REGULATION OF INTERNET PROTOCOL (IP) TELEPHONY

CONSULTATION PAPER

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INTRODUCTION

According to the World Telecommunication Policy Forum (WTPF) held by the International Telecommunication Union (ITU) in Geneva in March 2001, "Internet Protocol (IP) Telephony" is a generic term defined as the conveyance of voice, fax and related services, partially or wholly over packet-switched IP-based networks. IP Telephony may also include applications that integrate/embed the transmission of voice and fax with other types of communications such as text, data and multimedia. IP Telephony is also commonly referred to as "Voice over Internet Protocol" or "VoIP". IP Telephony or VoIP may be transmitted over the public Internet or separate IP-based networks managed by the operators. "Internet Telephony" refers to the specific type of IP Telephony transmitted over the public Internet. In some countries, the term "Voice over Broadband" (VoB) is used to refer to VoIP services that are delivered over broadband networks, for example, Digital Subscriber Loop (DSL) or cable modem. In the United States, the term "IP-enabled services" is used to indicate that the services are not limited to voice over IP. In the UK, the term "new voice services" is introduced to indicate that the services are a class of services different from traditional voice services. In this consultation paper, we follow the same generic term of "IP Telephony" as used by the ITU to represent any forms of voice transmissions over the Internet or managed IP-based networks. However, our use of this term is not confined to IP-based voice services alone. "IP Telephony" in this paper includes services that integrate voice with other types of communications such as data, text, image, video or multimedia.

2. Over the past few years, there have been active discussions at the international level such as the ITU on the policy, regulatory, economic and technical issues on the deployment of IP-based networks by member states for the provision of IP Telephony. National regulators have also developed, or are consulting with the industry on, certain issues about the regulation of IP Telephony. Many operators around the world see the potential of IP

Telephony and have already launched, or are planning to launch IP Telephony services in the market. The international development is further discussed in Annex 1.

3. In our local context, some fixed network operators and external telecommunications services providers have for many years been using IP-based networks one way or another in the provision of local and/or external voice and fax services[1] although the services are delivered to customers in the conventional circuit-switched Public Switched Telephone Network (PSTN) interface. Recently, some fixed network operators have commenced to offer IP Telephony services which are accessible over IP-based broadband connections to customers. Some of these broadband connections are operated by the operators providing the IP Telephony services while some are operated by other operators. The services allow the users to make and receive telephone calls using broadband Internet connections instead of traditional direct exchange lines (DEL).

4. The increasing use of IP Telephony services has however posed both opportunities and challenges. Consumers will not only benefit from the additional choices on voice services brought by IP Telephony, but also a wide range of new innovative multimedia content, applications and services using IP-based technologies (e.g. integrated voice and video services). On the other hand, IP Telephony has its limitations. This arouses concerns on the level of protection to consumers choosing IP Telephony services in lieu of conventional public telephony services, which have traditionally been operated as a service of high reliability.

5. To the telecommunications industry, the rise of IP Telephony services will cause a dramatic change to the operating environment. Network operators will feel the challenges brought by potential diversion of revenues from conventional public telephony services which have hitherto been mainly provided by network operators only. On the other hand, service providers will find opportunity to provide telephony services using IP-based technology to derive new revenue sources. To all players, however, IP-based technology will also enable new revenue streams from innovative multimedia services.

[1] IP technologies are deployed in transmission for external telecommunications services, or in the core and customer access networks, but the interface with the customers are converted back to the PSTN format.

6. As the government, we see the introduction of IP Telephony, as with other IP-based services, as an irreversible trend. Nonetheless, the pace of its introduction, and indeed the competitive landscape of the telecommunications market as well as the further development of telecommunications in Hong Kong will be very much affected by the regulatory approach we take in regulating IP Telephony services. It is therefore of paramount importance that we strike the right balance in deliberating on the regulation of IP Telephony which will enable us to reap the benefits offered by the opportunities and yet meet the challenges brought by IP Telephony.

7. The existing regulatory framework is primarily designed for the traditional PSTN-based telephony services. We therefore need to review if the existing regime would apply to IP Telephony. The ensuing sections set out the main regulatory issues and invite views from the industry and interested parties. Any views expressed in this consultation are preliminary views of the Telecommunications Authority (TA) only for consultation and do not represent the final position or decision of the TA on the issues.

8. For the avoidance of doubt, this consultation concerns only the regulation of IP Telephony as public telecommunications services. The operation of IP-based networks and services for private communications within an organisation, e.g. IP-based Private Automatic Branch Exchanges (PABX), is not the subject matter of this consultation paper and continues to be not subjected to any licensing requirements.

IMPLEMENTATION SCENARIOS

9. In general, there are three main implementation scenarios or modes of operation of IP Telephony in terms of the terminal equipment employed and types of networks involved, namely (a) Computer-to-Computer (b) Computer-to-Phone or Phone-to-Computer and (c) Phone-to-Phone. All of these three scenarios of IP Telephony services are being implemented in Hong Kong.

10. The networks involved in the implementation of the above IP Telephony services can be the public Internet, the managed IP network of a

service provider or a combination of both. The implementation scenarios are explained in detail in Annex 2.

REGULATORY ISSUES OF IP TELEPHONY

11. In this consultation, we classify the key regulatory issues of IP Telephony into (A) policy and licensing, (B) numbering issues, (C) interconnection and charge settlement and (D) consumer and other issues for discussion:

A. Policy and licensing

- Policy
- Licensing framework
- Separation of service provision from network operation
- Provision by service-based operators

B. Numbering Issues

- Conformance to numbering plan
- Number portability

C. Interconnection and charge settlement

- Any-to-any connectivity
- Interconnection between operators
- Calling line identification (CLI)
- Payment of interconnection charges, local access charge (LAC) and universal service contribution (USC)

D. Consumer and other issues

- Directory enquiry service
- Calls to 999 emergency services
- Backup power supply
- Quality of Service (QoS) requirements

12. ***Questions:***

(a) Are there any other issues in addition to those listed above that should be considered in formulating the regulation for IP Telephony services?

(A) Policy and licensing

13. The policy and licensing issues include (a) policy, (b) licensing framework, (c) separation of service provision from network operation and (d) provision by service-based operators.

Policy

14. In considering the appropriate regulation to be applicable to IP Telephony, we shall apply the regulatory principles that have proved to be effective in enhancing consumer interest and promoting investment in the telecommunications sector.

15. First, the minimum regulation should be applied while preserving the achievement of certain social objectives such as consumer protection and access to emergency services. Where regulation needs to be applied, the regulation should be proportionate to achieve the objectives and should not obstruct the introduction of new technologies.

16. At the same time, "technology neutrality" as one of the principles in the regulation of public telecommunications networks and services should be upheld. Like services should be regulated under like conditions, regardless of the technologies employed. Only the networks and services are licensed, not the technologies. Operators should be able to, under their respective licences, adopt any technologies provided that they operate within the scope authorised, and comply with the conditions, under the licences. "Technology neutrality" would enable network operators or service providers to adopt the most suitable technologies without any unnecessary regulatory barriers. We do not pick technological winners, or guarantee technological success. Consumers should be allowed to make a choice.

17. The introduction of IP Telephony is likely to affect a number of existing regulatory charging arrangements and business plans. The market should be allowed to manage the shape and pace of the transition to the IP-

based operating environment. The regulator should ensure that the transition would take place in an orderly manner so as not to cause confusions to consumers and operators. In other words, the regulatory rules governing the new technologies should be clear and unambiguous.

18. ***Questions:***

(a) Do you agree with our proposed approach that the minimum and proportionate regulation should be applied to IP Telephony services?

(b) Do you agree that the "technology neutrality" principle should continue to be applied to IP Telephony services?

(c) Do you agree that the market should be left to manage the shape and the pace of transition of the operating environment? What role should the regulator play in the transition?

Licensing framework

19. Section 8 of the Telecommunications Ordinance (the Ordinance) requires, among others, that any person who establishes or maintains any means of telecommunications or offers in the course of business a telecommunications service should be subject to the licensing regime set out in the Ordinance. In accordance with section 8, providers of IP Telephony services, be they network operators or service providers, should be subject to the regulation under the Ordinance.

20. Under the existing licensing regime, there is no specific type of licence tailor-made for IP Telephony services. Currently, IP Telephony service may be provided under an existing licence provided that it complies with the licence conditions. This is consistent with the "technology neutrality" principle.

21. However, it is noted that the licence conditions set out in the existing types of licences (particularly carrier licences) were prepared with the conventional public telephone service in mind and may be unnecessarily stringent for IP Telephony service. Full application of such conditions might impede the exploitation of the new technologies. In the circumstances, it may

be necessary to consider whether IP Telephony services should be treated as a different class of service and a different set of conditions should be applied to it.

22. Applying a different set of conditions to IP Telephony is not a departure from the "technology neutrality" principle. If it is decided that IP Telephony is to be regulated differently, the difference is not because IP Telephony employs a different technology, but rather IP Telephony is a new class of services with new functionalities (e.g. video and multimedia capabilities) not found in conventional public telephone services.

23. If it is decided that a different set of conditions is appropriate for IP Telephony services, then this set of conditions may be implemented by an amendment to existing licences (e.g. a waiver for IP Telephony services) or a new type of licences for IP Telephony services.

24. Although we consider in the above section that the minimum regulation should be applied to IP Telephony services, proportionate regulation of the IP Telephony services would be warranted to preserve the attainment of certain social objectives. IP Telephony services could be a potential substitute for the "conventional public telephone service" presently available from the circuit-switched PSTN for fixed services. If an IP Telephony service is intended to be offered as such a substitute, it would be necessary for the IP Telephony service to meet a minimum set of conditions in order to avoid consumer confusion and safeguard public interest. For example, these conditions may include (1) any-to-any connectivity (2) access to emergency services and (3) number portability. These conditions will be discussed in detail in the sections below. OFTA remains open-minded on whether the full set of FTNS licence conditions should be applied to IP Telephony services offered as substitutes for the conventional public telephone service.

