INFO-COMMUNICATIONS DEVELOPMENT AUTHORITY OF SINGAPORE

PUBLIC CONSULTATION ON THE POLICY FRAMEWORK FOR IP TELEPHONY AND ELECTRONIC NUMBERING IN SINGAPORE

ISSUED ON 21 SEPTEMBER 2004

POLICY FRAMEWORK FOR IP TELEPHONY AND ELECTRONIC NUMBERING IN SINGAPORE

PART I

INTRODUCTION

1 The objective of this consultation paper is for IDA to seek views from the industry and members of the public on the following:

(a) the proposed licensing and regulatory framework to be adopted to allow IP Telephony services to be provided in Singapore; and

(b) the proposed framework to be adopted to implement Electronic Numbering ("ENUM") in Singapore.

PART II

IP TELEPHONY

2 The Internet and other IP-based networks are increasingly being used for providing communication services in combination with and as alternatives to the circuit or public switched telephone networks (PSTN). IP-based networks present new opportunities of delivering innovative multimedia applications and telecommunication services to End Users, with voice as just one of the applications.

3 "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 consultation paper relates to a form of VoIP that requires telephone or E.164 numbers*[1], *that allows a user to make and receive voice, data and video calls with the same telephone number in any domestic or overseas location where Internet access is available*.

4 There has been extensive debate globally on the classification of the IP Telephony service – whether it is considered a voice service or an information service. There has also been debate on whether the service should be regulated to address certain social, public and regulatory concerns. Different countries have taken widely differing policy approaches towards IP Telephony primarily because of different market conditions and different legislative frameworks. Some chose to disallow IP Telephony while others chose to regulate it with a light touch to foster development.

[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.

5 The introduction of IP Telephony raises a host of important policy issues and it challenges the extent to which existing policy frameworks for traditional PSTN services should be applied to IP Telephony.

POTENTIAL BENEFITS OF IP TELEPHONY

6 The introduction of IP Telephony will increase competition and stimulate growth in the telecommunication markets in the supply of voice communications services. This may bring about reduced prices and reduced costs in providing telephone services, and greater service choices for end-users. IP Telephony may also drive the growth and development of broadband access. In Japan, IP Telephony is emerging as a *killer application* for broadband access.

Questions

IDA welcomes views and comments on the potential of and benefits arising from the deployment of IP Telephony; the likely services/applications to be deployed; and the potential demand from businesses and consumers.

IDA further seeks comments on how IP Telephony is likely to change the telecommunication competitive landscape in Singapore.

IDA'S POLICY OBJECTIVES AND APPROACH

7 One of IDA's policy goals is to encourage innovation in new emerging infocomm technologies, including the development and deployment of new applications and services. With the above objective in mind, the policy framework developed for IP Telephony should encourage investment, innovation and development of IP Telephony to provide businesses and consumers more service choices in terms of price, quality and service features.

8 Different commentators and regulators view IP Telephony differently. Some preliminary views include classifying IP Telephony services as an Information Service while others treat it as being no different to the traditional telephony services. While one of the IDA's regulatory principles is to be technology-neutral, IDA's view is that it is premature to consider IP Telephony and circuit-switched telephony services as being identical services delivered on different technology platforms. There are key differences in attributes and service outcomes that differentiate these services, for example, IP Telephony traffic routed over the public Internet could at times experience congestion and relatively lower service levels.

9 Therefore, IDA proposes to adopt the approach of imposing regulations only to the extent necessary to address certain economic, social/public and regulatory concerns relating to the provision of IP Telephony. This

is to allow emerging technologies such as IP Telephony to fully develop at the introductory phase.

Questions

IDA welcomes views and comments on IDA's proposed regulatory approach to be taken to encourage the development of emerging technologies such as IP Telephony in Singapore.

LICENSING FRAMEWORK

10 IDA proposes to allow IP Telephony services to be provided under a Facilities-Based Operation ("FBO") or Services-Based Operation ("SBO") licence, depending on whether the service provider intends to deploy network infrastructure to provide IP Telephony. An SBO (Class) licence will be issued for the carriage of Internet-based voice and/or data services over the public Internet, while an SBO (Individual) licence will be issued for service providers that lease transmission facilities from an FBO and operate their own network.

Questions

IDA welcomes views and comments on IDA's proposed licensing approach for providing IP Telephony in Singapore.

