has decided to establish the principle that operators will be required to provide a guard band of at least 200 KHz on the left (the lower frequency boundary) of every contiguous spectrum band they have obtained. Hence the guard bands will only be determined after the spectrum is allocated. Operators that deploy 3G or other UMTS services will be required to provide additional spectrum for larger guard bands between their 3G networks and other operators' 2G networks, based on the ECC Report 082¹, so as to ensure that they do not interfere with other operators' 2G networks.

Available Supply

11. In the consultation, IDA proposed not to put out any EGSM spectrum but reserve it for future demand. However, the response to the consultation indicates that there is existing demand for spectrum in the EGSM band. That being the case, IDA proposes to make available 1 out of the 2 lots of spectrum in the EGSM band for auction. This is in addition to the 5 lots of 900MHz spectrum and 12 lots of 1800 MHz spectrum proposed in the public consultation.
12. Nevertheless, to cater to future demand, IDA will reserve 3 lots of 1800 MHz spectrum, as well as the remaining 1 lot of EGSM spectrum, for allocation after this Auction if it deems necessary. The reserved

¹ The ECC Report 082 describes how WCDMA/HSPA can be introduced in the 900 MHz and 1800 MHz bands while keeping GSM in operation, in various scenarios.

spectrum may also be made available for other uses, such as technical or market trials, research and development, mobile equipment testing, *etc.* Separately, there is some spectrum in the 1900/2100 MHz band that has not been allocated, that may be used for the deployment of telecommunication services such as PCMTS in future if IDA feels there is such a need.

Spectrum Allocation

13. In the Consultation, IDA had proposed to allocate the spectrum on a 'greenfield' basis, meaning that existing operators that have 2G Spectrum Rights will not be given any preference in the reallocation exercise. A 'greenfield' allocation would be the most economically sound approach to ensure that the spectrum is allocated to operators that value it most, and would avoid setting a precedence of according a preference to incumbent operators even after they have no residual rights to the spectrum. 5 respondents raised strong objections to this proposal, citing the following implications:
 - (a) Potential disruption of services for existing 2G customers and inbound roamers. This would be a possibility if the existing operators do not get back their current spectrum lots, and/or have to make do with less spectrum;
 - (b) Increased costs which may be passed on to consumers. There may be significant costs incurred if there is a need to adjust networks and change equipment, particularly if there is a need to replace infrastructure in the existing MRT, road tunnels and in-building projects;
 - (c) Speculation in spectrum which could possibly drive up costs; and
 - (d) Writing off of existing investments in 2G networks. This would occur if the existing operators are unable to get spectrum in the Band.

14. As explained above, IDA's objective in allocating spectrum is to ensure the most efficient use of the scarce spectrum resource. A market-based allocation approach, implemented through an auction, is a means of achieving this outcome. By pricing spectrum at its market value as determined through an auction, operators will have the incentive to be efficient in their demand and usage of spectrum. The efficient use of spectrum in the Bands is important given the possible current and new uses of the Bands. For example, a recent Ofcom consultation paper² noted that, for operators in densely populated areas, the advantage of having access to 900MHz spectrum is likely to

² Consultation on the "Application of spectrum liberalisation and trading to the mobile sector" issued on 20 Sep 2007.

be greater in the case of 3G systems, compared to 2G systems. With the expiry of the existing 2G spectrum rights, IDA is able to review the current spectrum usage to take account of possible future uses as well as to ensure that all operators have a fair chance to obtain spectrum in the EGSM, 900 MHz and 1800 MHz bands according to their individual needs.

15. Some respondents raised the concern that an auction might result in operators' having to pay more for the spectrum, and also impose migration costs on operators in the event that they are unable to obtain the same spectrum bands as their existing 2G Spectrum Rights. They submitted that the increased costs would be passed on to consumers. Nevertheless, IDA is of the view that in a competitive market, consumer prices would generally be driven by market forces rather than sunk costs. IDA has thus decided to proceed with the use of an auction to reallocate spectrum in the Bands. However, IDA will make several changes to the proposed 'greenfield' approach in the auction, as elaborated in the following paragraphs.
16. Firstly, while IDA's intention in proceeding with an auction is to ensure that spectrum in the Bands is efficiently allocated and used, IDA is cognisant of the need to prevent any one operator from hoarding spectrum, and enable multiple operators to obtain some spectrum in the Bands. IDA has thus decided to impose a cap on the amount of spectrum that any bidder may obtain in the auction. Each operator will only be allowed to bid for up to 6 lots of spectrum, with a sub cap of 3 lots of spectrum in the EGSM and 900 MHz bands, taken together. The presence of a cap on the amount of spectrum that any bidder may obtain would also mitigate the concern raised by respondents that existing operators may be unable to obtain any spectrum in the Bands in the event of an auction.
17. Secondly, while IDA has decided to proceed with an auction to ensure efficient utilisation of spectrum in the Bands, IDA acknowledges that it is important to avoid unnecessary spectrum churning to minimise service disruptions and costs. This is especially when there are still a substantial number³ of mobile customers on 2G networks. IDA has thus decided to incorporate an element of "first rights of refusal" for existing holders of 2G Spectrum Rights, as part of the allocation process.
18. Broadly, for the purposes of this auction only, the allocation process will be structured on the following basis:

³ 70.7% of all mobile subscribers in Nov 2007

- (a) Quantity of spectrum that each operator gets will be determined by market mechanisms, so that spectrum is efficiently allocated. There will be measures in place to prevent abuses, eg. hoarding of spectrum by incumbents to squeeze out competition.
 - (b) Subject to the quantity of spectrum that they successfully obtain through a competitive bidding process involving the market mechanism, incumbent operators may exercise “first rights of refusal” to have first pick to retain the spectrum lots in their existing 2G spectrum rights. This is to avoid unnecessary spectrum churn and more importantly, service disruption to end-users.
19. IDA’s decision to give incumbent operators “first rights of refusal” over their existing spectrum lots in this case, should in no way imply that incumbent operators have residual rights with respect to their spectrum when their spectrum rights expire. For the avoidance of doubt, IDA is not bound in any way to grant “first rights of refusal” in future re-allocation exercise over these spectrum lots. Similarly, IDA is not bound in any way to accord similar preferences to the incumbent operators in other spectrum reallocation exercises. Going forward, decisions on reallocation frameworks will be determined solely by IDA based on its policy objectives and on the facts at that point in time.
20. The respondents also raised a concern that a ‘greenfield’ auction might result in speculation in spectrum, thereby artificially driving up the price of the spectrum. On this point, IDA has put in measures to ensure that speculation is deterred. Bidders that obtain spectrum in the auction will be required to use the spectrum to provide PCMTS. In order to provide PCMTS, operators will require a Facilities-Based Operator (“FBO”) licence, and be bound by licence conditions that, among others, require the operator to provide nationwide coverage for its PCMTS systems and services. These requirements on service provisioning would deter bidders from obtaining spectrum in the Bands purely for speculative purposes.

Auction process

21. To implement the proposed framework, IDA proposes to conduct a 2 stage clock-combinatorial auction in which all operators would have an equal chance of obtaining lots in the various spectrum bands. In the first stage, bidders will bid for generic lots of spectrum in each of the EGSM, 900 MHz and 1800 MHz bands in a clock auction. Bidders that manage to obtain spectrum in the first stage will proceed to the second stage, where existing holders of 2G Spectrum Rights will have first pick of the spectrum lots that they have under their existing 2G Spectrum Rights, subject to the number of lots that they obtain in the first stage.

The remaining unassigned spectrum lots will then be assigned through a combinatorial bid. The 2 stage auction will ensure that efficient use of spectrum in the Bands is achieved by pricing the spectrum at its market value, while ensuring that disruption to consumers is minimised by assigning the spectrum in a manner that avoids unnecessary churning of spectrum. Further details of the auction framework are found in the Information Memorandum on the “Auction of the Public Cellular Mobile Telecommunication Services Spectrum Rights”.

Spectrum Auction Fees and Spectrum Management Fees

22. The auction will determine the one-time upfront charge for the spectrum. A reserve price of S\$300,000 per spectrum lot will be set.
23. IDA has decided to impose a recurrent spectrum management fee of S\$140,000 per spectrum lot per year. This was consulted on, and respondents had submitted that the fee was reasonable.

FBO Licence Fees

24. In addition to the spectrum auction fees and spectrum management fees associated with the PCMTS Spectrum Rights, operators will be subject to licence fees, currently set at 1% Annual Gross Turnover ("AGTO"), for the provision of PCMTS under their FBO licences.
25. For the provision of 3G services using spectrum in the Bands, 2 respondents were of the view that it would be difficult to segregate revenues from 3G services over the Bands from revenues from 3G services over their existing 1900/2100 MHz 3G Spectrum Rights. The respondents thus proposed that all 3G services should not be subject to the payment of an FBO licence fee, similar to the treatment of 3G services offered over the 1900/2100 MHz 3G Spectrum Rights.
26. As explained in the Consultation, IDA is cognisant of the fact that the 3G Licensees had paid a one-time upfront fee of S\$100 million per operator for their 3G Licence and 3G Spectrum Rights in the 1900/2100 MHz Band. No annual licence fee is therefore imposed on 3G services provided using the existing 3G Spectrum Rights. However, this does not apply to the provision of 3G services using other spectrum bands, such as the 900 MHz and/or 1800 MHz bands.
27. If a 3G Licensee successfully obtains the PCMTS Spectrum Rights through the auction, and wishes to use the spectrum to provide 3G services, the operator will be required to seek IDA's approval to amend its existing 3G FBO Licences and Radio-Communications Network

Licences in order to provide 3G services using the PCMTS spectrum. IDA will require the payment of FBO licence fees for the 3G services that are provided over the Bands. The method of segregating revenues from 3G services over the Bands from revenues from 3G services over their existing 1900/2100 MHz 3G Spectrum Rights, will be determined when the Licensee seeks IDA's approval for the necessary amendments to its licences⁴.