25. One issue is the criteria on basis of which an IP Telephony service could be regarded as a substitute for the conventional public telephone service and be subject to the full regulation for conventional public telephone service or the minimum set of conditions to be designed for IP Telephony. It may not be enforceable if the distinction is based purely on description of the service in the sales literature or advertisement, or the types of customer equipment used to access the service (e.g. whether service is accessed through a PC or an ordinary telephone). One possible option is whether the service is

assigned with an ordinary telephone number to which calls from subscribers to the conventional public telephone service can be made. Another option is a formal declaration or a recognised logo signifying that the service meets the requirements for use as a substitute for the conventional public telephone service.

26. Some types of IP Telephony services emerging in the market may not be intended to be used as a substitute for the conventional public telephone service. Some services are intended for making outgoing calls only, at perhaps cheaper rates. Some services are intended for communications among members of a defined group. The conditions applied to substitutes for conventional public telephone service may be over onerous for these types of services. The application of the general obligations under the Ordinance (e.g. compliance with the provisions prohibiting anti-competitive conduct and misleading/deceptive conduct, etc.) to these services may be adequate.

27. ***Questions:***

(a) Do you consider that the conditions under the current licences for fixed and mobile carriers should be fully applied to the provision of IP Telephony services?

(b) If the answer to the above question is "no", do you agree that an IP Telephony service intended to be used as a substitute for the conventional public telephone service should be required to meet a minimum set of conditions?

(c) What are the criteria for classifying an IP Telephony service as one intended to be used a substitute for the conventional public telephone service?

(d) Do you consider that a new type of licence needs to be created for regulating IP Telephony services which are intended to be a substitute for the conventional public telephone service?

(e) Do you agree that minimal regulation should be applied to IP Telephony services not intended to be used as a substitute for the conventional public telephone service?

Separation of service provision from network operation

28. Traditionally, local telephone services in Hong Kong are provided by the network operators supplying the lines to the customers. In other countries like the UK or Australia, indirect access of call services which are not provided by the operators providing the access is already implemented, e.g. carrier pre-selection. With the introduction of IP Telephony, service provision can be divorced from network operation. The network operator supplies the broadband connection. The customer can then gain access to content, applications and services provided by others. The separation of service provision from network operation has in fact been a common practice in Hong Kong for IDD services and dial-up Internet access services.

29. Hong Kong network operators have recently launched IP Telephony services which can be accessed through broadband connections supplied by other network operators. In the United States, service providers without fixed network licence, such as Vonage, are allowed to provide IP Telephony services. Customers of such services can use the broadband connections of any operators in gaining access to the IP Telephony services.

30. There is also no geographic boundary in the provision of IP Telephony services. A subscriber of an IP Telephony service provider does not necessarily have to be a resident of the country in which the service platform is established. As such, a customer to an IP Telephony service provided in Hong Kong can access the service through a broadband connection provided by a network operator in any country and possibly use a Hong Kong telephone number. Any user in Hong Kong can also subscribe to the IP Telephony service and use the telephone numbers of a foreign country. The advantage of this type of services is that the calling party can save IDD call charges because, though locating elsewhere, he/she is treated as a local user of the country in which the service is established. However, a call originated from, or terminated at, a conventional circuit-switched network outside the country in which the service is established has to be routed as an international call to, or from, the service platform (the implementation details of such services may be referred to scenario 3(c) of Annex 2).

31. Some operators raised the concern that the provision of IP Telephony service by one operator over the broadband connection provided by

another could be unfair because the former provider would have a "free-ride" on the facilities provided by the latter. However, the customer of the broadband connection has already paid the latter operator for the connection. The customer is therefore entitled to use the connection to access any content, application or service accessible from the connection. The increase of data traffic arising from the IP Telephony service is minimal compared with other data sent and received over the broadband connection. If the operator supplying the broadband connection considers that it is not receiving adequate payment from the customer for the conveyance of the additional data, however small in volume, from IP Telephony, it is the commercial choice of that operator to decide whether to raise the flat fee for the broadband connection or impose a volume-sensitive charge.

32. The above mode of operation of IP Telephony has its inherent limitation. If the provider of the IP Telephony service has no commercial relationship with the provider of the broadband connection for the conveyance of the IP Telephony traffic, then the IP Telephony service provider would not be able to guarantee the overall quality of service accessed using a connection over which it has no control. IP Telephony service providers may therefore choose to offer their services over broadband connections that they provide (e.g. Yahoo!BB in Japan adopts this mode of operation), or enter into commercial agreements with the providers of the broadband connections, thereby enabling the IP Telephony service providers to exercise control over the overall quality of their services.

33. We are of the view that the modes described in the preceding paragraphs should all be permitted, but adequate information on the nature and limitations of the services should be given to potential customers prior to contract so that they can make informed choice in the market.

34. ***Questions:***

(a) Do you agree that the provision of IP Telephony service accessible over the broadband connections provided by others should be permitted?

(b) How should consumer interest be protected in the provision of IP Telephony services accessible over broadband connections provided by other operators?

Provision by service-based operators

35. Currently, local fixed telephony services are provided by local FTNS operators and local fixed carriers only. With the separation of service provision from network operation, it is expected that some service-based operators licensed under the Public Non-Exclusive Telecommunications Service (PNETS) Licence (e.g. Internet Service Providers (ISPs)) may wish to provide local voice telephony services using IP technology, without the need to apply for a fixed carrier licence.

36. As we can see from many overseas countries such as in the United States and Japan, service-based operators have been permitted to operate IP Telephony services without regulatory barriers. The ISPs are already operating the IP-based infrastructure and are fully capable of offering the voice services as part of multimedia applications. Consumers can benefit from the additional choice and competition in the market. However, there are counter arguments from the fixed network operators' point of view. They would argue that service providers like ISPs do not invest in network infrastructure. Allowing them to operate the IP Telephony services would divert revenue from the fixed network operators. This would dilute their commercial incentives and adversely affect their financial capability to further invest in the network infrastructure.

37. In Hong Kong, only carrier licensees are now entitled to receive allocation of ordinary telephone number blocks from the regulator. PNETS licensees at present do not have this entitlement. Without the assignment of an ordinary telephone number, a customer of an IP Telephone service cannot be reached by dialling an ordinary telephone number. If PNETS licensees are allowed to operate IP Telephony services that are intended to be a substitute for the conventional public telephone service, this existing rule would need to be reviewed.

38. At present, the PNETS licence granted to ISPs authorises the provision of International Value-Added Network Services and does not include local real-time voice telephony services. The PNETS licence granted to external telecommunications service providers also does not authorise the provision of local voice telephone services. If PNETS licensees are allowed to offer local fixed voice telephony services using IP technology, it would be

necessary to amend the scope of the existing PNETS licences. It would also be necessary to review whether the existing PNETS licence conditions could effectively regulate the provision of local fixed voice telephony services using IP technology.

39. ***Question:***

Do you consider that service-based operators (i.e. PNETS licensees) should be allowed to offer local voice telephony services using IP technology?

(B) Numbering Issues

40. The numbering issues to be discussed in this section are (a) conformance to numbering plan and (b) number portability.

Conformance to numbering plan

41. The TA published a numbering plan for telecommunications services in Hong Kong in January 1994. This numbering plan has been continuously updated to reflect the latest status of number allocation and availability of numbering resources. The guiding principles adopted by the TA in managing the numbering plan include (a) meeting the future growth and requirements in telecommunications, (b) being user friendly, fair and equitable to all providers of telecommunications services, and (c) being adaptable to new technologies and services in future.

42. Conforming to the numbering plan by each service provider/network operator is vital to the harmonised growth and development of different types of services. It also helps safeguard the better deployment and utilisation of the scarce numbering resources. However, the objective of numbering plan cannot be achieved without the support and cooperation of telecommunications service providers. In this connection, the TA also issued a document titled *"Code of Practice Relating to the Use of Numbers and Codes in the Hong Kong Numbering Plan (Cap. 106)"* for providing guidance to the telecommunications network operators and paging service operators.

43. According to the existing numbering plan issued by the TA, different types of services will be allocated with number blocks of different

prefixes. For instance, “30x” number blocks have been allocated to PNETS services, “15/16xx” access codes allocated to external telecommunications services, “2x/3x” number blocks allocated to fixed line telephony service and etc.

44. With the introduction of IP Telephony services, it is necessary to consider whether the IP Telephony services should share the existing number blocks for the conventional telephone services or should be allocated with dedicated numbering blocks.

45. No dedicated numbering blocks have so far been allocated to IP Telephony services already launched in the Hong Kong market. The current practice is if an IP Telephony service is limited to local fixed installation, it may share the same number blocks currently allocated to traditional local fixed telephony services.

46. It is anticipated that the introduction of IP Telephony services would generate additional demand and impose pressure on our limited numbering resources. If overseas customers or migrants from Hong Kong may also subscribe to the IP Telephony services in Hong Kong and be assigned with Hong Kong telephone numbers, there will be further demand on the numbering resources. The limited numbering resources planned for local fixed line telephony services are likely to be consumed in a quicker pace.

47. As discussed in the section on “access to emergency services”, there may be limitations concerning the provision to the emergency services of location information of the caller using an IP Telephony service. If IP Telephony services are allocated with dedicated numbering blocks, calls from IP Telephony users may be readily identified by the emergency services.

48. In other countries, special numbering blocks have been allocated to IP Telephony services. It is known that Japan has been allocating telephone numbers under a prefix “050” to IP Telephony users if the IP Telephony service satisfies the required minimum voice quality as telephony service while ordinary telephone numbers are allocated to users if the quality of IP Telephony service is equivalent to the existing telephony service. In the U.K., Ofcom has recently made a decision to allocate to IP Telephony service a special non-geographic number block beginning with a new code, “056”, which would not be linked to any location and could be used anywhere in the country. But it

also decides to allow IP Telephony to use ordinary geographic telephone numbers, such that it would be easier for customers to switch from a traditional service to a VoB service without having to change telephone number.