NUMBER ALLOCATION

11 The present national numbering framework is designed to meet Singapore's domestic number resource needs. Today, 8-digit telephone numbers starting with different first digits are allocated for different category of services. For example, level '6' numbers are for local fixed-line call services and level "8" and "9" numbers for mobile phone and paging services. A crucial difference between numbers allocated for IP Telephony and those for local fixed-line call or mobile phone services is that the use of IP Telephony numbers is not confined domestically within Singapore. A Singapore IP Telephony number could be used anywhere in the world. This could create serious constraints on our national number resources if there is global demand for these numbers.

12 IDA therefore considered 4 options for allocating numbers for IP Telephony:

A) Continue to assign the 8-digit local fixed-line numbers starting with "6" (i.e. +65 6xxx xxxx);

B) Assign a new 8-digit number level (i.e. +65 3xxx xxxx) from the 5 number levels left (i.e. 2, 3, 4, 5 and 7);

C) Assign a new 4-digit national destination code (NDC) (i.e. +65 3000 xxxx xxxx); or

D) Adopt **Option B** but if demand warrants, migrate to **Option C**.

13 Option **A** could create a significant strain on level "6" numbers, which are intended to meet domestic local fixed-line call services demand. It may also confuse consumers because IP Telephony may not provide the same service quality, price and features as the traditional local fixed-line call services delivered over the PSTN.

14 **Option B** provides a theoretical capacity of 10 million numbers. As it is a new number range, consumers would not be confused with the traditional local fixed-line call services. However, should IP Telephony demand picks up globally, the same concern about resource constraint will set in. The remaining 4 number levels may not be able to cope with high global demand, if it materialises.

15 **Option C** is similar to area codes applied in other countries, like the United Kingdom and the United States. This approach has been adopted by Japan, which introduced the 3-digit code "050" for IP Telephony, while the United Kingdom has proposed the use of "056". This option opens up 100 million numbers, fully overcoming IDA's number resource constraint. However, costs will be incurred by existing operators to implement the routing of a new/different number structure and these may not be justified at this point given the uncertainty in demand for IP Telephony numbers.

16 **Option D** offers a scalable approach in view of possible future demand for IP Telephony. The downside is that operators will incur the cost of opening up new number levels for IP Telephony twice – once for an 8-digit number and again for the 4-digit NDC. There may also be the need to educate consumers again when IP Telephony numbers change from an 8-digit number to a 12-digit number. However, this phased approach provides for a more controlled allocation of the scarce national number resource given the uncertainty in demand for IP Telephony numbers at the moment.

17 Having considered the pros and cons of each option, IDA proposes to adopt **Option D**, which is to assign a new 8-digit number level that will provide a theoretical capacity of 10 million numbers at the start. IDA proposes to allocate level "3" for IP Telephony services. As it is a new number range, consumers will not be confused with the traditional local fixed-line call services. If demand warrants, IDA will assign a new 4-digit national destination code (NDC) (i.e. +65 3000 xxxx xxxx) and migrate all level "3" IP Telephony numbers over to the 4-digit NDC.

18 On a related issue of qualifying criteria, levels 6", "8" and "9" telephone numbers today are only allocated to FBO licensees, except for Mobile Virtual Network Operators ("MVNOs") under the SBO (Individual)

licence. IDA has allowed MVNOs to obtain numbers directly from IDA in recognition of the need for MVNOs to retain some degree of independence from the network operator when providing services to End Users.

19 As an IP Telephony service provider can be an FBO or SBO licensee, depending on its business model, and in order to encourage the development of IP Telephony, IDA will allow telephone numbers to be given to both FBOs and SBO (Individual) licensees providing IP Telephony services.

20 In addition, IDA is considering whether there is a need to require that IP Telephony service providers assign level "3" numbers to only users with valid Singapore addresses to further ensure that the national numbering resources continue to benefit End Users in Singapore. Alternatively, IDA could allow access to level "3" numbers by subscribers residing overseas, and migrate to the 4-digit NDC if global demand grows.

Questions

IDA welcomes views and comments on the proposed phased approach in assigning new number levels to FBO and SBO (Individual) licensees for IP Telephony services. Please provide supporting reasons for the comments and proposals made.

IDA invites views on whether there is a need for IDA to take further measures to ensure that the national numbering resources continue to benefit End Users in Singapore such as requiring IP Telephony service providers to assign level "3" numbers to only users with valid Singapore addresses.

IDA also invites views on whether there will be technical issues if IDA were to allocate numbers in blocks of 1,000 instead of the usual blocks of 10,000?

INTERCONNECTION AND ACCESS

21 Under the Telecom Competition Code, IDA requires all FBO and SBO licensees, that use switching or routing equipment to provide telecommunication services to the public, to observe minimum interconnection-related requirements to ensure seamless and any-to-any communication throughout Singapore. These minimum requirements will continue to apply to IP Telephony service providers. Under this 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 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.

