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**Working Party on Telecommunication and Information Services Policies**

**THE POLICY IMPLICATIONS OF VOICE OVER INTERNET PROTOCOL**

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## **FOREWORD**

This report was presented to the Working Party on Telecommunication and Information Services Policies in June 2005 and was declassified by the Committee for Information, Computer and Communications Policy in October 2005.

The report was prepared by Mr. Jaebum LEE of the OECD's Directorate for Science, Technology and Industry. It is published under the responsibility of the Secretary-General of the OECD."

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## EXECUTIVE SUMMARY

Most countries think of VoIP services as an inevitable trend and try to clarify regulatory uncertainty for the new technology, shortening the time to commercial deployment. Some regulators may wish to reduce uncertainty in the market and to do this may find that they need to decide on the statutory classification to which VoIP services belong and whether or not a new market entry procedure is required. In order for regulators to decide this issue, they should analyse the differences between traditional telephone service and VoIP service in the context of their legal frameworks.

This paper conceptually classifies VoIP as a substitute service for traditional telephone service and as a service differentiated from traditional voice to explain the possible consequent regulatory treatments to VoIP. This paper also links the service classification to numbering policy, social obligations, interconnection (or access), and market definitions for ex-ante regulations because it is quite helpful to explain the regulatory treatment of VoIP compared with those of PSTN voice services without assumptions that the linkages between those policies can be applied to all member countries or that the linkages should be kept in the process of finding out desirable policy directions for VoIP.

Some countries, directly or indirectly, look at VoIP service as a traditional local voice service while others treat VoIP service as a separate service from PSTN voice, thus, plan to issue a separate license where applicable. These different approaches are well expressed in the numbering policies.

Whereas allocation of local geographic numbers without conditions seem to show regulator's orientation toward maximum competition in the local market, allocation of geographic numbers with heavy restrictions may imply the regulator's orientation toward facilities-based competition.

The countries allocating geographic numbers to VoIP providers without condition seem to have difficulty with applying the principle of technology neutrality in relation to social obligations such as access to emergency calls. If the principle is narrowly interpreted and VoIP is indistinguishable from PSTN voice, the VoIP providers could be subject to the same certain social requirements like fixed PSTN and mobile operators. Most countries impose obligations for VoIP providers to educate customers on the functional limits of VoIP calls. In certain cases, a concrete timetable has been imposed, until when VoIP providers are required to meet full or similar functional equivalence with traditional telephone.

Technology neutrality aims to provide coherent regulation for all transmission networks and services including broadcasting, regardless of the underlying technology by abolishing vertically integrated regulation that links regulation to underlying network technologies. However, this concept is based on the premise that the existing regulatory framework is also technologically neutral. If the existing regulations are crafted for a circuit-switched network, applying the principle of technology neutrality may in fact have a distorting effect.

As competitive safeguard issues, interconnection (or access), or unrestricted access and use of the Internet, potential effects of vertical integration, and the impact on the relevant markets are also discussed in this paper.

It is unclear what the appropriate compensation mechanism should be between VoIP providers and PSTN operators. In some countries, interconnection (or access) arrangements between VoIP providers using non-geographic numbers and PSTN operators would likely lead to conflict in setting the appropriate access charges because new interconnection (access) arrangements need to be established for the calls with dedicated non-geographic numbers to be connected with PSTN operators. However, in those countries where VoIP numbering is a major issue and geographic numbers are allocated to VoIP without strict restrictions, VoIP providers seem to make use of existing interconnection (access) arrangements, number portability, carrier pre-selection (or carrier selection) without much difficulty. In the United States, no decision has been made as to the appropriate intercarrier compensation for these types of calls, but the FCC is examining the issue in pending rulemaking proceedings. Further, in the US, numbering policy is not a major driver of regulation.

For PSTN operators, the wisest strategy may be “if you can’t beat them join them,” in other words, to start providing VoIP service themselves since VoIP service has a significant cannibalizing effect on their existing PSTN voice operations. When the PSTN incumbent starts using VoIP technology while maintaining the PSTN, regulators should pay attention to the appropriate accounting methodology adopted. In the same context, as voice traffic migrates from PSTN to IP networks, the cost of PSTN per subscriber will rise resulting from the decrease in the volume of PSTN traffic. However if the PSTN operator is in a competitive market, it could not raise its interconnection charges.

Since VoIP is just one of applications which can be delivered over multiple platforms, ensuring unrestricted access and use of Internet to the reasonable degree by allowing a consumer to reach any independent VoIP provider without interference from broadband access providers is necessary for consumer benefits and competition of VoIP market.

Although there is a concern that vertically integrated companies between PSTN operators and ISPs and equipment manufacturers could misuse their market positions e.g. by offering predatory bundling services, regulatory interventions could end up with protecting certain market players from structural change in the market and keeping high prices. In this sense, the regulatory reactions to these potential integrations in the IP world can not be prejudged presently in that until now the players in the Internet are playing well without regulatory interventions. With regard to the impact on the market definition for ex-ante regulations, it seems that even though the markets for VoIP and PSTN voice are separately defined, the concerns about the potential misuse of dominant market power can be addressed provided that VoIP service market is recognized as one of relevant markets. If it is evaluated that the PSTN incumbent is leveraging its dominant position in the DSL and PSTN call markets to disadvantage competitors in a separate new markets including the VoIP market, then regulatory remedies could be imposed on the incumbent PSTN operators with market dominance.<sup>1</sup>

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<sup>1</sup> The issue of universal service related with VoIP will be covered in other TISP work (DSTI/ICCP/TISP(2005)5).

## I. INTRODUCTION

A Commissioner of the FCC stated that “we stand at the threshold of a profound transmission of the telecommunications marketplace, as the circuit-switching technology of yesteryear is rapidly giving way to IP-based communications. In the IP world, voice communications, once restricted to a dedicated, specialized network, represent but one application – one species of bits – provided alongside many others.”<sup>1</sup> Although the speed with which the transition to the next generation network (NGN) will happen depends on a number of factors, there is agreement in the industry that migration to NGN is inevitable resulting in converged services traversing seamlessly on a multitude of internet protocol (IP)-based networks. Voice over IP (VoIP), viewed by some as a potential killer application to accelerate migration to NGN, is very representative of the different service characteristics which are expected to flow from IP-based NGN services; these include the dichotomy between service and access, trans-national service provision, different price structures, etc.