49. In Hong Kong, we may consider the allocation of dedicated number blocks to IP Telephony services in order to ease the pressure on the number resources and to serve certain types of IP Telephony users (e.g. those users who may not be using the service at a fixed location ("nomadic" users), or use the numbers outside Hong Kong ("external" users)). For instance, a prefix of 2 to 3 digits as access code, followed by an 8-digit subscriber number, may be assigned to "nomadic" or "external" users of the IP Telephony service while traditional telephone services using circuit switched or IP technology will continue to use the existing 8-digit numbers. Although this arrangement may have the effect of easing the pressure on numbering resources, there is the drawback that users when migrating to use the new IP Telephony services would need to change to a new number with more digits. It is also a challenge to offer porting between the existing and new numbers. However, operators might find a niche market where users of IP Telephone services may not mind to use a longer telephone number in exchange for the cheaper price and other benefits.

50. ***Questions:***

(a) Should the traditional PSTN services and IP Telephony services which are intended to be a substitute for the conventional public telephone service share the same number blocks?

(b) Should IP Telephony services which are not intended to be a substitute for the conventional public telephone service be allocated with special number blocks or the normal numbers for conventional local fixed line telephone?

(c) If IP Telephony services are allocated with special number blocks, should all or only certain types of IP Telephony services be allocated with the special number blocks?

(d) How should the numbering resource challenge arising from the proliferation of IP Telephony services be tackled?

Number portability

51. The merit of number portability is that it allows the customers to change their network operators or the relocation of their residence/office without the need to change the telephone numbers. Since the implementation of number portability for fixed telephone service in 1995, fixed line telephone customers have enjoyed the resulting benefits and convenience.

52. If an IP Telephony service is marketed as a substitute for the conventional public telephone service, the service would be indistinguishable from the conventional telephone service from the user's perspective. It could be a concern if a user of such an IP Telephony service is not able to port the number to another preferred IP Telephony service provider or to any PSTN service operators. In this regard, it becomes logical for all providers of IP Telephony services marketed as a substitute for conventional public telephone service to facilitate number portability whether it is an FTNS licensee, a PNETS licensee or the holder of a new type of licence tailor-made for IP Telephony service. This seems to be the preferred way to achieve the ubiquitous provision of number portability in Hong Kong.

53. ***Questions:***

(a) Should the requirements of number portability be applied to IP Telephony services intended to be a substitute for the conventional public telephone service?

(b) Is number portability necessary for IP Telephony services not intended to be a substitute for the conventional public telephone service?

(C) Interconnection and charge settlement

54. The regulatory issues related to the network interconnection and settlement of charges include (a) any-to-any connectivity, (b) interconnection between operators, (c) calling line identification (CLI) and (d) payment of interconnection charges, LAC and USC.

Any-to-any connectivity

55. As far as the legacy PSTN is concerned, any-to-any connectivity refers to the capability inherent from network interconnection such that customers connected to a network can communicate with customers connected to any other networks. Such an interconnection is made between PSTN gateways of core networks and is termed Type I Interconnection in our regulatory regime. In the long term, as IP-based networks proliferate and traditional PSTN gradually phase out, there will be a need to have direct interconnection among the IP-based networks of different operators under the control of soft-switches[2] as an alternative to interconnection through the PSTN.

56. Any-to-any connectivity is one of the key regulatory principles in Hong Kong. If this policy is to be maintained in the regulation of IP Telephony services, users of IP Telephony services intended to be used as a substitute for the conventional public telephone service should be able to place calls to, or receive calls from, any customers connected to other IP-based or non-IP-based networks or service platforms all over the world. Consumer confusion is likely to arise if an IP Telephony service marketed as a substitute for the conventional public telephone service does not have this capability.

57. We observe that certain IP Telephony services being marketed in and outside Hong Kong do not have any-to-any connectivity. However, these services are not intended to be used as substitutes for the conventional public telephone service.

58. ***Questions:***

(a) Should any-to-any connectivity principle be adopted for IP Telephony services intended to be a substitute for the conventional public telephone service?

Is any-to-any connectivity necessary for IP Telephony services not intended to be a substitute for the conventional public telephone service?

Interconnection between operators

[2] A softswitch, which may be referred to as call agent, call manager or gatekeeper, is used to offer address resolution, admission control, routing and other call control services.

59. In the absence of interconnection among the networks, the customers on each individual network cannot communicate with customers connected to other networks. This would significantly hamper the effectiveness of public telecommunications services and violate the policy objective of any-to-any connectivity. As such, each FTNS operator or fixed carrier licensee is required to facilitate interconnection with other network operators or service providers upon request.

60. In a sufficiently open and competitive market, there should be no restrictions on the interconnection arrangements between operators or service providers. It is preferable to allow operators to enter into interconnection agreements among themselves on a commercial basis without any intervention by the TA. However the TA may be required to intervene in a justified and appropriate manner to safeguard the policy objective of any-to-any connectivity whenever no commercial agreement can be reached between operators and the TA is requested by an operator to do so.

61. At this point in time, it is understood that majority of the IP Telephony service providers would rely on PSTN as the transit network to deliver their traffic to the terminating network. In the long run, the IP-based network of each operator may interconnect with each other directly without the need to transit through the PSTN.

62. If IP Telephony customers on different networks need to call one another using the conventional (E.164) telephone numbers, it may be necessary for operators to exchange information on the conversion between the E.164 telephone numbers and the associated IP addresses. Such exchange may be based on the ENUM framework (please refer to Annex 1). Interconnection between the databases of the different operators will become necessary. OFTA may need to facilitate the establishment of such interconnection similar to the cases for the implementation of Operator Number Portability and Mobile Number Portability.

63. ***Questions:***

(a) Should we extend our existing interconnection regime to IP Telephony services?

(b) Should we prescribe technical standards for network-to-network interconnection and user-to-network interface of IP-based technologies or should we simply allow the market to evolve and determine the standards itself?

(c) Is it necessary for OFTA to play a role to facilitate the establishment and interconnection of E.164 number/IP address databases of IP-based networks?

Calling Line Identification

64. Calling Line Identification (CLI) refers to the signalling information which enables the calling party's number to be identified and which is transmitted through one or more networks. CLI is important in two aspects. First, it facilitates the settlement of inter-network interconnection charges such as the LAC. Second, it supports the provision of calling number display (CND) and calling name display (CNAMD) services. Currently the FTNS and fixed carrier licensees are required to follow the "*Code of Practice in relation to Calling Line Identification and other Calling Line Identification related services*".

65. In the PSTN environment, the delivery of CLI information among networks is supported and realised by the ITU-T signalling system No. 7 (SS7), which is being adopted by FTNS operators. For calls between IP Telephony customers, the IP Telephony protocols such as Session Initiation Protocol (SIP) or H.323[3] may provide information of the calling party. In the case of calls originating from an IP phone and terminating on a PSTN, or vice versa, the gateway between an IP-based network and the PSTN may carry out translations of different protocols/signallings such as SIP or H.323 and SS7 so as to carry across the information of the calling party.

66. ***Questions:***

(a) Should operators providing IP Telephony service be obliged to fulfil the requirements of sending/receiving CLI to and from other fixed network operators/service providers?

[3] ITU-T Recommendation H.323 is entitled "Packet-based multimedia communications systems". The H.323 standard covers the transmission of real-time audio, video, and data communications over packet-based networks.

Payment of Interconnection charges, LAC and USC

Interconnection charges between networks

67. If any-to-any connectivity for IP Telephony is to be achieved, we need to have interconnection between the traditional PSTN and IP-based networks. The IP Telephony service provider provides an interface called the media gateway[4] for connection with the networks of FTNS operators, fixed/mobile carriers based on circuit-switched technology. Details are shown in the various implementation scenarios at Annex 2. Where the interconnection between the networks is based on the circuit-switched technologies, the charging principles given in the TA Statement entitled "*Interconnection and the Related Competition Issues*", Statement No. 7 (Second Revision) "*Carrier-to-Carrier Charging Principles*" would still apply irrespective of the technology behind the media gateway.

68. Where interconnection between networks is based on packet-switched IP technology, the principles in the above quoted TA Statement which is based on networks using circuit-switched technology would not be applicable. So far it has not been necessary for the TA to intervene in IP-based interconnection. However, if regulatory intervention or guidance is considered necessary, the TA may consider issuing guidelines under the Telecommunications Ordinance.

69. If the PNETS operators (e.g. ISPs) are permitted to operate IP Telephony services, they could approach and seek hosting connection with one of FTNS operators/fixed carriers which would handle the interconnection with the rest of operators/service providers on their behalf. The other approach is to grant the interconnection right/obligation to these PNETS operators in a similar manner as the existing mobile virtual network operators such that they could handle their own interconnection requirements directly with other network operators/service providers concerned. Under the existing rules, the PNETS charge is applicable to interconnection between a PNETS licensee and a fixed carrier. A PNETS charge is payable by the PNETS licensee to the fixed carriers for calls over the interconnection *in both directions*. Whether

[4] Media gateway is used to direct interconnect with the PSTN and provide translations between different transmission formats, communications procedures and signal coding methods adopted on the IP-based network and the PSTN.

this would create unfair competition between carriers and service providers, and how this would affect the business case of an IP Telephony service operated by PNETS licensee (if permitted to operate local IP Telephony service) are issues to be considered.

Interconnection charge between IP Telephony service and broadband access service providers

70. An IP Telephony service needs to be accessed through a broadband connection provided by a network operator, or a PNETS licensee (an ISP) reselling the broadband connection acquired from a network operator. There are three modes of provision of IP Telephony services over broadband connections:

(a) In the first mode, the IP Telephony service provider supplies the broadband connection to the customer. The IP Telephony service provider may be the network operator operating the broadband connection. In this case, the question of interconnection charge is not applicable. Alternatively, the IP Telephony service provider may be a PNETS licensee acquiring the broadband connection from a network operator on a wholesale basis and reselling the broadband connection over which the IP Telephone service is delivered. In this case, charges payable by the PNETS licensee should be based on the commercial agreement between the PNETS licensee and the network operator.