Questions

IDA welcomes views and comments on IDA's proposed approach to apply the same interconnection framework under the Telecom Competition Code to IP Telephony service providers.

IDA also welcomes views and comments on whether the current interconnection framework is sufficient to address the interconnection arrangements with IP Telephony networks. Specifically, IDA invites views on issues such as interconnection configurations or models that are likely to arise, technical, financial and implementation considerations for interconnection. Please provide supporting reasons for each comment and proposal made.

QUALITY OF SERVICE (QOS)

22 The present generation of Internet was designed primarily for data traffic and does not provide any QoS guarantee for real time voice and video. While QoS may be important, consumers may accept a lower quality service for a cheaper price. IDA proposes not to impose QoS on IP Telephony and allow market forces to dictate the price points and the corresponding QoS levels.

23 With IDA's proposal to assign a new number range for IP Telephony services, it will help users differentiate IP Telephony calls from traditional local fixed-line calls or mobile calls and to exercise choice. However, IP Telephony service providers must inform their users that their services may not comply with the minimum QoS standards set by IDA for local fixed-line and mobile phone services.

Questions

IDA welcomes views and comments on whether there is a need for QoS to be established for IP Telephony. If so, what are the types of QoS needed and the minimum standards to be set?

BASIC OBLIGATION AND PUBLIC SAFETY

24 Today, telecommunication licensees providing local fixed-line call services are required under the licence to provide directory enquiry services, free access to emergency numbers (i.e. 993, 995, and 999), and printed directory services free-of-charge. However, given the "nomadic" nature of IP Telephony, there may be practical constraints to achieving this. For example, if a user were to dial "999", "993" or "995" while overseas using an IP Telephony number issued in Singapore, the

calls could be routed to the Singapore emergency agencies. Likewise if a user in Singapore makes a call from a "foreign" IP Telephony number (for example numbers issued in the United States), the call will not reach the emergency agencies in Singapore. Moreover, IP Telephony providers may set up a "close-user" network with no interconnection with existing networks.

25 IDA thus proposes to allow the service providers to decide if they would like to provide access to emergency services or not. All IP Telephony service providers, however, must provide very clear information to their users on whether the service can or cannot reach the emergency agencies. IDA reserves the right to mandate the provision of emergency services at a later stage, depending on market development.

26 Similarly, IDA proposes to allow IP Telephony service providers to decide whether or not to provide directory enquiry and printed directory services.

Questions

IDA welcomes views and comments on whether there are issues relating to the provision of emergency services in the context of IP Telephony. IDA further invites comments on the availability of operational solutions to address the issue of emergency calls.

NUMBER PORTABILITY

27 Number portability is a facility that enables consumers to retain their existing numbers when changing service providers. While it is a key facilitator of consumer choice and effective competition, it would not be appropriate to mandate number portability at this nascent stage as imposing such conditions may unduly burden new service providers. However, IDA reserves the right to mandate number portability at a later stage should it be required to allow customers to move from one service provider to another without having to change their numbers.

Questions

IDA welcomes views and comments on whether there are issues that may pose problems to achieving number portability in future.

DIFFERENTIATION BETWEEN LEVELS "6" AND "3" 8-DIGIT NUMBERS

28 When developing the above framework, IDA is cognizant of increasing difficulties in differentiating IP Telephony services from other digital voice services. Existing operators could choose to deploy IP-based wired or wireless technologies to deliver voice services and may request for level

"6" numbers on grounds of similar technology functionality and capability as traditional local fixed-line call services.

29 To ensure framework consistency for existing FBO licensees that provide local fixed-line call services, IDA will 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. They include:

(a) Be an FBO licensee;
(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 or mobile networks in Singapore;
(c) Provide number portability;
(d) Provide connection to emergency agencies (e.g. "999", "995", and "993");
(e) Provide directory enquiry services and printed directory services; and
(f) Comply with the QoS for local fixed-line call services.

30 Service providers who do not wish to provide IP Telephony under any of the above licence conditions will be allocated with 8-digit numbers beginning with "3".

Questions

IDA welcomes views and comments on the above differentiation approach. Please provide supporting reasons for each comment and proposal made.

PART III

ELECTRONIC NUMBERING ("ENUM")

31 ENUM is a protocol that translates normal telephone numbers into a format for storing and retrieving Internet addressing information, which can in turn be used to route communications over the Internet. The standard translation protocol uses the Internet domain name system (DNS) to map telephone numbers to DNS addresses. For example, +65 6211 1234 will be mapped as 4.3.2.1.1.1.2.6.5.6.e164.arpa by essentially reversing the order of the numerals within the telephone number. This technology protocol, in essence, enhances the global reach of traditional telephone numbers through the Internet and could enhance IP Telephony adoption as well as Unified Messaging type of application. Through the use of ENUM, users can reach multiple points of contact such as telephone and fax numbers, URLs, and email addresses.

