



**EXPLANATORY MEMORANDUM ISSUED BY
INFOCOMM DEVELOPMENT AUTHORITY OF SINGAPORE
ON THE POLICY FRAMEWORK FOR
IP TELEPHONY AND ELECTRONIC NUMBERING IN SINGAPORE**

14 June 2005

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PART I: INTRODUCTION

1. On 21 September 2004, IDA issued a public consultation on the proposed policy framework for IP Telephony and Electronic Numbering (“ENUM”) in Singapore (“Consultation”). The Consultation closed on 5 November 2004.

**Part II: OVERVIEW OF COMMENTS RECEIVED ON THE PROPOSED
POLICY FRAMEWORK FOR IP TELEPHONY AND ELECTRONIC
NUMBERING IN SINGAPORE**

2. At the close of the Consultation, IDA received comments on the proposed policy framework for IP Telephony and ENUM in Singapore from 13 respondents:
 - i. Asgent Inc.
 - ii. AT&T Corp.
 - iii. Ellipse Communications Pte Ltd
 - iv. Ericsson Telecommunications Pte Ltd
 - v. MediaRing Ltd
 - vi. MobileOne Ltd
 - vii. Pacific Internet Ltd
 - viii. Reach Ltd
 - ix. Singapore Telecommunications Ltd
 - x. StarHub Ltd
 - xi. Tan & Tan Partnership
 - xii. Vole Inc. (Worldwide) Pte Ltd
 - xiii. Vonage Holdings Corp.

3. IDA would like to thank the commenters for their inputs. IDA notes that all the commenters in general agreed with the proposed policy framework, although some suggested some modifications for IDA's consideration. IDA has reviewed the responses and has given extensive consideration to the views submitted. The sections below discuss the key issues raised during the consultation and propose the final framework IDA has adopted.

PART III: IDA'S POSITION ON THE POLICY FRAMEWORK FOR IP TELEPHONY

IDA's Policy Objectives & Approach

4. IDA had, in the document issued for Consultation, proposed to take a developmental approach of allowing emerging technologies such as IP Telephony to fully develop at the introductory phase. IDA would impose regulations only to the extent necessary to address economic, social/public or regulatory concerns.
5. Most commenters agreed with IDA's approach. A few further suggested that the framework must establish a level playing field for all licensees especially if the IP Telephony service is to become a substitute to current Public Switched Telephone Network ("PSTN") services.
6. IDA therefore will maintain its "light-handed" regulatory approach to encourage introduction of this new emerging technology to provide businesses and consumers with greater service choices. IDA will introduce regulations to ensure a level playing field where necessary.
7. The term "Voice over Internet Protocol" (VoIP) is a generic name for the transport of voice traffic using IP technology. VoIP traffic can be carried on a private managed network or the public Internet or a combination of both. *The IP Telephony service referred to in this policy framework paper relates to a form of VoIP that requires telephone or E.164 numbers¹, that allows a user to make and receive voice, data and video calls in any*

¹ An ITU-T standard network addressing format for telephone numbers. E.164 addresses are 15 decimal digits long and include a country code, area or city code, and a local number.

domestic or overseas location where broadband Internet access is available.

Licensing Framework

8. IDA had proposed to allow IP Telephony services to be provided under a Facilities-Based Operation (“FBO”) or Services-Based Operation (“SBO”) (Individual) licence, depending on whether the service provider intends to deploy network infrastructure. An SBO (Individual) licence will be issued to those that lease transmission facilities from an FBO to operate their own network. Most commenters agreed with the proposed approach.
9. Service providers who intend to subscribe to the public Internet access services from an Internet Access Service Provider (“IASP”) to carry Internet-based voice and/or data services over the public Internet and do not require the use of E.164 telephone numbers and allocation of such numbers to its customers in Singapore will continue to be issued an SBO (Class) licence.
10. One commenter suggested that IDA grant limited licences to test new applications in Singapore and to grant limited licences to run commercial trials of such applications. IDA believes that such a suggestion is not in line with IDA’s approach towards full liberalisation of the telecommunication market in 2000. IDA has adopted an open market entry approach since full liberalisation and does not limit the number of licences issued for the provision of telecommunication services, unless limited by scarce resources. On 28 July 2004, IDA introduced the Market Trial Framework that allows companies to offer commercial market trials for a period of 6 months.
11. Therefore, IDA will maintain the licensing framework as proposed. For the avoidance of doubt, any service provider who intends to provide IP Telephony services using E.164 telephone numbers and allocating such numbers to its customers in Singapore, regardless of whether the telephone numbers are issued by IDA, must obtain an SBO (Individual) licence from IDA.