(b) In the second mode, the IP Telephony service provider does not supply the broadband connection, but enters into a commercial agreement with the supplier of the broadband connection (a network operator or PNETS licensee) in which case interconnection charges may be payable under the terms of the commercial agreement.

(c) In the third mode, the IP Telephony service provider has no commercial relationship with the provider of the broadband connection specifically for the IP Telephony service. There may well be other commercial relationship (e.g. a “peer-to-peer” arrangement) for the exchange of generic Internet traffic. In

such case, the IP Telephony service provider would have no control over the overall quality of the IP Telephony service as perceived by the customer, as it has no control over the quality of the broadband connection. However, the customers should have already paid for the usage of the broadband connection for the access of content, applications and services on the Internet with data rate (no matter whether they are voice or data packets) up to the permissible limits (e.g. 1.5, 3 or 6 Mbps for downstream and 256 kbps for upstream of ADSL) or, where applicable, with usage time up to the prescribed limit. As such, there should be no basis for the broadband connection supplier to ask the IP Telephony service provider for an additional payment of interconnection charge for the conveyance of the IP Telephony traffic over the broadband connection if the supplier of the broadband connection does not provide special treatment of the IP Telephony traffic. There is also no justification for the broadband connection supplier to block the IP Telephony traffic if such payment is not made.

71. ***Questions:***

(a) Do you agree with the above approach on the interconnection charges between IP-based networks and conventional circuit-switched networks?

(b) Do you agree with the above approach on the interconnection charges between IP-based networks?

(c) Do you agree with the above approach on the interconnection charges between the IP Telephone service provider and the supplier of the broadband Internet connection?

LAC

72. The purpose of the local access charge (LAC) is to compensate the FTNS operators or fixed carriers for the use of their local network facilities for the delivery of external traffic to and from customers in Hong Kong. LAC should on the one hand reflects a fair charge to the external services operators for their use of the local networks, and on the other a fair and adequate

compensation to the FTNS operators or fixed carriers so as to ensure continuous and sufficient commercial incentive for investment in the local infrastructure.

73. The existing LAC mechanism assumes that the external calls are originated from or terminated at a circuit-switched local network. With the introduction of IP Telephony, LAC would be payable if the calls traverse through a circuit-switched interconnection interface between the local network and external service. For example, LAC is payable in the following scenarios:

(a) An external call is made by a customer of a local IP Telephony service that interconnects (through a gateway) with an ETS using a circuit-switched interface. Conversely, an external call from this ETS is terminated at the customer of the IP Telephony service.

(b) An external call is made by a customer of a circuit-switched local fixed network to an ETS that uses IP-based network for external conveyance but nevertheless interconnects with the fixed network using circuit-switched interface. Conversely, an external call from this ETS is terminated at a customer of the fixed network.

74. As a result of the increasing deployment of IP Telephony and the resultant traffic migration from the circuit-switched networks, some may have concern on the possible eventual bypass of LAC in the delivery of external telephone services.

75. There is a further complication when the calling or called party is a customer accessing the IP Telephony service of an FTNS operator (say, A) through a broadband connection supplied by another FTNS operator (say, B). The LAC is paid to the FTNS operator B that interconnects with the ETS in a circuit-switched interface and would be treated by the ETS as originating or terminating the external traffic. There may be practical difficulties for the LAC to be paid to the FTNS operator A providing the broadband access to the calling or called party as the FTNS operator A may not be aware that the customer is using the broadband connection for access to IP Telephony services.

76. Another issue is the relevance of the level of LAC based on

circuit-switched costs to a local fixed network that uses IP technology behind the gateway interconnecting with an ETS using a circuit-switched interface. In the TA Statement "*Review of the Principles and Costing Methodology of the Local Access Charge*" issued in February 2004, the TA has taken the view that, assuming the cost base of an IP-based network is lower, LAC based on circuit-switched costs would indeed signal the market to deploy an IP-based network as the core network for call routing and a media gateway for interconnection with the circuit-switched networks in order to reduce cost. If and when IP-based services and direct IP-based interconnection become more prevalent, circuit-switched networks would increasingly be bypassed, in which case the existing LAC regime would naturally become less relevant. While the TA would let the market decide whether LAC based on circuit-switched costs is becoming obsolete or not, the TA will consider whether the existing LAC regime will remain sustainable during the transition period.

77. Interconnection arrangements between IP-based networks will have their inherent mechanisms for fair compensation of the participating network operators and so far there has been no need for the regulator to intervene in the interconnection arrangements between IP-based networks. Our preliminary view is that there would be no need for the equivalent of the LAC mechanism to be developed for the IP-based environment.

78. ***Questions:***

(a) Do you agree that the existing charging principles of LAC should be continued for interconnection between IP Telephony and circuit-switched networks?

(b) Do you consider that fundamental changes to the LAC mechanism should be made to cater for the IP-based environment?

79. It is known that some fixed carriers have assigned the local fixed network numbers to customers of IP phone such that these customers could make use of an IP phone overseas for making connection with any customers of local PSTN or IP phones (as shown in Scenarios 3(b) and 3(c) in Annex 2). Under this arrangement, this "overseas" IP phone seems to be not an external phone *per se* as (a) it has utilised our domestic telephone numbers and (b) the translation or mapping of IP address and telephone numbers takes place at local

servers. One may argue that the call traffic to and from the local PSTN to this "overseas" IP phone is virtually "local" traffic. The operation is just an extension of the local telephone service of Hong Kong to the overseas user. Conversely, as we have discussed in paragraph 30, any Hong Kong customers could also subscribe to IP Telephony services using overseas telephone numbers. The operation seems to be an extension of the overseas domestic telephone service to the customers in Hong Kong. It would be more and more difficult for such traffic in and out of Hong Kong to be monitored or metered as "external traffic" for LAC purposes. This will compound the sustainability problem of the LAC and the USC regimes.

80. ***Questions:***

(a) Do you agree that the type of traffic described in the preceding paragraph generated by IP phone at local or overseas locations should be regarded as local traffic?

(b) If the answer to the above question is "no", how do you propose to meter the above type of traffic for LAC payment purposes?

USC

81. At present, the incumbent carrier, PCCW-HKT Telephone Limited, has the Universal Service Obligation (USO) to supply basic telephone service to any customer at any location upon request at the published tariff irrespective of whether or not service provision to that customer is loss-making. The cost of meeting the USO is calculated by the TA on an annual basis. The cost is shared by operators providing external telecommunications services in the market. These service providers are required to share the universal service cost, by making contribution, the Universal Service Contribution (USC), based on the volume of their external telecommunications traffic originating from, or terminating at, the local fixed and mobile networks.

82. The introduction of IP Telephony may gradually bring a change to the net cost of providing universal service. There are several factors to be considered. First, the cost of providing a telephone line is offset by the profits from external services delivered through the line. The profits derived from external call traffic delivered through the telephone line will be reduced due to a loss of market share of the incumbent and/or lower prices resulting from

competition from IP Telephony. Second, fewer "direct exchange lines" will be rented by customers because the future broadband service may include as a service package both IP telephony service and broadband Internet access service. As the cost base of the access network is almost fixed cost, a drop in the number of lines rented implies an increase in the cost per line. Third, some revenue will be lost as external calls will be increasingly diverted to cheaper or even free services that are delivered not through the conventional telephone lines but through broadband connections.

83. Not only would the net cost of meeting USO increase, the number of external traffic minutes sharing the cost would also reduce as a result of diversion to IP-based services which do not traverse circuit-switched networks at all.

84. The above effects will in the longer term build up pressure on the funding of USO and the USC per minute will be increased as a result. When the existing USC mechanism was drawn up in January 1998, the TA made a regulatory decision not to include the international Internet traffic in the USC sharing process. Nonetheless, the TA stated that it would *"monitor developments of the internet market from time to time especially with regard to internet telephony and review the situation if necessary"* (paragraph 69 of the TA's Statement entitled "*Universal Service Arrangements: The Regulatory Framework*" dated 14 January 1998 refers). OFTA is conducting a comprehensive review of both the scope of the USO and the USC sharing mechanism and will consult, subject to the views we receive in this consultation paper.

85. ***Questions:***

(a) Do you consider that the USO and USC sharing mechanisms should be overhauled because of the development of IP Telephony services?

(b) Do you consider that all providers of IP Telephony services should be obliged to share the contribution to USO, even though their traffic may not traverse the PSTN at all and some of them may be local IP Telephony service providers?

(c) If the IP Telephony service providers should be obliged to share

the contribution to USO, and if there are practical difficulties in metering the volume of "external" traffic for USC purposes, what should be the basis for the sharing – number of telephone numbers assigned to customers, revenue, etc.?

(D) Consumer and other issues

86. There are several issues related to the consumer interest, which include (a) directory enquiry, (b) access to emergency services, (c) backup power supply and (d) quality of service (QoS).

Directory enquiry

87. Under General Condition (GC) 25(4) of the FTNS licence or Special Condition (SC) 12.4 of the Fixed Carrier licence, the licensee shall make the printed directory and telephonic directory service available free of charge to all of the licensee's customers, in a manner satisfactory to the TA. The original objective of providing printed directory and telephonic directory service is to facilitate the calling party to find out the telephone number of another party.

88. The FTNS licensee or fixed carrier is permitted to make commercial arrangements with one or more of the other FTNS operators or fixed carriers in the joint provision of either or both of the printed directory and the telephonic directory service. The licensee's printed directory has to be a unified printed directory. Its telephonic directory service has also to be a unified telephonic directory service utilizing a unified directory database that contains directory information on all customers of all FTNS operators and fixed carriers, except for those customers who request their directory information not to be disclosed. The licensee shall provide updated raw directory information about its customers to each other FTNS operator and fixed carrier.

89. Under the existing licence conditions, FTNS operators and fixed carriers are obliged to provide unified printed directory and unified telephonic directory service irrespective of the technology adopted for the provision of telephony service.