32 Today, ENUM is at its early stages of development and testing. While commercial implementation of ENUM is unclear, a number of countries have initiated "test-bed" implementations in anticipation of the potential benefits ENUM would bring.

INTERNATIONAL DEVELOPMENTS

33 Today, the Internet Engineering Task Force ENUM Working Group ("IETF EWG") is the key international body co-ordinating and developing frameworks, standards and guidelines for ENUM implementation and administration. It has developed a set of guiding principles on the administration of ENUM to facilitate domestic implementation consistency worldwide. This body works closely with the ITU to ensure alignment with the existing ITU E.164 telephone numbering system adopted internationally.

34 To enhance global interoperability, IETF EWG has designated "e164.arpa" as the exclusive domain name for ENUM. The ENUM database is to be administered in a hierarchical model with a single central international database pointing to a single national database for each telephone country code, which in turn points to authorised service providers. In other words, this tiered model is broken down into Tier 0 – the international level, Tier 1 – the national level (i.e. registry), and Tier 2 – the competitive registrar/service provider level.

35 IDA has applied to RIPE (Réseaux IP Européens) Network Coordination Centre ("RIPE NCC"), a key international body co-ordinating and developing frameworks and guidelines for ENUM implementation and administration, and received the "5.6.e164.arpa" using Singapore's telephone country code.

36 IDA understands that ENUM as a protocol can work and in fact has worked in some countries without using "e164.arpa". In addition, if any person in any country wishes to use "e164.arpa", it can choose to register with any country if the overseas administration accepts them.

37 IDA has taken these international developments and ENUM characteristics into consideration when developing its policy framework for implementing ENUM in Singapore.

Questions

IDA welcomes views and comments on the potential of and benefits arising from the deployment of ENUM; the likely services/applications; and the potential demand from businesses and consumers.

IDA welcomes views and comments on whether there are other key international developments that IDA should take into consideration when developing the policy framework to implement ENUM in Singapore.

POLICY FRAMEWORK FOR ENUM

38 The implications of ENUM on IDA's policy framework are primarily in the area of number resource allocation and ENUM database administration.

As one of IDA's policy objectives is to encourage innovation in new emerging infocomm technologies, IDA's policy framework would strive to facilitate the introduction of ENUM without compromising the efficient use of the national number resources. There is also a need to set-up a framework or system to allow companies or users to use "5.6.e164.arpa" if interested.

Telephone Number Resource Allocation

39 IDA believes that ENUM does not affect the way telephone numbers are assigned and managed by IDA under the National Numbering Plan. Today, under our National Numbering Plan, IDA allocates telephone number levels for the provision of telecommunication services. The ENUM Working Group's convention stipulates that an assignee of an ENUM number would use the same numerical string as the assignee's public telephone number.

40 IDA proposes to adopt the ENUM Working Group's convention, which means to allow a specific ENUM number to be made available only to an ENUM subscriber who has been assigned a corresponding telephone number, be it for local fixed-line call, mobile phone or paging services. If a telephone number is no longer given to the subscriber for these telecommunication services (e.g., as a result of service termination or shifting to a new location), the use of the telephone number for ENUM will be discontinued. If a local fixed-line call or mobile service subscriber switches to another service provider, and retains the number through number porting services, the subscriber will then be able to continue using the same telephone number for ENUM.

Questions

IDA welcomes views and comments on the allocation of ENUM to only telecommunication service subscribers allocated with telephone numbers.

IDA also invites views on what would be a suitable authentication mechanism and the frequency of re-authentication to ensure that the assignee is still using the assigned telephone number.

ENUM Registration and Administration

41 IDA proposes that the current Registry-Registrar-Registrant model, adopted by SGNIC[2] in Singapore for registering domain names and maintaining its database, be applied to the registration of "5.6.e164.arpa". IDA proposes to appoint SGNIC as the registry for "5.6.e164.arpa". SGNIC will then appoint accredited registrars to administer the registration process and maintain the respective databases.

[2] 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.

42 The proposed arrangement takes into consideration that ENUM is essentially a domain name and the DNS administration model adopted by SGNIC today follows the tiered structure recommended by IETF EWG. This framework is also similar to the European model for ENUM delegation.

Questions

IDA welcomes views and comments on the proposed Registry-Registrar-Registrant approach for registering for ENUM.