VoIP traffic is growing rapidly in conjunction with the growth in broadband connections, in particular digital subscriber lines (DSL) and cable modems. According to a TeleGeography survey, VoIP is growing at twice the rate of traditional switched voice, and now accounts for 11 percent of international call minutes. Global voice traffic reached nearly 200 billion minutes in 2003, 22 billion of which was carried over the Internet<sup>2</sup>.

Most countries are trying to apply a ‘light-handed’ approach to VoIP. In some cases there is an attempt to “clarify” regulations to facilitate the rapid diffusion of new voice applications in the market, and utilize them to maximize competition in the local voice market. However the existing regulatory framework, in some cases, imposes certain obligations, to protect customers, which in some cases are difficult for VoIP service providers to implement. VoIP also is viewed by some as posing a threat to existing public switched telephone network (PSTN) operators.

Recently a number of regulators have allocated telephone numbers (usually non-geographic) to VoIP providers as a priority. Numbering policy can, depending on the type of service, be important for the success of VoIP services, as well as having strong linkages to the licensing scheme and interconnection regimes, and market definition where appropriate.

It has become fairly evident to regulators that as networks migrate toward converged next generation networks VoIP will become one of many different services being provided over such networks. This is likely to mean that the application of regulations crafted for a circuit-switched network environment to VoIP may be impractical, and applying the principle of technology neutrality may in fact have a distorting effect.

From the perspective of certain types of VoIP applications, which are not geographically based and provide services on a global basis, a harmonized regulatory treatment may be necessary to avoid unnecessary inefficiencies related with compliance with numerous regulatory requirements. At the same time, however, it must be recognised that it may be difficult to enforce regulatory requirements on such ‘nomadic’ VoIP service suppliers.

The scope of this paper is limited to examining regulatory approaches to VoIP services by member countries in terms of three main issues related with regulatory certainty, consumer safeguards, and

competitive safeguard. The thoughts or recommendation, if any, on the desirable ways of regulatory treatments towards VoIP would be studied in a follow-up paper.

## 1. Defining VoIP

For purposes of this paper, the term Voice of over internet protocol (VoIP) is used in its generic context to portray the regulatory treatments of member countries toward VoIP to its entirety, which is the main purpose of this paper. The generic term VoIP means the conveyance of voice, fax and related services, partially or wholly over packet-switched IP-based networks. Always-on broadband connections make it possible to make and receive calls to and from the public switched telephone network (PSTN)<sup>3</sup> using VoIP. In addition, with its improved quality VoIP service is comparable to traditional telephone service. The generic term VoIP also includes use of IP technology in the core transmission network while both ends are still circuit-based PSTN networks as in the case of pre-paid voice service providers or PSTN operators who are deploying IP technology. However, some member countries seem to exclude from the VoIP definition, in the context of regulatory application, the use of VoIP as a pure transmission technology within an operator's network, or peer-to-peer VoIP calls (on-net calls) or allowing download of free software. The use of VoIP as a pure transmission technology is excluded in that it results in no net difference to end-users or does not form a service offered to an end user, but rather an activity internal to the operator.<sup>4</sup> Peer-to-peer VoIP calls are outside VoIP definition since they belong to Internet world free from regulations without connection to the traditional voice networks. Allowing download of free software is also outside of VoIP definition since it is not provision of an electronic communication service. VoIP services may use geographic or non-geographic numbers or may be 'nomadic', that is, voice applications which enable end users of VoIP to call and be called with PSTN numbers from any broadband access point. Some of the services using geographic numbers do not require that the user is resident in the numbering area when VoIP is used in the nomadic way. For example, a French user may obtain a number in the United States which allows for callers in the US to call that number which will ring in France (the CRTC in Canada has referred to these services as *foreign exchange* VoIP services).

Given the different range of VoIP services that have become available and their rapid growth, a number of national regulatory authorities have started procedures to determine how VoIP services could be considered with existing regulatory frameworks and whether or not they could or should be subject to regulations and, if so, whether these could or should be the regulations applied to traditional PSTN voice services.

Before providing an explanation of the regulatory treatment of VoIP, it would be helpful to generally describe the trend in regulatory treatment toward circuit-based voice service without any prejudgement or impression that VoIP should be subject to the same framework. With the advent of liberalization in the telecommunications sector, regulators started to issue PSTN voice licenses to alternative PSTN voice operators in which a set of rights and obligations are written. Geographic telephone numbers have been allocated as one of rights of the licensees for PSTN operators. However, in some countries, as more liberalization was introduced, this individual licensing regime in the fixed telecommunications sector was streamlined into a system of registration or notice to the regulators or into a general authorization system to abolish regulatory barriers to market entry in the fixed telecommunications. In the wireless sector, the licensing regime has been generally kept based on the rationale that spectrum resources are scarce. Under some systems, the rights and obligations of the fixed operators which have been set down in individual licenses became inscribed in telecommunication-related laws and regulations with some objective eligibility criteria. In the process of inscription of the rights and obligations into regulations, the rights and obligations were under review in light of their necessity to allow full competition. This review resulted in a broader categorization of communications services when it comes to market entry and thus, in simplified rights and obligations matching the simpler service classification. However, in some countries, the service classification to define relevant markets for application of ex-ante regulations is subject to the legal case-

be-case ‘substitutability test’ in the context of competition law, having nothing to do with the broader classification of services in view of market entry. Where individual licensing regimes are relaxed or abolished, in some systems numbering policy seems to replace the licensing function in classifying services in detail and authorizing the provision of the service. If a service provider is allocated a certain type of numbers including geographic numbers, the service provider is generally understood to be entitled to provide the specific service.

In some countries, in the past, an individual licensing regime existed where a license for a kind of service category normally accompanies a set of corresponding rights and obligations including right to use a certain type of numbers for the license given and obligation to provide access to emergency call services or caller-line-information. When the individual licensing regime was scrapped and replaced with streamlined market entry procedures, the correlations broke between certain types of numbers allocated and the rights and obligations of service providers holding the numbers. While relevant rights and obligations of service providers became simplified and inscribed into relevant laws, the regulators still needed to categorize communications services by allocating different types of number to a specified service. In this way, it became possible that the same rights and obligations in the context of market entry could be applied to service providers who use different type of numbers.