90. It is necessary to consider whether the provision of unified

printed directory and unified telephonic directory service is one of the minimum conditions to be satisfied by an IP Telephony service if it is intended to be a substitute for the conventional public telephone service.

91. In the case of IP Telephony services not intended to be substitutes for the conventional public telephone service, it may be unnecessary or even impracticable for corresponding printed directory or telephonic directory service to be provided.

92. ***Questions:***

(a) Is there any practical problem for a FTNS operator or fixed carrier

(i) to include the customers of an IP Telephony service in the unified directory database; and

(ii) to provide unified printed directory and telephonic directory services to their customers subscribing to an IP Telephony service?

(b) Which types of IP Telephony services should be required to provide printed directory and telephonic directory service to the customers?

Access to emergency services

93. Under GC 26 of the FTNS licence or SC 13 of the Fixed Carrier licence, the licensee is required to provide public emergency call service by means of which any member of the public may, at any time and without incurring any charge, by means of compatible apparatus connected to the network, communicate as quickly as practicable with the Hong Kong Police Emergency Centre or other entity as directed by the TA to report an emergency. As such, all FTNS operators and fixed carriers are obliged by their licences to provide emergency call service to their customers regardless of the technology they adopt in the provisioning of telephony service.

94. If an IP Telephony service is intended to be a substitute for conventional public telephone service, a customer will naturally expect he/she can gain access to the emergency services.

95. At present, apart from providing the caller with access to the emergency services, the conventional telephone services are also capable of providing the agencies operating the emergency services with information on the location of the caller. Such information is based on the address at which the telephone line used to make the call is located. The objective is to facilitate the Police or other emergency service agencies to attend to the emergency quickly in case the caller cannot identify his/her location because of some unexpected reasons. Nevertheless, the provision of such information on callers' locations is solely a commercial arrangement between the Police (or other emergency service agencies) and the local FTNS operators, but not a part of the licensing conditions of FTNS/Fixed Carrier licence.

96. An IP Telephony service may be used over any broadband connection located anywhere (e.g. a wireless LAN connection in an Internet Café). The broadband connection over which the IP Telephony service is accessed may even be located outside of Hong Kong. Therefore unless the IP Telephony service provider is kept informed of the current location of the customer, it would not be feasible to provide reliable information to the emergency service of the location of the caller. However there may be some technical or operational solutions to overcome or ameliorate this problem. For example, the IP Telephony service may use dedicated number blocks for "nomadic" users and hence calls from such users can readily be identified by the emergency centres. Another solution could be for the IP Telephony system to prompt the customer automatically to input his/her current location wherever the IP Telephone terminal is set up at a new location for the first time.

97. ***Questions:***

(a) Should all IP Telephony services intended to be substitutes for the conventional public telephone be obliged to provide access to emergency services? Should similar requirement be extended to other types of IP Telephony services?

(b) If service providers were exempted from such an obligation, what should be done to protect the interest of end-users and to avoid confusion?

(c) What technical or operational solutions are available for the supply of reliable information on the locations of callers using

IP Telephony services to the emergency services?

Backup power supply

98. Backup power supply is important in ensuring the provision of uninterrupted telephone service during the outage of primary power supply. During the days when public telephone service was provided over copper-based local loops between the customer premises and the local exchanges, the provision of backup power supply to the customer premises equipment was one of the basic technical requirements in the design of a telephone exchange. As a result, the services offered by legacy telephone network operators have always been protected with backup power supply from the exchanges. To cope with technological developments in the customer access networks, the TA in September 2003 stipulated the requirement for backup power supply for fixed telephone line services during failure of public electricity supply in a statement and a code of practice. The reason for doing so is that some operators have commenced using IP technology or optical fibre connections in the customer access networks and with such technology the supply of backup power supply from the local exchanges to the customer buildings no longer exists.

99. According to the TA Statement on "*Backup Power Supply for Fixed Telephone Line Service during Failure of Public Electricity Supply*" issued on 26 September 2003, all network equipment of the FTNS licensee or fixed carrier licensee involved in the provision of "basic telephone line service" should be supported by a backup power supply system. "Basic telephone line service" refers to a fixed single-line telephone service usable with a telephone set which is powered by the telephone line and which enables the customer to use the basic telephone line service without reliance on power supply from the customer premises. Despite the proliferation of mobile telephone services, certain groups of the community (e.g. the aged) are relying on the "basic telephone line service" for critical applications such as "life-lines".

100. Where the implementation of IP Telephony service falls within the scope of "basic telephone line" service, such as cases where the Integrated Access Devices (IAD, see Figures 3 and 4 of Annex 2) are provided outside the customer premises (i.e. on the "network" side of the network termination point) and the customer is expected to plug an ordinary analogue telephone to a wall telephone socket, then according to the TA Statement and code of practice

issued on 26 September 2003, all network equipment involved in the provision of the telephone service should be supported by a backup power supply system.

101. Where the implementation of IP Telephony service requires the installation of a modem, IAD or other types of equipment requiring power supply directly from the customer premises concerned, the service would fall outside the definition of "basic telephone line service" under the TA Statement and code of practice of 26 September 2003. In other words, the existing regulation under FTNS or Fixed Carrier licences does not impose a requirement for backup power supply on IP Telephony services that operate with an equipment powered from the customer's premises.

102. ***Questions:***

(a) Do you agree with the above initial views and clarifications with respect to the requirement of the backup power supply for IP Telephony services?

(b) Do you consider that the existing backup power supply requirement for "basic telephone line service" should be extended to the IP Telephony services?

(c) If the backup power supply requirement for "basic telephone line service" is not to be extended to IP Telephony services, what should be done to protect the interest of customers who may be relying on the telephone line services for critical applications (e.g. "life-lines")?

Quality of Service (QoS)

103. All sectors of the telecommunications industry in Hong Kong are now open to competition and consumers have benefited from significantly lowered prices and expanded choices. However, in order to ensure that market forces do work effectively to safeguard and promote QoS in the face of intense competition, there is a need to implement a system for monitoring and reporting quality of service of public telecommunications services so that consumers can make informed choices in the market.

104. The advent of IP Telephony is expected to bring to the market a

range of services with different functionalities and quality of service. It is important that the consumers are given adequate information for informed choice to be made.

105. The conventional public telephone service has traditionally been operated as a service of very high reliability. The public has relied on the service to summon assistance in the event of emergency. Therefore if an IP Telephony service is intended to be a substitute for the conventional public telephone service, there would be a general expectation for a minimum standard of quality to be met by the IP Telephony service. Alternatively, it might be sufficient for the operators to advise the consumers of the quality of service specifications before contract and as part of the operation of the service, to monitor and report the quality standard achieved.

106. The parameters for reporting quality of standard of traditional public telephone service may not be fully applicable for the IP Telephony services. For example, the time to install a line would not be applicable to a "do-it-yourself" service for which the customer could set up the service in accordance with instructions provided by the service provider. What are more relevant are perhaps the reliability of the service, the network delay[5], the grade of service (i.e. blocking probability) and voice quality.

107. Where an IP Telephony service is provided over broadband connections provided by others, the service provider may or may not be in a position to control the quality of the broadband connections and therefore guarantee the overall quality of the service as perceived by the customers. In such cases, the customers should be clearly advised of the quality of service in any sales literature or advertisement.

108. Under GC 11 of the FTNS licence or GC 6 of the Fixed Carrier licence, the licensee is required to prepare customer charters setting out the minimum standards of service to their customers and give guidance to their employees in their relations and dealings with customers. Customer charters should also cover IP Telephony services provided by the FTNS operators or fixed carriers under their licences since this is one of their services. However, a PNETS Licence does not contain the requirement for customer charters. If PNETS licensees are allowed to provide IP Telephony services, it appears that

[5] Network delays or latency due to encoding/decoding of voice and transmission through the network will affect quality of voice services.

the governing conditions should be brought into line with those for FTNS operators and fixed carriers.

109. ***Questions:***

(a) Should IP Telephony services intended as a substitute for the conventional public telephone service meet minimum quality standards?

(b) What QoS monitoring and reporting requirements should be adopted for IP Telephony services?

(c) Should the customer charters requirement under FTNS and Fixed Carrier licences be extended to cover the IP Telephony services provided by PNETS licensees?

INVITATION FOR COMMENTS

110. In summary, we would like to solicit views and comments from the industry and interested parties on the above issues raised in this consultation paper. Views and comments on this consultation paper should reach OFTA on or before 4 December 2004. Any person who submits views and comments should also give the supporting information or justifications and should note that the TA may publish all or any part of the submission received and disclose the identity of the source in such a manner as the TA sees fit. Any part of the submission which is considered commercially confidential should be clearly marked. The TA would take such markings into account in making his decision as to whether or not to disclose such information. Submissions should be addressed to:

Office of the Telecommunications Authority
29/F Wu Chung House
213 Queen's Road East,
Wanchai
Hong Kong
(Attention: Mr. Sin Kwok-Kei, Telecommunications Engineer)

Fax : 2838 5004

E-mail : iptelephony@ofta.gov.hk

An electronic copy of the submission should be provided by e-mail to the address indicated above

Office of the Telecommunications Authority
4 October 2004

Annex 1

International Developments on IP Telephony and Electronic Numbering (ENUM)

Development of IP Telephony Services

There is a worldwide trend for IP-based networks to emerge. The reasons may be due to the lower implementation cost and the ability to integrate voice services with data and multimedia applications. With different prevailing market conditions and degree of liberalisation, economies over the world have been adopting widely differing approaches in the treatment of IP Telephony.

2. IP technology is already having an impact on network architectures of carriers. Some carriers are planning the complete replacement of circuit-switched networks with IP-based networks. For example, one major carrier in the United States had announced it would purchase no more circuit-based switches, but only IP-based routers and servers[6]. British Telecommunications has recently announced the replacement of the PSTN by IP-based networks by 2008[7].