Interconnection and Access

12. IDA had proposed in the Consultation that all FBO and SBO licensees observe the Minimum Interconnection Duties under the Telecom Competition Code (“Code”) to ensure seamless and any-to-any communication throughout Singapore. Under the proposed framework, an IP Telephony service provider can commercially decide to set up a “close-user” network and not request for interconnection with existing telecommunication networks. However, if the IP Telephony service provider chooses to interconnect with existing telecommunication networks, such as the PSTN or mobile networks, the existing FBO and SBO licensees must observe the interconnection requirements stipulated under the Telecom Competition Code to allow interconnection. Similarly, if existing FBO and SBO licensees request for interconnection with the IP Telephony service provider, the latter will have to observe the requirements stipulated under the Telecom Competition Code and allow interconnection.
13. Commenters generally agreed with IDA’s proposal. However some commenters expressed uncertainties on the manner which IP Telephony service providers could connect to the PSTN service providers under the current interconnection framework and suggested that IDA considers specifying the interconnection methods and details². One commenter also asked IDA to consider different termination or settlement rates applicable to different IP Telephony service providers depending on the infrastructure provided.
14. IDA recognises that IP Telephony is a new and evolving technology, therefore, consistent with IDA’s policy objectives and approach, IDA will not dictate the specific interconnection configurations that must be adopted at this stage. IP Telephony service providers are free to commercially negotiate and pursue the most appropriate interconnection arrangements with the Dominant Licensee and/or other service providers.

² IDA notes that several interconnection models could arise. These include (i) Direct interconnection between IP networks; (ii) IP Telephony service provider interconnection to the PSTN; and (iii) Interconnection between IP Telephony service providers via the PSTN. IDA also notes for interconnection with PSTN, different methods include the use of media translation gateways by IP Telephony service providers for conversion of IP Telephony traffic to PSTN traffic and vice versa, or to interconnect using H.323 or SIP protocol.

In negotiating interconnection arrangements, IP Telephony service providers must observe the Minimum Interconnection Duties for establishing interconnection agreements as set out in the Code.

15. IDA further notes that an IP Telephony service provider, issued with E.164 telephone numbers from IDA, seeking connection with the Dominant Licensee's network may do so through commercial arrangements, for example, connect using ISDN-30 product, or rely on the different options for entering into an Interconnection Agreement following the procedures set out in the Code. To provide further guidance to the industry, IDA has issued a "Guide to Interconnection with the Dominant Licensee" attached in the **Annex** to this paper, outlining different interconnection approaches and methods.
16. IDA will continue to assess market developments and provide further policy guidance on the interconnection requirements and consult the industry on this matter where appropriate.

Quality of Service ("QoS")

17. IDA had proposed not to impose any QoS level on IP Telephony services. Most commenters agreed with IDA's position. One commenter suggested that IDA impose minimum requirements on educational activities such as those undertaken by IP Telephony service providers to inform end-users of the non-availability of QoS.
18. IDA has set minimum QoS standards for basic local call services, currently provided by FBO licensees such as Singapore Telecommunications Ltd and StarHub Ltd. As for international call services, the market is highly competitive with many service providers. IDA believes that IP Telephony service providers, when entering the market, would have the commercial incentives to achieve a comparable level of QoS in order to compete with existing local and international call service providers for customers. IDA believes that it should let market forces determine and let end-users decide the level of QoS that is acceptable and the price points end-users would pay for the services provided. IDA therefore will not impose minimum QoS on IP Telephony services. IDA reserves the right to require a minimum set of QoS standards at a later stage, depending on market development.

Basic Obligation and Public Safety

19. In the Consultation, IDA proposed to allow IP Telephony service providers to decide whether they would like to provide access to emergency services, and whether to provide directory enquiry and printed directory services. While most agreed with IDA's proposal, some commenters suggested that some form of reach to emergency services should be mandated especially if the IP Telephony service is intended to be a substitute to the fixed-line service.
20. IDA understands that there are practical constraints in mandating end-user access to emergency services because of the nomadic nature of the IP Telephony services. The current technologies may not support accurate location identification and reliable caller-identification information. IDA thus proposes to maintain its position to allow all IP Telephony service providers to decide if they want to provide emergency services access, but they must inform their customers on whether access to emergency services is provided. For those IP Telephony service providers who want to provide emergency services access, they are required to provide it at no charge, to be in line with IDA's current licence requirement on other telecommunication service providers. IDA reserves the right to require the provision of emergency call services at a later stage, depending on market development.
21. Similarly, for directory enquiry and printed directory services, IDA does not consider it a necessary service that must be provided by IP Telephony service providers. Therefore, IDA proposes to maintain its decision not to mandate the provision of these two services on IP Telephony service providers. However, IDA reserves the right to require the provision of directory enquiry and printed directory services at a later stage, depending on market development.