Nowadays in those countries, where the streamlining of market entry procedures occurred, numbering policy is logically independent of market entry procedures, such as service classification and applications of the corresponding rights and obligations. This implies that two different services, which may be substitutable, can use the same type of numbers or that different type of numbers can be used for the same category of services if this meets the objectives of numbering policy. Along these lines, the existing social obligations imposed on PSTN operators, such as access to emergency call services, caller-line-information, lawful interception could also be reviewed so that they are independent of service classifications. In short, to attain the maximum flexibility to treat new services it is important that the different regulatory requirements and obligations imposed on existing PSTN voice providers are treated as separate modules rather than as a single structure.

That said, this paper tries to explain the regulatory treatment of VoIP basically according to how VoIP is classified by member countries. VoIP can be categorized as a substitute service for traditional voice service or as new service different from traditional voice service. This paper conceptually classifies VoIP services into the two types and links the service classification to numbering policy, social obligations, interconnection (or access), and the market definition for ex-ante regulations because it is quite helpful to explain the regulatory treatments to VoIP compared with those of PSTN voice services.

One way to explain the relationship between the definition of VoIP and the regulatory treatments by member countries is to theoretically separate the definition of VoIP as a substitute service for traditional voice service (underlying technology) from that of VoIP as a new service. VoIP can be viewed as merely a new technology to facilitate voice telephony service and in this sense VoIP would be a substitute for PSTN voice services. This viewpoint can be clearly supported when traditional PSTN operators have started using IP technology to provide services to their existing customers. Using a very strict interpretation of technology neutrality then, irrespective of the underlying technology used, insofar as the new technology can provide voice service similar to existing PSTN voice service, the technology should be subject to the same rights and obligations which apply to PSTN local service providers, in terms of licensing, numbering, interconnection arrangement and market definition. VoIP-based voice service can be allocated geographic numbers and can make use of the interconnection arrangements which PSTN local service providers are using. VoIP services, according to this viewpoint, could also be included in the same relevant market definition as PSTN fixed voice markets. This approach can entail maximum competition and low price in the local voice market. However regulators can have difficulty in applying obligations such as access to emergency calls to VoIP services. Canada and the US have partially taken this position in that VoIP



providers have access to geographic numbers without any restrictions and required that emergency call services be provided by VoIP service providers while it is noted that, in the US, numbering policy is not a major driver of regulation.

If VoIP services are recognized as having, from the perspective of end-users, a set of distinct and different characteristics from those of PSTN voice (and therefore may not be considered as a substitute), then it could be argued that VoIP providers should have different market entry conditions than PSTN voice operators, and have access to a range of dedicated non-geographic numbers instead of geographic numbers where telephone numbers (numbering policy) are used to distinguish the characteristics of communications services. In some systems, furthermore, interconnection arrangements between VoIP network operators using the non-geographic numbers and PSTN operators need to take place while the VoIP providers using geographic numbers can make use of the ready-made interconnection agreements among PSTN operators (the switches of the incumbent operator can not distinguish the VoIP calls from PSTN calls due to the use of the same geographic numbers by VoIP subscribers), and a separate relevant market for voice, if applicable, should be defined. Such a differentiated approach could be one of underlying prepositions for a different treatment of VoIP service in terms of social obligations. This approach makes possible a more tailored regulatory approach for VoIP services. Germany, Japan and Korea seem to have moved toward this direction.

However this viewpoint is likely to entail an unfriendly environment for VoIP. First, non-geographic numbers are unfamiliar to end-users who may be afraid of premium (high) rates when dialling non-geographic numbers. Second, interconnection (or access) arrangements, which have to be established with PSTN operators to terminate the calls could face difficulties unless there is strong market competition (such as carrier selection) to press PSTN operators to cooperate with VoIP providers (where carrier selection is in operation for local calls, if a PSTN operator is unwilling to reach access arrangements with VoIP providers, the end-users will be pushed to use carrier selection to make their outbound calls to VoIP subscribers). These factors may reduce the ability of VoIP service providers to compete effectively in the local voice market. The most difficult aspect in adopting this standpoint is that when a traditional PSTN operator replaces their existing technology with VoIP technology to provide voice service, the question arises as to whether existing obligations on the operator should change. If, due to the change of the underlying technology, the former PSTN operator is no longer deemed to be providing fixed local voice service, then existing geographic numbers would have to be replaced with non-geographic numbers (in those systems making such a distinction) and the need to apply a number of social obligations, imposed upon PSTN operators, to VoIP providers should be reassessed since the VoIP services are classified as different services from PSTN voice service.

Most member countries taking either theoretical approach to the definition of VoIP seem to support the concept of technology neutrality. In defining technological neutrality the European Commission's Directive states that "... national regulatory authorities take the utmost account of the desirability of making regulation technologically neutral, that is to say that it neither imposes nor discriminates in favour of the use of a particular type of technology, does not preclude the taking of proportionate steps to promote certain specific services where this is justified, for example digital television as a means for increasing spectrum efficiency."<sup>5</sup> The nuance of this definition is important since many have argued that the application of the concept of technological neutrality would require that VoIP be treated the same way as voice on the PSTN if it met the criteria of the "*duck test*", *i.e.* if a service appears to a consumer to be indistinguishable from ordinary telephony service, then it should be classified as such. In this context, some PSTN fixed and mobile operators have argued that on the basis of technology neutrality arguments VoIP providers should be subject to social obligations such as access to emergency call services and universal service contributions. As implied in the EC Directive, the concept of technological neutrality does not preclude forbearing from regulation if there are benefits to users or the economy in general.

The concept of technology neutrality plays a major part in the new regulatory framework which the EU adopted in 2002. The new regulatory framework's explicit objective is to provide coherent regulation for all transmission networks and services including broadcasting, regardless of underlying technology by abolishing vertically integrated regulation that links regulation to underlying network technologies. In this regard, VoIP will be the first test for the new framework in terms of technology neutrality. This concept is based on the premise that the existing regulatory framework is made technologically neutral. If the regulations are crafted taking into account the characteristics of the PSTN in some way or other, applying the principle of technology neutrality may in fact have distorting effects. In this regard, the existing regulations for voice service need to be thoroughly reviewed in terms of technology neutrality and reformed, if necessary.

Most countries seem to view VoIP as a new technology providing the same voice service as PSTN voice (substitute service) and at the same time as a new service, although the relative weight each country puts on these two aspects differs. In this context it should be noted that VoIP offerings vary from being a substitute service to "plain old telephone service" to a voice service with much more additional functionalities or with lower quality. With regard to the concept of technological neutrality, some countries interpret it in a narrow basis while others do so on a broad basis. For example, in the UK, geographic numbers are allocated to VoIP providers without conditions. In this sense VoIP is being treated as an underlying technology. The UK also allocates a non-geographic number range, and in this sense treating VoIP as a new service. In terms of technological neutrality, the UK seems to interpret technology neutrality on a broad basis since the country forbears in enforcing social obligations over VoIP providers, unless they select to become publicly available telephone service (PATS) providers, while allocating geographical numbers without conditions.