IP Telephony and ENUM

3. Electronic Numbering (ENUM) is a protocol for the conversion of ordinary telephone numbers (E.164 numbers) into a format that can be used to look up Internet address information. At this juncture, IP Telephony may be operated without using ENUM. However, ENUM may facilitate the development and widespread use of IP Telephony. International organisations are working on the necessary standards and numbering schemes to facilitate the development.

4. The global ENUM implementation issues are jointly addressed by the International Telecommunication Union (ITU) and the Internet

[6] Please refer to P.7 of http://www.itu.int/ITU-D/tdag/PDFs/5thMeeting/16-e.pdf

[7] According to British Telecom, the mass migration of customers from PSTN to IP networks would begin in 2006 and, by 2008, majority of customers will be served by IP networks.

Engineering Task Force (IETF). In May 2002, the ITU-T Study Group 2 (ITU-T SG2) set out the interim procedures for administration of ENUM to allow for trials by member states. Trials have been carried out in Austria, China, France, Korea, Sweden, Switzerland, the United Kingdom and the United States. Meanwhile, the ITU-T SG2 is working on the concerned draft new Recommendation E.A-ENUM, "*Principles and Procedures for the Administration of E.164 Geographic Country Codes to be Registered into the Domain Name System*", which covers the final procedures for administration of ENUM. The information of ITU ENUM resources can be found at http://www.itu.int/ITU-T/inr/enum/index.html.

Development of IP Telephony Regulation in Some Economies

Australia

5. In Australia, the preliminary view of Australian Communications Authority (ACA) is that an arrangement to send voice between two (PC or the like) end terminals over a packet-switched or any network is the same as that for any other user data. The voice carried in this way is managed by the end users and not intended to be an "any-to-any" connection in the usual telephony sense. Therefore, the carriage service provider simply provides a connection service (in most cases a data connection) and does not provide a service that is for the provision of voice telephony and capable of "any-to-any" connection. Such a service would not meet ACA's definition of "standard telephone service (STS)", to which are attached a range of other obligations such as the provision of voice telephony or equivalent to people with special needs. If a service provider offers a public telephony service over a packet-switched network, the regulatory requirements associated with the STS shall apply.

6. In Australia, IP telephony/VoIP services are considered as transitional services to the next generation networks (NGN). In November 2000, the Department of Communications, Information Technology and the Arts conveyed its policy to the ITU that "technology neutrality is an important principle within such an environment for ensuring that particular competing technologies are neither advantaged nor disadvantaged thus maximising the opportunities for diversity, flexibility and innovation in the supply of services. This applies equally to conventional PSTN telephony as it does to IP telephony".

7. The ACA is reviewing the need to reconsider the regulatory provisions in the context of the transition to the NGN, which could include a new billing model and a likely range of services available with a corresponding range of quality with an associated range of pricing options.

8. In July 2004, the ACA proposed amendments on emergency services rules "that explicitly recognises that, if the carriage service provider's technical ability to provide that access is affected by a matter beyond its control, then the carriage service provider will not be able to provide that access during the affected period." *VOIP was among the examples of providers covered by the amendments.*
http://www.aca.gov.au/aca_home/media_releases/media_enquiries/2004/04-51.htm

Canada

9. In April 2004, the Canadian Radio-television and Telecommunication Commission (CRTC) issued a public notice to invite comments on its preliminary views on VoIP, the main points of which are as follows:

- VoIP services that require number allocations and allow subscribers to call and/or receive calls from any telephone anywhere in the world are functionally the same as circuit-switched voice telecommunications services and hence the existing regulatory framework should apply, including the regulatory framework governing local competition;

- If the VoIP service providers are not able to provide 9-1-1, enhanced 9-1-1 (E9-1-1), message relay service (MRS) and privacy safeguards in the initial stage, they should specifically and clearly advise potential and existing subscribers of such limitations and the CRTC is of the view that it should become mandatory for all VoIP service providers to provide 9-1-1, E9-1-1, MRS and privacy safeguards *as soon as practicable*; and

- The national contribution collection scheme, under which telecom service providers exceeding a certain revenue threshold are required to contribute to a fund to subsidise services in rural

and remote areas, should be applicable to VoIP services that provide access to PSTN.

10. The CRTC public notice can be viewed from the weblink: http://www.crtc.gc.ca/archive/ENG/Notices/2004/pt2004-2.htm

European Union

11. The current regulatory framework in the European Union (EU) for electronic communications services (ECS) came into effect in July 2003. IP Telephony is a type of ECS and is therefore governed by the current regulatory framework.

12. The regulation applied to IP Telephony depends on whether the service falls within the scope of a private service, "publicly available ECS" or a "publicly available telephone service (PATS)". A publicly available ECS is subject to a set of obligations which are mainly for consumer protection. A PATS is subject to additional obligations (e.g. access to emergency services, number portability, etc.) on top of the obligations for publicly available ECS.

13. An ECS would fall within the scope of a PATS if it is a service available to the public, for originating and receiving national and international phone calls, that gives access to emergency services and through a number or numbers in a national or international telephone numbering plan. Therefore a public IP Telephony service meeting these criteria will be caught by the regulation on PATS.

14. A study report was produced by a consultant entrusted by the European Commission entitled "*IP Voice and Associated Convergent Service*s" in January 2004. The report can be downloaded from http://europa.eu.int/information_society/topics/ecomm/useful_information/library/studies_ext_consult/index_en.htm#2004

15. Further to the study report, the European Commission issued an information and consultation document on 14 June 2004 seeking views on the application of the current regulatory framework for ECS to IP telephony. The consultation closed on 31 August 2004. The document and the responses on the consultation can be downloaded from http://europa.eu.int/information_society/topics/ecomm/doc/useful_information/

library/commiss_serv_doc/406_14_voip_consult_paper_v2_1.pdf

16. A number of EU member states have issued consultation on issues related to IP telephony: apart from Ofcom of the UK, Comreg of Ireland has issued consultation on numbering for VoIP services. The German and Austrian regulators have also issued consultation on general issues that have to be addressed, including numbering, interconnection, emergency services and consumer interests etc. The information of these countries' consultations and comments received can be found from:

http://www.comreg.ie/_fileupload/publications/ComReg0472.pdf
http://www.regtp.de/en/aktuelles/pm/02952/
http://www.regtp.de/reg_tele/start/in_05-17-01-00-00_m/index.html
http://www.rtr.at/web.nsf/deutsch/Portfolio_Konsultationen_bisherige_bisherigeKonsultationen_KonsultationVoIPErgebnis?OpenDocument

Finland

17. TeliaSonera, a major telecom network and service provider in Finland (No. 1 in Internet and mobile, and No.3 in fixed service) is offering VoIP service to its broadband customers. Taking into account the fact that (a) the service is publicly available, (b) numbers complying with the Finnish numbering plan are used for the provision of service, (c) users can originate and receive national and international calls and (d) users can access emergency services, the Finnish Communications Regulatory Authority (FICORA) has considered the VoIP service as a "substitute" to PSTN connection and therefore imposed on TeliaSonera the same obligation set for basic telephone (which they call "PAT" or publicly available telephone service). The obligations include provision of emergency service, telephone directory, CLI, QoS, interception etc. Details of FICORA's decision are available at the document of URL www.ficora.fi/englanti/document/SoneraPuhekaista.pdf.

Japan

18. The policy of Japan also supports the development of IP Telephony. In 2001, Fusion Communications started its nation-wide IP Telephony followed by the incumbent NTT groups and other major operators like KDDI, Japan Telecom to provide IP Telephony services on computer-to-computer and computer-to-phone basis. At present, Yahoo!BB is the major IP

telephony service provider offering phone-to-phone services to its broadband users (i.e. Yahoo!BB bundles its IP phone service with its broadband Internet access service). It was estimated that there were 3.93 million residential IP Telephony users as of December 2003, among which 3.46 million are Yahoo!BB's subscribers. Users of Yahoo!BB's service can make / receive calls to / from other users on the PSTN.

19. The policy maker and regulatory agency, Ministry of Internal Affairs and Communications (MIC)[8] has been issuing telephone numbers for IP Telephony since November 2002. By May 2004, nearly 18 million numbers have been allotted to IP Telephony service providers which include ISPs. The number prefix of "050" has been allocated by MIC for IP telephony services meeting certain defined quality parameters[9]. IP telephony services with quality and functionalities (e.g. ability to make emergency calls, provision of information on callers' location, etc.) equivalent to existing telephone services are allocated numbers same as existing telephone services.

20. MIC is also working on issues like priority for emergency calls on IP-based networks, universal service obligations and IP interconnection between networks. In the case of termination of IP Telephony calls on PSTN, MIC stated that the payment of interconnection charge is required.

Mainland China

21. IP Telephony is explicitly defined as fixed telecommunications services in Mainland China. IP Telephony service in China began in 1999, first as trials in 25 cities. In 2000, permits to operate phone-to-phone IP telephony were issued to the incumbents operators, China Telecom, China Unicom, China Netcom, Jitong Communication (subsequently merged with China Netcom) and China Mobile. The operations are essentially for the provision of long distance and international phone services to subscribers on the traditional PSTN (Figure 5, scenario 3a in Annex 2).

22. IP Telephony is growing fast in Mainland China, mainly because it is a low-cost means to send long distance and international calls as compared with the traditional circuit-switched routes. According to MII, the domestic IP Telephony traffic in the first six months of 2004 had reached 54 billion

[8] Renamed from MPHPT

[9] Based on "general voice transmission quality rate" and "end-to-end delay".

minutes, a 44.5% growth as compared to the same period in 2003. The percentage of IP Telephony in the total long distance traffic in the first half of 2004 had risen to 45.9 % from 34.3% in the same period of 2002.

Singapore

23. The Info-communications Development Authority of Singapore (iDA) issued a public consultation paper on the policy framework for the IP telephony and electronic numbering on 21 September 2004. In the paper, iDA has proposed to adopt a light-handed approach of imposing regulations only necessary to address certain economic, social/public and regulatory concerns to allow the emerging technology of IP telephony to fully develop at the introductory phase.