END USER ENUM REGISTRATION

43 With ENUM, individuals' personal contact information will be stored in the DNS of the global Internet. The use of a "who-is" like database[3] could create concerns to individuals on what data is collected from the registrant, and how it is used, maintained, and made available to others. To address this concern, IDA proposes to let individuals decide whether they wish to register for ENUM and what information they want to make publicly available.

Questions

IDA welcomes views and comments on the approach to allow End Users to decide whether they want to register for ENUM and the information they want to make publicly available.

PART IV

INVITATION FOR COMMENTS

44 IDA would like to seek the views and comments from the industry and members of the public on the issues and proposals raised in this consultation. This will allow IDA to have a better understanding of the issues and the different needs and requirements of the different interested parties. The questions are listed again below:

IP TELEPHONY

(a) *IDA welcomes views and comments on the potential of and benefits arising from the deployment of IP Telephony; the likely services/applications to be deployed; and the potential demand from businesses and consumers. IDA further seeks comments on how IP*

[3] "Who-is" information is provided to assist persons in determining the content of a domain name registration record.

Telephony is likely to change the telecommunication competitive landscape in Singapore.

(b) *IDA welcomes views and comments on IDA's proposed regulatory approach to be taken to encourage the development of emerging technologies such as IP Telephony in Singapore.*

(c) *IDA welcomes views and comments on IDA's proposed licensing approach for providing IP Telephony in Singapore.*

(d) *IDA welcomes views and comments on the proposed phased approach in assigning new number levels to FBO and SBO (Individual) licensees for IP Telephony services. Please provide supporting reasons for the comments and proposals made. IDA invites views on whether there is a need for IDA to take further measures to ensure that the national numbering resources continue to benefit End Users in Singapore such as requiring IP Telephony service providers to assign level "3" numbers to only users with valid Singapore addresses. IDA also invites views on whether there will be technical issues if IDA were to allocate numbers in blocks of 1,000 instead of the usual blocks of 10,000?*

(e) *IDA welcomes views and comments on IDA's proposed approach to apply the same interconnection framework under the Telecom Competition Code to IP Telephony service providers. IDA also welcomes views and comments on whether the current interconnection framework is sufficient to address the interconnection arrangements with IP Telephony networks. Specifically, IDA invites views on issues such as interconnection configurations or models that are likely to arise, technical, financial and implementation considerations for interconnection. Please provide supporting reasons for each comment and proposal made.*

(f) *IDA welcomes views and comments on whether there is a need for QoS to be established for IP Telephony. If so, what are the types of QoS needed and the minimum standards to be set?*

(g) *IDA welcomes views and comments on whether there are issues relating to the provision of emergency services in the context of IP Telephony. IDA further invites comments on the availability of operational solutions to address the issue of emergency calls.*

(h) *IDA welcomes views and comments on whether there are issues that may pose problems to achieving number portability in future.*

(i) *IDA welcomes views and comments on the above differentiation approach. Please provide supporting reasons for each comment and proposal made.*

ENUM

(j) *IDA welcomes views and comments on the potential of and benefits arising from the deployment of ENUM; the likely services/applications; and the potential demand from businesses and consumers. IDA welcomes views and comments on whether there are other key international developments that IDA should take into consideration when developing the policy framework to implement ENUM in Singapore.*

(k) *IDA welcomes views and comments on the allocation of ENUM to only telecommunication service subscribers allocated with telephone numbers. IDA also invites views on what would be a suitable authentication mechanism and the frequency of re-authentication to ensure that the assignee is still using the assigned telephone number.*

(l) *IDA welcomes views and comments on the proposed Registry-Registrar-Registrant approach for registering for ENUM.*

(m) *IDA welcomes views and comments on the approach to allow End Users to decide whether they want to register for ENUM and the information they want to make publicly available.*

45 Respondents are also invited to comment on any other issues not covered in this consultation document but which are considered to be relevant in the introduction of IP Telephony and ENUM services.

46 IDA will consider inputs submitted and make its policy decisions thereafter. IDA will target to announce the policy framework for IP Telephony and ENUM by March 2005.

47 All views and comments should be submitted in writing and in both hard and soft copies (Microsoft Word Format), and should reach IDA by **12pm, 22 October 2004**. Respondents are required to include their personal / company particulars as well as the correspondence address in their submissions to this Consultation Paper. Comments and views should be addressed to:

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AND

Please submit your soft copies via email to:

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48 IDA reserves the right to make public all or parts of any written submissions made in response to this Consultation Paper and to disclose the identity of the source. Any part of the submission, which is considered by respondents to be commercially confidential, should be clearly marked and placed as an annex. IDA will take this into account regarding disclosure of the information