This paper will deal with VoIP as a substitute service for traditional voice service and also as a new service since this distinction enables us to capture the characteristics of VoIP and various regulatory reactions from member countries in a comprehensive way. This paper will be focused on VoIP over an always-on broadband connection.<sup>6</sup> The use of IP technology only in the core transmission network with both ends still using circuit-based PSTN network will be addressed only when necessary.

## **2. Features of VoIP**

IP technology has been used for many years within the core transmission network to provide long distance voice services to end-users. Pre-paid, long distance or international voice service providers have shown a strong preference for IP technology because of the ability to reduce prices. However, these providers have not been treated differently by regulators because there has been no change in the services provided to customers. It is widely accepted that it is the service that makes the difference rather than the technology used to provide the service.

VoIP services can have different characteristics than traditional PSTN telephony for customers if VoIP providers wish to provide these added characteristics in their offerings. First, VoIP services are location independent. VoIP services decouple customers from a geographic location. VoIP services enable end-users to make and receive calls at any locations in the world providing broadband access. This nomadic feature makes identification of the end points of any given communications session impractical, causing difficulty in providing direct access and caller-location-identification (CLI) to emergency centres. Also this location independence enables a VoIP provider to offer services worldwide without a commercial presence in a country where its customers live, making it difficult to implement requirements for law enforcement.

Second, VoIP services are associated more with a person rather than a location or a household in the context of nomadic service characteristics of VoIP. The capability of calling with the same number (or

username/IP address) worldwide makes the service more personalized and allows end-users to tailor their preferences, resulting in various kinds of converged service offerings. Third, VoIP services using IP networks allow for significant cost savings compared to voice services on the PSTN resulting in much lower retail prices.

Fourth, VoIP services normally provide enhanced functions. VoIP services are normally provided with additional features not available with traditional telephony such as instant messaging ('chat') and presence management (*e.g.* 'online' or 'offline'). Finally, customers may experience lower call quality than traditional telephony. If a VoIP call traverses over the public Internet in some part along the call path it may not be possible to guarantee call quality because, by default, Internet provides "best-effort" quality of service. End-to-end quality of service (QoS) can be guaranteed when the VoIP service is provided over managed IP-networks using IP — QoS mechanisms such as Multi Protocol Label Switching (MPLS), Integrated Services (IntServ), or Differentiated Service (DiffSer).

## II. REGULATORY CERTAINTY ISSUES

### 1. Classification and Market entry (authorisation)

It is important for VoIP providers to have a clear idea of their legal position within existing regulatory frameworks. Many OECD countries have fully recognized that VoIP services are different from traditional telephone services from the user perspective. However, regulatory treatment of VoIP services varies depending on countries although in many cases a final conclusion has not yet been reached as to the final treatment of VoIP services.

One way to classify VoIP services is to treat VoIP as a substitute service for traditional voice service. This paper presumes that the classification for VoIP services is taking this approach if VoIP providers without network infrastructure (resellers) can have access to local geographic numbers without additional restrictions compared with traditional voice resellers, and are subject to the similar social obligations such as access to emergency calls compared with PSTN operators.<sup>7</sup> In this approach, VoIP service providers have access to geographic numbers and there would be no need for separate dedicated non-geographic numbers or a market definition for VoIP service. This approach could possibly lead to maximum competition in the voice markets and price cuts, resulting in a drastic contraction of the local voice market and lead to immediate pressure to change universal service funding mechanisms where appropriate<sup>8</sup>, and possibly to undermine the investment capability coming from voice revenue of local voice providers. Until now, VoIP providers have been similar to resellers, as in the case of Skype and Vonage, who are unlikely to invest in network capacity.

For example, in Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) classified VoIP by following the existing technical regulatory classifications. VoIP services are interpreted as a new technology to deliver local voice services as long as VoIP services conform to the regulatory definition of local calls. The CRTC explained that to the extent that VoIP services provide subscribers with access to and/or from the PSTN along with the ability to make and/or receive calls that originate and terminate within an exchange or local calling area as defined in the incumbent local exchange carriers' (LECs) tariff, in the CRTC's preliminary view, these services should be treated as local exchange services and are referred to as local VoIP services.<sup>9</sup> This classification is based on the argument that voice communications services using IP have characteristics that are functionally the same as circuit-switched voice telecommunications service. CRTC has classified local VoIP services into three types. The first type is a fixed VoIP service where users can only place a telephone call from the location where their service is being provided (non-nomadic use). The second type is a nomadic VoIP service where calls can be made from any location that offers Internet access. The third type is a foreign exchange VoIP service which allows users in one exchange to receive telephone calls dialled as local calls in another exchange (for example, a customer located in Ottawa with a Halifax local telephone number). In Canada, only geographic numbers have been being allocated up to now to VoIP service providers. In the case of Canada the regulator has imposed in its preliminary finding the existing technical definition of a local service to VoIP and the concept of technological neutrality has been used to classify VoIP in the same way as PSTN voice. In using the 'duck test' noted above and by treating VoIP as an underlying technology (*i.e.* as the same service with the PSTN local voice service) rather than as a distinct service application, the preliminary CRTC finding has not used the concept of technology neutrality which allows for forbearing from regulation if there are benefits to users or the economy in general.