24. iDA has proposed to issue a class licence for the carriage of Internet-based voice/data services over the public Internet, and a services-based licence to service providers that lease transmission facilities from a facilities-based operator to operate their own network. It has also proposed to allocate initially a new 8-digit number level for the IP telephony service, and to migrate the service to a new 4-digit national destination code with the 8-digit number level if demand warrants. Quality of service on IP telephony will not be imposed in order to allow market forces to dictate the price and the corresponding QoS levels. iDA has also proposed to allow service providers to decide whether or not they want to provide access to emergency and directory enquiry services. To avoid undue burden on new services providers, iDA has proposed not to mandate number portability for IP telephone service at this stage, but to reserve the right to mandate the number portability at a later stage if it is required.

25. On interconnection issues, iDA has proposed that IP telephony service providers should meet minimum interconnection-related requirements to ensure seamless and any-to-any communication as required under the existing regulatory framework. Under the framework, an IP telephony service provider can commercially decide to set up a “closed-user” network and not to request for interconnection with existing telecommunication networks. However, if the IP telephony service provider chooses to interconnect with existing networks, the existing operators must observe the interconnection requirements to allow interconnection. Similarly, if existing operators request

for interconnection with the IP telephony service provider, the latter will have to observe the requirements and to allow interconnection.

26. The consultation paper of iDA can be found from the following web-link:
http://www.ida.gov.sg/idaweb/doc/download/I3048/PC-VOIP&ENUM3.pdf

United Kingdom

27. As a member state of the European Union (EU), United Kingdom (UK) has the obligation of implementing the regulatory framework for electronic communications services which entered into effect in July 2003 and applies to IP Telephony services as a type of electronic communications services (see summary of EU regulation above).

28. The UK regulator, Office of Communications (Ofcom) has issued a consultation paper on 6 September 2004 and invited comments and views by 15 November 2004 on what Ofcom called "new voice services".
http://www.ofcom.org.uk/consultations/current/new_voice/new_voice_services.pdf?a=87101

29. In the paper, Ofcom has indicated its aims to (a) create an environment in which new technologies can be developed successfully in the market, so that consumers can benefit from a wider and more innovative range of services, (b) ensure that consumers are properly informed and protected in relation to the products they are using and (c) limit the extent to which regulation creates distortions in the market.

30. As identified in the consultation paper, Ofcom's initial views are that (a) it is not desirable for all voice services to be required to offer the same features as traditional telephone services; (b) it is not desirable to rely on criteria such as appearance of a service or whether it is used as a second line in order to draw a distinction between those services that are regulated in a similar way as traditional telephone services and those that are not. Instead, providers should be allowed to offer a range of differentiated services and consumers should be enabled to make informed decisions about the products they are buying and using; (c) it is not currently necessary or appropriate for access to emergency to be a requirement for all voice services. It is apparent that Ofcom has no intention to impose specific obligations on IP telephony service

providers provided that they let their potential customers know the limitations in their services in comparing with the traditional telephone services and ensure their customers are well-informed before they make a choice.

31. Before the conclusion of the consultation, Ofcom adopts an interim policy of not apply the full set of "publicly available telephone service (PATS)" obligations to IP Telephony services even though they offer access to emergency services and meet the criteria for PATS as defined by the EU regulatory framework.

32. On 6 September 2004, Ofcom also issued a final statement on numbering which makes both geographical number ranges and a new location independent "056" number range available for new voice services including Voice over Broadband (VoB) services. According to Ofcom, the geographical numbers would make it easier for the customer to switch from a traditional service to a VoB service without having to change telephone number while the new "056" number range would not be linked to any location and could be used anywhere in the country.
http://www.ofcom.org.uk/ind_groups/ind_groups/telecommunications/nvs_index/nvs_statement.pdf

United States

33. In the United States the FCC has determined that IP Telephony is essentially an "information service" that should remain unregulated. However, the FCC decided that it would review on a case-by-case basis whether certain phone-to-phone voice communications using the Internet should be subject to regulation.

34. In October 2002, AT&T filed a petition to FCC seeking clarification that its interstate phone-to-phone IP telephone services should be exempted from access charges. FCC has made a ruling in April 2004 that AT&T's specific service constitutes telecommunications service and interstate access charge may be assessed. FCC's ruling is based on AT&T's specific service that it (i) uses ordinary customer premises equipment with no enhanced functionality; (ii) originates and terminates on the public switched telephone network and (iii) undergoes no net protocol conversion and provides no enhanced functionality to end users.

35. However, in a court decision on 16 October 2003, a federal court spiked the State of Minnesota's attempt to regulate and enforce a tax on broadband phone company Vonage, ruling that the VoIP firm did not have to register as a telephone company in order to conduct business in Minnesota.

36. On 12 February 2004, FCC took action on two items related to Internet enabled communications services:

(a) The Commission adopted a Declaratory Ruling stating that pulver.com's Free World Dialup (FWD) offering should remain free of unnecessary regulation. The FCC considered that Pulver was not involved in the transmissions of the calls in the FWD service. The connections for the calls are established by the users themselves over the Internet. Pulver just operates a directory or translation service informing users whether the parties which users wish to communicate with are on-line and the IP addresses of those parties. FCC emphasised the decision in the FWD case was based on the specific circumstances of the case and should not be generalised; and

(b) The Commission adopted a Notice of Proposed Rulemaking (NPRM) seeking comment on issues related to "IP-enabled services". The NPRM advocates the minimum regulation approach for IP-enabled services, but asks which regulatory requirements - for example, those relating to E911, disability accessibility, access charges, and universal service - should be extended to IP-enabled services to protect consumers and public interest.

37. Details can be found from:

http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-243868A1.doc
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-243869A1.doc

Annex 2

Implementation Scenarios of IP Telephony

Scenario 1 : Computer-to-Computer

1. This may be the simplest and earliest configuration of IP telephony. It solely relies on the Internet access service provided by the Internet Service Provider (ISP) as the media for call routing. The only requirement is that the users at both ends have to connect with the Internet and have a personal computer (PC) equipped with suitable telephony application software. The software digitises the analogue voice signal, compresses it into packets and transports the packets over the IP-based network to the receiving end where the process is reversed.

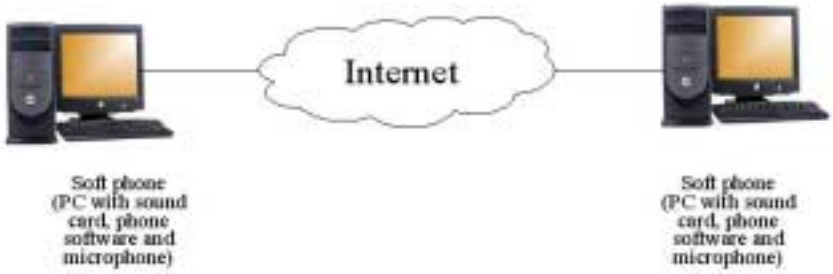

Figure 1 - PC to PC

2. The two parties are able to establish communications by prior arrangements including (a) dial-up access to the Internet at the right moment, or they are both connected to broadband "always-on" Internet service and (b) the acquisition of the IP address of the called party by the caller. The caller may get the called party's IP address by consulting an online directory server where users can register free-of-charge before each communication.

Alternatively, the caller may rely on the Instant Messaging[10] technology to acquire the IP address of the called party.

Scenario 2 : Computer-to-Phone or Phone-to-Computer

3. In this scenario, one end of the users is a normal subscriber to the traditional PSTN telephony service or mobile telephone network while the other end is a subscriber to IP Telephony service and has his/her computer connected to the Internet via the local access network and service platform of an ISP.

Scenario 2a : PC-to-Phone

4. Before a call is originated from the PC to the telephone, the computer user has to ensure that its PC is connected to the Internet via the platform of its ISP. Once connected, the computer user can gain access to the service platform of the IP Telephony service provider and make a call to any party connected to the PSTN via a media gateway[11] operated by the service provider.

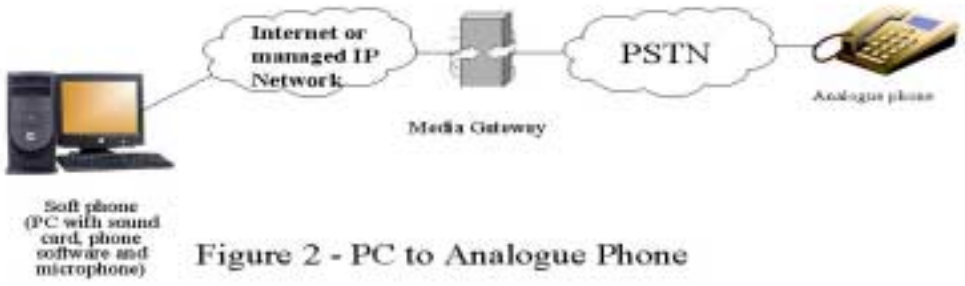

Figure 2 - PC to Analogue Phone

[10] Instant Messaging (IM) is a type of communications service that enables a user to create a kind of private chat room with another individual in order to communicate in real time over the Internet. Two users communicate with each other using IM must log onto the same web server on which the IM software application is installed. Most of the popular instant-messaging programmes provide a variety of features including voice telephony via the Internet.

[11] Media gateway is used to directly interconnect an IP-based network with the PSTN and provides translations between different transmission formats, communications procedures and signal coding methods adopted on the IP-based network and the PSTN.

5. In case the ISP is also the IP Telephony service provider, there is no need to route the voice packets over the public Internet. Instead, they could be routed through the managed IP-based network of the service provider, thereby ensuring a better quality of service for the voice call.

Scenario 2b: Phone-to-PC

6. In this case, the calling party is a PSTN phone user and the called party is a PC user. There is a need to assign a telephone number to the PC for mapping with its IP address as it is impossible for a PSTN phone to call the PC using its IP address. The PC user therefore needs to be a subscriber to an IP Telephony service which provides the user with such a telephone number. Alternatively, a PC user can be indirectly called by the PSTN phone user. There is such a service available in the market that allows a customer to activate a call forwarding function in such a way that any call to the customer's designated telephone number (e.g. office telephone number) would be forwarded to the customer's PC at home for example via the service provider's IP-based network.