Number Portability

22. In the Consultation, IDA proposed not to mandate number portability for IP Telephony. While some commenters agreed with IDA's approach, others preferred that number portability be mandated now. IDA believes that mandating number portability at this early stage will place a significant

burden on IP Telephony players. IDA reserves the right to do so at a later stage if demand warrants and as the service matures.

Usage, Allocation and Assignment of Numbers

23. In the consultation, IDA proposed to assign a new level “3” 8-digit numbers to FBO and SBO (Individual) licensees for IP Telephony services. If demand warrants in the future, IDA would consider migrating these level “3” numbers to a 4-digit national destination code (“NDC”) (i.e., +65 3000 xxxx xxxx). IDA also proposed to allocate numbers in blocks of 1,000 instead of the usual blocks of 10,000.
24. Responses to these proposals were mixed. Some suggested that IDA allocates the existing level “6” 8-digit numbers to IP Telephony while others suggested the use of an NDC. One commenter in its comments proposed an elaborate approach of allocating: (a) 8-digit numbers for FBO licensees with nationwide access network; (b) a 3-digit NDC for FBO licensees without nationwide access network; and (c) a 4-digit NDC for SBO (Individual) licensees. IDA studied the feasibility of implementing the NDC structure on the present network infrastructure deployed by existing operators. IDA has received feedback from network operators that the present networks in Singapore would need to be upgraded in order to provide an 8-digit call analysis³. Considering that IP Telephony is at its early stage of development, it would not be reasonable for IDA to adopt the NDC arrangement immediately and require existing network operators to upgrade their networks.
25. IDA, however, believes that there is a need to differentiate, through the assigned numbers, the IP Telephony services from the current PSTN services because of the distinctions in the service features between the 2 services, e.g., possible differences in terms of QoS and non-availability of emergency services, directory enquiry and printed directory services for IP Telephony subscribers.

³ Currently, local PSTN networks analyse the first 4 digits of a number string, e.g., 6 123 XXXX, before routing the number to another operator. If an NDC is used, e.g., 3000 XXXX XXXX, local networks will have to analyse the first 8 digits of a number string before a number can be routed e.g., 3000 1234 XXXX to the intended operator.

26. Therefore, after taking all the feedback into consideration, IDA proposes to maintain its proposed framework of allocating **level “3”** 8-digit numbers for IP Telephony services, and consider an NDC arrangement in the future if demand warrants.
27. As for the allocation of numbers in 10,000 or 1,000 number blocks, IDA has also determined that the current network systems are generally designed for 10,000 number blocks. Even if numbers were allocated in blocks of 1,000, operators would still require the entire 10,000 range to be reserved for the specific service provider. In view of the implementation limitation, IDA has decided to adopt the current arrangement of allocating numbers in blocks of 10,000.
28. Telephone numbers will be allocated through either an administrative allocation or an auction process. To allow licensees to select the numbers they desire through a market-based approach, IDA will periodically hold auctions for such telephone numbers. IDA intends to hold the first auction in the third quarter of 2005⁴. Subsequent to the first auction, licensees may request for administrative allocation of numbers. For these requests, number levels will generally be allocated in a sequential manner.

Differentiation Between Number Levels “6” and “3” 8- Digit Numbers

29. IDA had, in the Consultation, proposed to allocate 8-digit numbers starting with “6” to IP Telephony service providers if they could comply with the same licensing conditions under the FBO licence. Each licensee must:
 - (a) Hold an FBO licence;
 - (b) Comply with IDA’s interconnection framework and provide any-to-any interconnection. Users must be able to receive and make calls to subscribers on any PSTN, mobile, or public digital voice networks in Singapore;
 - (c) Provide number portability;

⁴ Details on the auction and the amount of number levels to be put up for auction will be released at a later date.

- (d) Provide access (without charge) to emergency services (e.g., “999”, “995”, and “993”) in Singapore;
 - (e) Provide directory enquiry services and printed directory services; and
 - (f) Comply with the QoS standards established by IDA, similar to the standards set for basic local call services.
30. In view that there are different attributes between IP Telephony and PSTN services, IDA has decided to maintain the above policy approach so as to protect the interest of end-users and to maintain the level of service quality for basic telephony services in Singapore.