Based on the perception of VoIP service as an underlying technology, the CRTC determined in May 2005 that it would regulate VoIP service only when it is provided and used as local telephone service and that, thus, the incumbent LECs with market power could not price their local VoIP services below cost to stifle competition.<sup>10</sup>

In the United States, the Federal Communications Commission's (FCC) number administrator generally allocates local geographic numbers-The FCC has not designated VoIP providers as equivalent to PSTN local service providers (although it is still in the process of deciding on how to classify VoIP services). With the exception of one VoIP provider that has obtained a waiver from the FCC, the FCC's numbering administrator does not provide numbers to VoIP providers. Rather, the FCC has up to now allowed VoIP providers to obtain geographic numbers from telecommunications carriers, which have obtained the numbering resources from the FCC's numbering administrator. No non-geographic numbers have been designated up to now to VoIP services. In the United States, the FCC has exempted computer services from common carrier regulations, on the basis that as long as the underlying transmission services were regulated and thus available at reasonable prices, the provision of computer services utilizing these transmission services could be competitive, and thus did not require regulation. This distinction was made in the Telecommunications Act of 1996. In 1998, the FCC released a report commonly referred to as the 'Stevens Report' which suggested that phone-to-phone services offered in a fashion similar to circuit-switched voice services may be a "telecommunications service"<sup>11</sup>, but did not make definitive determination in this regard.<sup>12</sup>

In February 2004, the FCC issued a ruling that categorized pulver.com's peer-to-peer type of VoIP communications, which allows users to make calls only to the other member users, as "information services" subject to federal jurisdiction, and concluded that the service should remain largely unregulated. The FCC ruled that pulver.com's Free World Dialup (FWD) offering is neither "telecommunications services" nor "telecommunications."<sup>13</sup> In April 2004, however, the FCC issued a decision on AT&T's petition for exemption from access charges concluding that even though the inter-exchange carrier transmitted its inter-exchange service using its Internet backbone, the firm's service is "telecommunications service" because (1) it uses ordinary customer premises equipment with no enhanced functionality; (2) calls originate and terminate on PSTN; and (3) the service offers no enhanced functionality and the message undergoes no net protocol conversion.<sup>14</sup>

In November 2004, in its Order in the matter of the Vonage petition, the FCC found that Vonage's DigitalVoice service cannot practically be separated into intrastate and interstate components since, among other characteristics, DigitalVoice customers can use their phones from a broadband connection anywhere in the world, making it difficult to determine whether a call is local, interstate or international in nature. The FCC, in its Order, noted that the question of whether DigitalVoice should be classified as an unregulated "information service" or a telecommunications service under the Communications Act would be addressed in the FCC's IP-Enabled Services Proceeding.<sup>15</sup> The FCC made it clear that all VoIP services that integrate voice communications capabilities with enhanced features and entail the interstate routing of packets – whether provided by application service providers, cable operators, LECs, or others – will not be subject to state utility regulation<sup>16</sup>, thereby effectively avoiding the patchwork of inconsistent state regulations. Thus, even though some VoIP service providers have access to local numbers, the FCC decided not to apply a purely technical definition to these services in the same way as the CRTC.

In March 2004, the FCC released a Notice of Proposed Rulemaking (NPRM) seeking comment on issues relating to services and applications making use of the Internet Protocol (IP), including voice over IP services. Specifically, the NPRM seeks comment on ways in which the FCC might properly categorize IP-enabled services. In addition, the NPRM asks questions on the legal and regulatory framework for each type of Internet service and the relevant jurisdictional considerations for each category. Final rulings are to be made on these extensive issues.

Another regulatory treatment of VoIP service is to categorize VoIP service according to its distinct traits which differentiate it from existing fixed and mobile services. In this case, a separate classification, and dedicated non-geographic number ranges are provided. Some of EU states have followed this path. The United Kingdom position has followed the two different procedures noted above by allocating both geographic numbers and dedicated non-geographic numbers. The variation in EU countries can be understood in the context of the Electronic Communications Directives.

In the EU, the new regulatory framework for electronic communications networks and services, classifies communications service into two kinds in the context of market entry. One is “publicly available electronic communication service (PAECS),” which covers all kinds of communications conveying signals with few exceptions.<sup>17</sup> The other is “public available telephone service (PATS)”. PATS is a subset of PAECS. PATS means “a service available to the public for originating and receiving national and international calls and access to emergency services through a number of numbers in a national or international telephone numbering plan...”. A provider that offers PAECS has a certain number of rights and obligations.<sup>18</sup> A provider that offers PATS has additional rights and obligations on top of those of PAECS providers. PATS providers have rights to number portability and carrier selection and pre-selection. This implies that if a VoIP service provider has a number (not necessarily a geographic number) it can obtain subscribers through number porting from other PATS providers and that only those VoIP providers classified as a PATS provider can explicitly request access to carrier selection and pre-selection from a PSTN operator with significant market power. On the other hand, PATS providers have obligations to provide access to emergency services free of charge while providers of PATS and public telephone networks at fixed location need to take all reasonable steps to ensure the availability of PATS at fixed locations in the event of catastrophic network breakdown or in cases of force majeure. PATS providers at fixed location are also obliged to take all reasonable steps to ensure uninterrupted access to emergency services. Other obligations include transparency and publication of information, and the listing of subscribers in a publicly available directory.

The view of the European Commission is that if VoIP is being used to provide a service to the public then it is subject to the conditions that apply to PAECS.<sup>19</sup> VoIP providers have the commercial freedom to offer services that qualify them as PATS or to offer services that qualify them as ECS. If they choose to offer PAECS services, then they are not eligible for the rights of a PATS providers.

According to the EU Directive, PAECS providers, and therefore also PATS providers, have right to provide PAECS without prior approval or authorization from regulators and only general authorization is allowed in the EU Directive. This means that there would be no individual licensing. Thus EU national regulatory authorities would, at most, provide VoIP service providers with a general authorization. In turn this would help in streamlining the regulatory burden for both market players and regulators.

In this sense, EU member countries need not classify VoIP services compared with PSTN voice services in terms of market entry. However, they still need to decide whether to interpret VoIP as an underlying technology (a substitutable service for PSTN voice service) or as a distinct service when they segment markets for ex-ante regulations. In EU, there are eighteen (18) different communications markets recommended by European Commission to assess undertakings with significant market power. In order to apply ex-ante regulations, EU member countries must decide whether or how VoIP services fit into the recommended market definitions.

For example, the Dutch regulatory authority OPTA recently announced that it currently does not have the power to regulate the VoIP offering(s) of the fixed incumbent operator KPN until publication of market analysis. The ‘College van Beroep voor het Bedrijfsleven’ (a Dutch administrative court) made a ruling that, in April 2004, VoIP cannot be considered to be identical to the traditional telephony service in the

Netherlands. This means that OPTA is not allowed to simply extend the rules applicable to KPN's (Netherlands' incumbent operator) fixed telephony service to VoIP services also provided by KPN.<sup>20</sup>

The decision may come from the recognition that VoIP service is different from traditional PSTN fixed voice services. In other words, VoIP services do not have a "local, national, or international market boundary" and could not be considered as 'fixed' telephone services as listed in the recommended list of relevant markets by EC.