Duration of new spectrum rights

28. The current 2G Spectrum Rights are due to expire on 30 September 2008. However, in view of possible network migration and major international events taking place in Singapore in end September 2008 that require close spectrum coordination, IDA has decided to offer current 2G operators the use of their current 2G spectrum for an additional 3 months, from 1 October 2008 to 31 December 2008. Based on an annual spectrum management fee of \$140,000.00, the applicable pro-rated spectrum management fee for the 3 months will be \$35,287.67 for each 2 x 5 MHz 2G Spectrum Lot, exclusive of the applicable GST. Fees for 2G spectrum lots of less than 2 x 5 MHz will be pro rated accordingly. For the avoidance of doubt, all other fees relating to the use of the 2G Spectrum Lot for the provision of PCMTS continues to be payable (including the 1% AGTO under the 2G FBO Licence)
29. Hence, the PCMTS spectrum rights to be allocated under this reallocation exercise will take effect only from 1 January 2009. All the respondents submitted that a 7 year spectrum right duration was too short given the heavy rollout obligations imposed on mobile operators in Singapore. They generally proposed durations of 10-20 years, citing practices in other jurisdictions. Nevertheless, IDA has to strike a balance between providing operators with a longer spectrum right duration, thereby more business certainty, and the need to ensure the most efficient and effective use of Singapore's spectrum resource. Furthermore, IDA notes that the FBO licences of the 3 existing 2G operators expire on 31 March 2017. Balancing the above considerations, IDA has decided to set the spectrum right duration at 8 years and 3 months. The PCMTS Spectrum Rights to be allocated in the Auction will thus expire on 31 March 2017, similar to the expiration of the existing 2G operators' FBO licences. Operators will have no residual rights to the spectrum in the Bands after 31 March 2017. IDA reserves the right, in its sole discretion, to determine the framework for

⁴ Operators may, upon applying for IDA's approval to amend their licences, propose the method for segregating revenues for IDA's approval.

the reallocation of spectrum in the Bands after the expiry of the PCMTS Spectrum Rights.

Licences and Roll-out Requirements

30. Bidders that successfully obtain the PCMTS Spectrum Right must apply for an FBO licence for the provision of PCMTS (if they do not already have one). In this regard, IDA will impose on the successful bidder in its FBO licence the same specific licence conditions relating to service coverage for the provision of PCMTS as other licensed providers of PCMTS, such as the obligation to provide coverage for the whole island of Singapore (including MRT underground stations/lines and road tunnels), the offshore islands and the territorial waters up to 15km from the coast line of the island of Singapore.
31. In addition, where IDA issues a new FBO licence to a successful bidder of the PCMTS Spectrum Right, the operator will be required to rollout its systems and services within 2 years from when the PCMTS Spectrum Right is issued. In determining the 2 year rollout timeframe, IDA also considered that 2G and 3G are mature technologies today, and that the 2 year timeframe is similar to the timeframe given to StarHub Mobile when it was awarded the 3rd PCMTS licence in 1998, to deploy its 2G services by 2000. For the avoidance of doubt, the annual spectrum management fees will apply even for the period where the successful bidder has yet to roll out its system and services.
32. As mentioned above, if existing 3G Licensees obtain the PCMTS Spectrum Rights and wish to use spectrum in the Bands to provide 3G services, they will be required to seek IDA's approval to amend their existing 3G FBO Licences and Radio-Communications Network Licences before providing 3G services using the PCMTS Spectrum Rights. In this regard, the existing 3G Licensee will have to pay a FBO licence fee set at 1% AGTO, for the provision of 3G services under its 3G FBO Licence using the PCMTS Spectrum Rights.

Potential uses of the 800 MHz band

33. IDA also sought views on the potential uses of the 800 MHz band. The respondents did not indicate strong demand for spectrum in this band. IDA will continue to monitor industry interest in the band before deciding on the timeframe, and manner of allocation for spectrum in the 800 MHz band.

PART V: SPECTRUM ALLOCATION RULES AND PROCESSES

34. IDA has today released the Information Memorandum on the “Auction of the Public Cellular Mobile Telecommunication Services Spectrum Rights” containing information on the application process for the PCMTS auction, as well as the auction rules and other relevant documents. These documents can be found on the IDA website at www.ida.gov.sg, under the “Policy and Regulation” section.