Scenario 3 : Phone-to-Phone

7. The scenario of Phone-to-Phone can be further classified into several situations depending on the terminal equipment and types of networks involved.

Scenario 3a: Analogue Phone-to-Analogue Phone

8. In this scenario, both the caller and called party can continue the use of their analogue telephones while the network operator or service provider is offering IP Telephony service in a way transparent to the telephone users. Nevertheless, an additional device called Integrated Access Device (IAD) needs to be installed between the telephone and the Internet or managed IP-based network for the conversion of analogue voice signals into IP packets to be transported over the public Internet or managed IP-based network. The IAD can be a customer premises equipment, or a unit within the network of the network operator in which case the interface at the network termination point is of the conventional analogue PSTN format.

Figure 3 - Analogue Phone to Analogue Phone (1)

9. For situation shown in Figure 3, both the calling party and called party are subscribing to the service provided by the same IP Telephony service provider using an IAD. If the IP Telephony service and Internet access service subscribed to by the user are provided by the same local operator, the voice packets would be transported through the local managed IP network of the service provider. Otherwise, the voice packets will have to be transported over the public Internet. In this case, it is possible that the IP Telephony service provider has its platform set up in an overseas country and the subscribers can gain access to the service anywhere in the world provided that he/she carries along and makes use of the IAD for connection to the Internet.

10. For situation shown in Figure 4, the calling party is subscribing to the IP Telephony service while the called party is a subscriber of the traditional PSTN service. The IP Telephony service is accessible via the Internet and has interconnection with the PSTN via a media gateway installed on its platform. Again, in case the IP Telephony service and the Internet access service subscribed to by the calling party are provided by the same service provider, the voice packets will be routed over the managed IP network of the service provider instead of the public Internet.

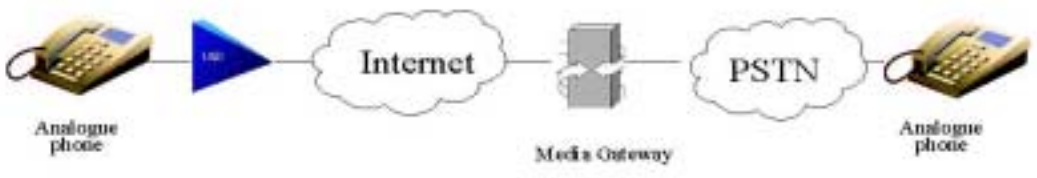

Figure 4 - Analogue Phone to Analogue Phone (2)

11. The configuration shown in Figure 5 may represent two different scenarios depending on whether the facilities such as the media gateways and managed IP-based network belong to the same operator/service provider. If the facilities belong to the same operator, Figure 5 represents the conveyance of IP Telephony calls within a single network operator, which owns and manages the entire operation for both calling party and called party.

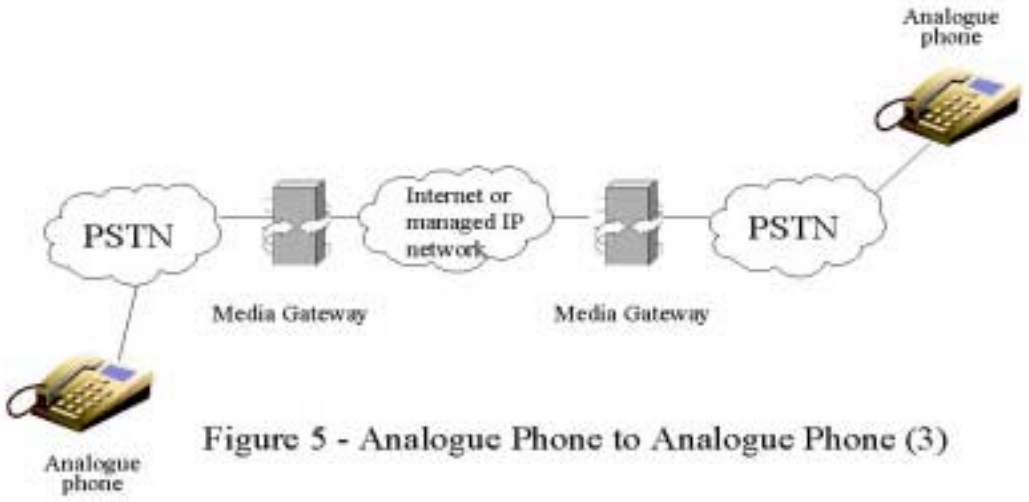

Figure 5 - Analogue Phone to Analogue Phone (3)

12. In case the calling party and called party are subscribing to services provided over different networks, Figure 5 is referring to the provision of a long-distance or international voice service by an external telecommunications service provider using IP technology. The external traffic is transported over an IP-based network, which may be the public Internet or a managed IP network established between Hong Kong and an overseas destination. For simplicity, the external telecommunications service provider which is responsible for the external traffic is not shown in the figure.

Scenario 3b : IP Phone-to-Analogue Phone

13. With the advent of technology, IP Phone has emerged as a commercial product recently. Unlike PC and analogue telephone, IP phone is an integrated device with both IAD and telephone which can be directly connected to any IP-based network for voice communication without the requirement for additional hardware or software. With the availability of such an IP-enabled communication device, there is more flexibility for operator to provide IP Telephony service while the end users have more choices on various forms of IP Telephony services. The beauty of IP phone lies in the fact that it is not bound to any fixed location for calling and can be used anywhere in the world if there is a connection to broadband Internet access network.

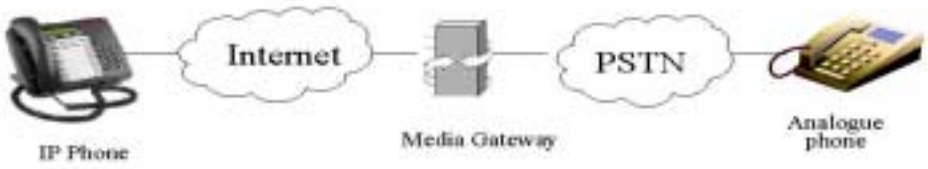

Figure 6 - IP Phone to Analogue Phone

14. For the scenario shown in Figure 6, the calling party is subscribing to an IP Telephony service using an IP phone while the called party

is a subscriber of traditional PSTN telephony service using a PSTN phone. When the IP phone user makes a call to the PSTN phone user, the call traffic will be routed to the platform of the service provider via the Internet and it will be subsequently delivered to the PSTN after signal/protocol conversion by the media gateway of the IP Telephony service provider.

Scenario 3c: IP Phone-to-IP Phone

15. Figure 7 shows the scenario in which two IP phone users, who are subscribing to the same IP Telephony service, are communicating with each other through the public Internet. Each subscriber of the IP Telephony service would be assigned a telephone number by the service provider. In making any call, the caller simply dials the telephone number of the called party. The call will first be routed to the platform of the service provider and, after address translation from telephone number to IP address, it would then be routed to the called party using the IP address of the called party.

Figure 7 - IP Phone to IP Phone (1)

16. Actually, the IP address of each subscriber will be registered with the service platform each time the user connects its IP phone to a broadband access network and logs onto the service provider's platform. Similar to the scenario of Figure 3, it is possible that the IP Telephony service provider has its platform set up in an overseas country and the subscribers with the IP phone

can gain access to the service anywhere in the world through the broadband Internet access connection. As such, the provision of such a service is not subject to the physical boundary between countries and a resident of Hong Kong can subscribe to the services provided by an operator in an overseas country and use the telephone number of the overseas country.

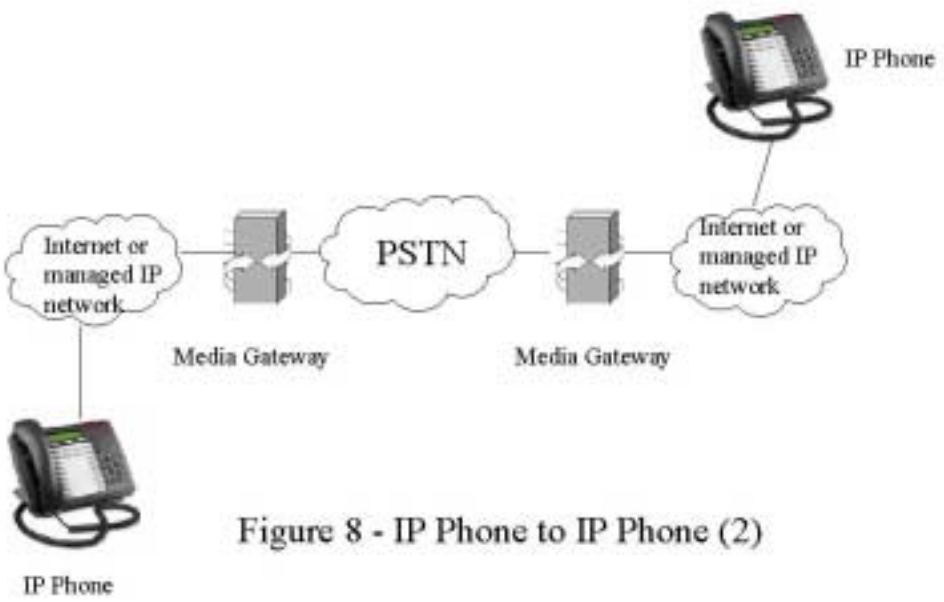

Figure 8 - IP Phone to IP Phone (2)

17. For situation shown in Figure 8, the two IP phone users are subscribing to the services of two different IP Telephony service providers, which do not have direct interconnection with each other and any traffic between them has to be transited through the PSTN. When the IP Telephony service and broadband Internet access service subscribed to by a customer are provided by the same entity, the voice packets will be routed over the managed IP network of the service provider. Otherwise, the voice packets will be transported over the public Internet.

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