Korea also recognises that VoIP service is distinct from traditional PSTN voice service categorization. The Ministry of Information and Communication (MIC) added VoIP services as one of the basic telecommunications services via a Ministerial decree in September 2004. MIC plans to issue a separate license to facilities-based VoIP providers by the first half of 2005. Interconnection with regulated wholesale prices are applied between licensed basic telecommunications service providers. A provider who operate on a non-facilities basis needs registration at MIC. A separate non-geographic number was allocated to accommodate all kinds of VoIP service providers which meet certain quality of service requirements. Use of local geographic numbers was restricted only to VoIP providers who can meet certain requirements.

Japan, a forerunner in the usage of VoIP services, has been treating VoIP service as distinct one from PSTN voice service in principle in that non-geographic numbers are allocated for VoIP providers satisfying certain level of quality of service criteria. However there is no separate license for VoIP service. The revision of the telecommunications Business Law in July 2003 resulted in the creation of only one broad service category, "telecommunications services"<sup>21</sup> which includes VoIP service. While there had been no separate category for "information services," as in the US, the sub-categories (type 1 and type 2) under the "telecommunications services" were also abolished by this revision. Accordingly there is no separate license even for VoIP providers distinct from PSTN operators. If a VoIP service provider intends to operate a telecommunications business by installing telecommunications circuit facilities, the Minister must register the provider. However, if the scale of the facilities and the coverage of areas where the facilities are installed do not exceed a certain threshold, notification needs to be submitted to the Minister<sup>22</sup>. Interconnection with the holder of Category I Designated Telecommunications Facilities (now, NTT East/West) is applicable to any telecommunications carriers,<sup>23</sup> who have obtained registration from the Minister and has submitted a notification to the Minister, with a regulated interconnection charge. In parallel with this principal treatment, the VoIP providers are allowed to get local geographical numbers when they wish to get geographic numbers and can meet the same requirements applied to local PSTN operators.

## 2. Numbering

Subscribers of VoIP service need telephone numbers (E.164) to receive calls from PSTN subscribers. When a PSTN end-user dials a E.164 number to call a VoIP user, the gateway resolves this telephone number into an IP address, via an intermediate process based on ENUM<sup>24</sup> or SIP addressing.<sup>25</sup>

The most important and difficult issue in numbering policy for both communications providers and customers would be whether and how geographic local numbers are allocated to VoIP services providers. The allocation of geographic numbers to VoIP services could potentially have significant impacts on the local voice market. If geographic local numbers are liberally distributed to VoIP providers, this could result in significant changes in local competition, and in the market share of operators, and a sizable market contraction in terms of revenues in the local market. It would also result in pressure for PSTN operators to invest in IP technology while reducing their ability to self-finance such investment from PSTN revenues.

The issue of distribution of geographic numbers to VoIP services is difficult where telephone numbers have been strongly tied with the services or the characteristic of the services and, in some regulatory regimes, also tied strongly with the kind of license and its accompanying rights and obligations. In this regulatory environment, the allocation of geographic local numbers often can mean that VoIP providers can be treated in the same way as the traditional PSTN operators in terms of rights and obligations.

Allocation of geographic numbers to VoIP providers also brings some significant benefits under certain regulatory frameworks. From the perspective of the calling party, geographic numbers distributed to VoIP services could provide that local tariffs will be applied to the calls which originate on the PSTN and terminate on the IP networks. This may be the case as long as the calls from the PSTN to VoIP customers are not identified as such because the VoIP provider is 'hiding' behind a generic PSTN-network operator. From the VoIP providers' viewpoint, geographic numbers enable them to make use of the established arrangements for local calls such as interconnection, number portability, and carrier pre-selection without additional arrangements which in most cases take time. Non-geographic numbers of VoIP providers can also technically work with geographic numbers of PSTN operators in terms of interconnection (or access), number portability, and carrier pre-selection. However, the systems of PSTN operators can clearly identify the VoIP calls through the non-geographic numbers designated for VoIP. Therefore if PSTN operators have some incentives to deter VoIP services in favour of PSTN voice services, it is potentially possible for them to do so. In case of geographic telephone numbers, the VoIP calls are undistinguishable from traditional voice calls unless there are geographic number ranges pre-agreed for VoIP providers. However, allowing geographic number for VoIP phones could result in scarcity in the availability of geographic number resources since VoIP service providers from outside as well as inside a country would demand national geographic numbers.

The impact that the allocation of geographic numbers will have depends on the extent to which there are restrictions on the allocation of geographic numbers to VoIP providers. Regulators can choose to issue geographic numbers to all VoIP providers without discrimination, or they can issue numbers only to VoIP providers who meet some or all of the requirements which traditional PSTN operators must comply with. Some prefer the allocation with limited eligibility. There are divergent views as to the best way forward. Arguments have been put forward to restrict the access of VoIP service providers to geographic numbers only to those that fully comply with existing PSTN obligations since this would reduce pressure on the availability of geographic numbering resources while promoting some local competition. Others counter that linking number allocation with PSTN obligations create entry barriers against some VoIP service offerings that cannot satisfy certain criteria, and in turn this would result in a delay in technology innovation, and potential harm from market distortion. Further, it is argued, that there should be number allocation without discrimination in order to stimulate the maximum competition and this would outweigh other drawbacks. For example, any customer confusion that could arise from using the same geographic numbers by both traditional telephone operators and VoIP providers can be dealt with by different policy tools, including a clear description of shortcomings of VoIP services in the contract.

Most national regulators allocated, or are expected to allocate dedicated non-geographic numbers for VoIP services in order to provide sufficient numbering resources and, to some extent, to relieve pressure on the geographic numbering resource. The separate non-geographic numbers for VoIP services is expected to help consumers, in some countries, recognize the differences in characteristics of services offered on the separate number. The most significant issue with the dedicated non-geographic number would be the interconnection between traditional PSTN operators and VoIP providers. For the new non-geographic numbers, new interconnection arrangements need to be made. Traditional PSTN operators are very likely to stop routing calls with non-geographic numbers if interconnection arrangements fail. The PSTN operators have an incentive not to negotiate interconnection arrangements with VoIP providers since VoIP services cannibalize their existing PSTN voice business. However, this concern would be less where VoIP providers are 'hiding' behind fixed network operators who are allocated non-geographic numbers



and make interconnection arrangements between them for the non-geographic numbers. Furthermore, where carrier selection is adopted for local calls, the incumbent PSTN operator has an incentive to make interconnection arrangements with VoIP providers to offer complete end-to-end connectivity. Otherwise, the customers would be pushed to make use of carrier selection instead.