Typing Numbers to Valid Singapore Addresses

31. IDA also sought views on whether the numbers assigned should be limited to those with valid Singapore addresses (i.e., domestic customers within Singapore with no sale of numbers in other countries) to ensure that scarce numbering resources are used to benefit businesses and consumers in Singapore. Some commenters indicated that such a practice would restrict the growth of IP Telephony given its nomadic feature. IDA agrees with such a view. Hence, in line with the approach of facilitating the growth of this emerging technology, IDA has decided not to impose such a restriction on 8-digit numbers starting with level “3”. However, IDA would require that IP Telephony service providers, who qualify for level “6” 8-digit numbers, to assign these level “6” numbers to domestic customers within Singapore only. This is to ensure that if demand for IP Telephony takes off and if there is a need to expand the 8-digit number to an NDC arrangement, this conversion will be kept to level “3” numbers and will not spill over to level “6” numbers, which would then affect all existing domestic fixed-line users in Singapore.

Additional Requirements and Safeguards for the Provision of IP Telephony Services

32. In co-operation with law enforcement agencies to enhance necessary measures for public safety and security, IDA will require all IP Telephony service providers to comply with specific licence requirements. These requirements include proper access to emergency services (if access to

such services is provided) and the recording and verification of subscribers and resellers' particulars.

PART IV: IDA'S POSITION ON THE POLICY FRAMEWORK FOR ELECTRONIC NUMBERING

Background / International Developments

33. IDA had, in the document issued for Consultation, sought views on the potential of and benefits from deploying ENUM, and asked for suggestions on any international development that IDA should consider when developing the ENUM policy framework in Singapore. Most commenters, who commented on the proposed ENUM framework, generally agreed that IDA should closely follow international practices and standards.

ENUM Registration and Administration

34. IDA had proposed that the current Registry-Registrar-Registrant model adopted by the Singapore Network Information Centre ("SGNIC")⁵, for registering domain names and maintaining the databases in Singapore, be applied to the registration of "5.6.e164.arpa". IDA proposed to appoint SGNIC as the Registry for "5.6.e164.arpa". SGNIC would then appoint accredited Registrars⁶ to register ENUM and maintain the databases.
35. Most commenters generally agreed with IDA. One commenter, however, said that the requirements of ENUM could extend beyond the current processes needed for the issuance of domain names. It would be more appropriate for IDA to assume the role of registering ENUM given that it would extend to the management of the national numbering plan. Another commenter suggested that IDA consider allowing any service providers to be the Registrar as these service providers would be the interfacing point with the users.

⁵ SGNIC is a fully owned subsidiary of IDA that fulfils the registry requirement for the DNS function most notably for the .sg top level domain.

⁶ An entity who wishes to be accredited by SGNIC to operate ENUM registration must first satisfy SGNIC's ENUM registrar accreditation requirements which SGNIC will make available separately.

36. IDA maintains its position that appointing SGNIC as the registry for “5.6.e164.arpa” does not compromise its National Numbering Plan. IDA will maintain policy oversight on SGNIC and ensure that it has proper processes in place for the authentication and mapping of telephone numbers to ENUM domain names. IDA would also like to clarify that any business entity in Singapore can seek accreditation to be a Registrar. SGNIC will make available the qualifying criteria for Registrar accreditation separately.

Telephone Number Resource Allocation

37. IDA had proposed to allow a specific ENUM to be made available only to an ENUM subscriber who had been assigned a corresponding telephone number, be it a local fixed-line number, a mobile number or a paging number. Most commenters agreed with IDA except for one who commented that it would not be appropriate to use the fixed-line phone number as the number would usually be used by several family members and a call could still be set up using ENUM without the PSTN. Given that ENUM is a translation of traditional E.164 numbers to domain names format, IDA will maintain its position that only a registered subscriber of an E.164 number, including IP Telephony numbers allocated by IDA, can request for an ENUM address.
38. Another commenter added that the allocation process could be “automatic” such that upon issuance of a telephone number to a subscriber, an ENUM address would be created automatically for the individual. IDA does not prohibit such a practice so long as the service provider is an accredited Registrar and the subscriber has agreed to register for an ENUM.

End User ENUM Registration

39. IDA also proposed to allow individuals to decide whether they wish to register for ENUM and the types of information they want to make publicly available. All commenters agreed with IDA’s proposal and one commenter even suggested that the maintenance of privacy information should be strictly imposed on service providers.

PART V: APPLICATION FOR THE PROVISION OF IP TELEPHONY SERVICES

40. IDA has today, released the “Guidelines on Licensing of IP Telephony Services” highlighting the key features of the licensing framework for IP Telephony Services, including the licence terms and conditions to be complied with. IDA has also updated the SBO (Individual) licence template with the additional licence conditions to be observed by IP Telephony service providers. FBO licensees intending to provide IP Telephony services will have similar requirements incorporated into their FBO licence. The Guidelines and the SBO (Individual) licence template can be found on IDA’s website at www.ida.gov.sg, under the “Policy and Regulation” section.

41. Companies are invited to apply to IDA for the provision of IP Telephony services starting from today.