In the United Kingdom (UK), the numbering policy adopted in September 2004 allocated geographic numbers to all publicly available new voice services with no discrimination between new voice services, *e.g.* VoB, and a PSTN voice service, or between a PATS and non-PATS new voice service. In this sense, the UK cut the link between geographic phone numbers and their corresponding service traits by allowing VoIP service providers to use the same geographic numbers. The UK's regulator Ofcom also decided to make 056 numbers available for Location Independent Electronic Communication Service (LIECS).<sup>26</sup>

According to the EU Directive, all operators of public communications networks in the EU have both a right and a duty to negotiate interconnection with each other. In the event of a dispute, the national regulatory authority may intervene. Incumbent operators with significant market power were required to provide interconnection according to the principles of transparency, non-discrimination and cost orientation, and to publish a Reference Interconnection Offer containing the relevant terms and conditions.<sup>27</sup> This means that the incumbent operator must provide interconnection to broadly defined PAECS providers with communication network including VoIP providers. Also in the EU, as described earlier, all PAECS providers have the right to provide ECS without prior approval from regulators. Only general authorization is needed without getting a separate license for a new service. The duty of maintaining universal service provision is up to all PAECS. In this context, the UK utilized numbering policy to enable maximum local competition by cutting the linkage between service characteristics and local geographic numbers.

It is the view of the European Commission that geographic and non-geographic numbers should be made available for VoIP services. National regulatory authorities can attach specific conditions to the use of numbers (Annex C of the Authorisation Directive). Where Member States decide that the amount of numbers in a given number range is limited it shall distribute those numbers in an objective, transparent and non-discriminatory matter. Member States should take into account the need to foster emerging innovative services, whether these are based on VoIP or not. Member states must avoid discriminating between providers as regards the numbering used.<sup>28</sup>

There is variation in the EU on the approach to numbering policy. For example, Germany, with two Administrative Orders dated 19 August 2004, the Regulatory Authority for Telecommunications and Posts (RegTP) has ruled that local network call numbers may only be allocated to customers within their relevant local networks. Geographic numbers have to be used for/by subscribers of a certain geographic area. It is the RegTP's view that allocating local network call numbers independently of their place of residence distorts the geographic information of the local network call number and, furthermore depletes the scarce quotas of call numbers of the relevant local networks, endangering the overall national numbering plan. To use geographic numbers without a fixed home location is not allowed although this is under consideration for the future. RegTP provides 032 as non-geographic call numbers.<sup>29</sup>

According to European Regulators Group's report<sup>30</sup> in February 2005, several EU States set some requirements that have to be fulfilled by VoIP service for use of geographic numbers. In France, the operator is required to justify that it can fulfil the condition of a fixed location within a given geographic zone, the most common proof being that the operator also controls the access line. In Belgium, end-users must use geographic numbers which belong to the numbering area where their access to Internet is located. In the Czech Republic and Hungary, for VoIP providers to be eligible for geographic numbers, they should provide VoIP service as PATS. In Greece and Sweden, geographical numbers should be used within the

geographical area. In Portugal, the geographic numbers must be tied to the physical Network Termination Point in a public fixed network according to the defined geographic area.

Nomadic use of geographic numbers is allowed without any restrictions in Finland, Switzerland and the UK. In the Netherlands, the existing number plan does not offer the possibility for VoIP providers to offer nomadic services with the use of geographic numbers. The Dutch government is negotiating a proposal with commercial parties to broaden the scope of the existing number regulation so that it encompasses the possibility of nomadic use. The government plans to publish a definite decision by the end of 2005 with other issues including privacy and trust. The proposal also offers a specific range of numbers to offer VoIP. In Ireland, nomadic operation outside of the relevant minimum numbering area (MNA) is permitted, but permanent out-of MNA use is not permitted. In Norway, the use of geographic numbers is restricted to the geographic area the number is reserved for in the national numbering plan.<sup>31</sup>

With regard to non-geographic number, 14 European countries of OECD members have non-geographic number ranges open for VoIP services or intend to do so (Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland, UK). With the non-geographic numbers, nomadic use is normally allowed. However, the Netherlands do not allow the use of the numbers outside of the particular country and Austria mandates that the main focus of the usage has to be in Austria.

In the United States and Canada, VoIP service providers have access to geographic local numbers without any restrictions. Until now, dedicated non-geographic numbers have not been distributed in those countries. In these countries, telephone numbers are available to carriers and VoIP providers usually do not want to be classified as carriers. VoIP providers, instead, get their geographic numbers from a carrier with whom they have a business arrangement. VoIP providers generally offer their customers a choice of different geographic numbers without geographic restrictions on the use of the numbers. However, there will be implications for both the charges billed to customers and for inter-carrier compensation, because local circuit switches use the geographic numbers to distinguish calls that are “local” from those that are “toll”.

In Japan, number allocation is used to guarantee a certain level of quality of service of VoIP services. It was decided, in September 2002, that geographic numbers would be allocated only to VoIP services having voice quality equivalent to existing telephones, direct access with end-users, location correspondence, and access to emergency calls. And a dedicated number 050 is allocated to VoIP services which meet a certain minimum voice quality.<sup>32</sup>

In Korea, a dedicated non-geographic number, 070, was allocated to accommodate VoIP services. As an alternative to the PSTN, local operators started using VoIP technology to provide voice services to their existing customers, and they requested clarification from MIC (Ministry of Information and Communication) to confirm that the provision of voice services using VoIP technology would come within their existing local license. The MIC confirmed, that VoIP-based voice provision still came under the existing facilities-based local telephone service license, and that the providers of VoIP services were allowed to use geographic numbers subject to certain requirements. The Requirements state that the VoIP providers must not unduly discriminate against subscribers in terms and conditions compared with those served by circuit based technology and the VoIP providers must meet the legal obligations, imposed on the traditional PSTN local telephone service license holders, including the provision of emergency calls, universal service obligation, provision of carrier pre-selection for long-distance calls, and compliance with local call areas. This confirmation enabled the alternative PSTN operators to continue to use local geographic numbers in attracting customers with the low cost technology. The inquiry and confirmation from the MIC came after the MIC added VoIP services into the category of “basic telecommunications

service.” and declared that it planned to issue a separate license for facilities-based VoIP providers with 070 numbers by the first half of 2005.

### **3. Number Portability**

If a VoIP provider is allowed to use geographic numbers, the provider is likely to inherit all the rights, including number portability, of traditional local telephone operators. However, that may not necessarily be the case as, for example, in the EU where number portability is mandated only between PATS providers. If a VoIP service provider chooses to become a PATS provider and receives geographic numbers, it can request number portability. However, if it chooses not to be a PATS provider, even with geographic numbers, it cannot request number portability. Number portability is more of right rather than an obligation to VoIP providers since it is more likely that subscribers to traditional PSTN operators will switch to VoIP service providers than the other way around.

### **4. Carrier Selection (CS) & Carrier Pre-Selection (CPS)**

In the EU, it is mandatory for fixed operators with significant market power to enable their subscribers to access the services of any interconnected provider of PATS on a call-by-call basis by dialling a carrier selection code and by means of pre-selection, with a facility to override any pre-selected choice on a call-by-call basis by dialling a carrier selection code. The calls to which CS and CPS are applicable must include local, long-distance, international, and fixed to mobile. Even though mobile to mobile calls are not mandatory, most EU States apply CS and CPS to those calls too. The pricing for access and interconnection in relation to the provision of the facilities for CS and CPS must be cost-oriented.<sup>33</sup>

This means that if geographic numbers are allowed to be used for VoIP services, CS and CPS enable subscribers of the traditional PSTN operators to select VoIP providers as their outbound call operators only when the VoIP providers are PATS providers. Regarding the question of whether the CS and CPS can be applied to calls originating from VoIP service providers, the UK regulator, Ofcom explained its current view that “call origination of new voice services, including Location Independent ECS, is at an immature stage and that it is unclear whether it is in the same market as PSTN services or in a separate call origination market. If it is considered to be in a separate market, it would be one where a market review had not yet taken place and where there had been no finding of SMP. Clearly this may change in the future once the market has matured, but the current position is that calls from 056 numbers would not be subject to CPS. The lack of an obligation to provide CPS in relation to outbound calls from new voice services may generate confusion for consumers, particularly if geographic numbers are used. VoIP service providers may need to inform consumers that CS and CPS can not be applied to outbound calls using VoIP services.”<sup>34</sup>

### III. CONSUMER SAFEGUARD ISSUES

#### 1. Access to Emergency Call Services and etc.

PSTN fixed and mobile operators have been subject to some social obligations to ensure that all users of the service can call an emergency number, that all users are provided with a directory enquiry service, and that low-income households should benefit from special measures as regards late payment of bills, and so on.<sup>35</sup>

The issue for regulators, then, is whether to extend these kinds of social obligation to all VoIP providers. The danger is, on the one hand, that the imposition of such obligations could inhibit the development of this competitive technology. If imposition of obligations is compromised for a new service, it could, on the other hand, risk the principle of technology neutrality, resulting in strong objection from traditional operators.<sup>36</sup>

It seems that most member countries are trying to protect consumers by imposing related obligations to the maximum extent subject to technical possibilities. In that consumers use nomadic VoIP services without informing their VoIP providers of where they are located, most countries have required that end users must be informed that the quality of access to emergency services provided on a VoIP connection will be lower if they choose to use their VoIP connection at more than one location, or do not inform their VoIP provider of their address accurately. As long as this is done in a pragmatic manner, it seems feasible for VoIP service providers to provide a reasonable form of access to emergency services that is, at least as good as that provided by existing mobile networks.<sup>37</sup>

In Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) imposed some social obligations with timetables. CRTC made a decision in April 2005 that Canadian carriers offering fixed (i.e. non-nomadic) local VoIP service, where the end-user is assigned an NPA-XXX native to any of the local exchanges within the region covered by the customer's serving Public Safety Answering Point (PSAP), to provide 911/E911 service, where it is available from the incumbent local exchange carrier (ILEC), within 90 days from the date of its decision. Enhanced 911 services automatically send customers' location information to an emergency centre where an operator dispatches a response service. Basic 911 services connect callers to a central call centre which then connects the call to the correct emergency response centre, from which point the caller must identify his or her location in order for an emergency response service to be dispatched.<sup>38</sup> With regard to provisioning 911/E911 service with local VoIP services offered on a nomadic basis or with a telephone number that is not native to any of the exchanges within a customer's PSAP serving area, the CRTC directs Canadian carriers offering these local VoIP services to implement an interim solution, within 90 days from the date of its decision, which provides a level of service function comparable to basic 911.<sup>39</sup>

The CRTC categorized VoIP services into fixed local VoIP service, nomadic local VoIP service, and foreign exchange local VoIP service as mentioned earlier. Fixed providers must offer either enhanced or basic 911 services, while nomadic or foreign exchange providers must simply provide an interim solution with basic 911 service.

The CRTC also directed that VoIP service providers must notify customers about any limitations to their emergency services, as well as make sure their subscribers acknowledge they are aware of limitations.

The CRTC also requires that all VoIP providers provide ongoing customer notification during service provisioning, by issuing warning stickers to be placed on telephone sets, through any subsequent advertising and in billing inserts.

In the United States, the FCC ordered in May 2005 that interconnected VoIP providers, who are able to receive calls from and place calls to the PSTN, are required to supply E911 emergency calling capabilities to their customers as a mandatory feature of the service. Interconnected VoIP providers must provide emergency operators with the call back number and location information of their customers (*i.e.* E911) where the emergency operator is capable of receiving it. Although the customer must provide the location information, the VoIP provider must provide the customer a means of updating location information, whether he or she is at home or away from home. Interconnected VoIP providers must inform their customers, both new and existing, of the E911 capabilities and limitations of their service. The incumbent LECs are required to provide access to their E911 networks to any requesting telecommunications carrier. They must continue to provide access to trunks, selective routers, and E911 databases to competing carriers. Interconnected VoIP providers must comply with these requirements, and submit to the FCC a letter detailing such compliance, no later than 120 days after the effective date of the order. Finally the Commission stated its intention to adopt, in a future order, an advanced E911 solution that includes a method for determining the customer's location without the customer having to self-report location information.<sup>40</sup>

The FCC order came after Texas filed a lawsuit against a VoIP provider, Vonage, for failing to make clear to consumers that the company's service did not include access to traditional 911 service. The lawsuit alleges that Vonage deceived consumers by not revealing in its television commercials, brochures or other marketing material that customers must proactively sign up for 911 service. The Texas Attorney General contends that even after a Vonage subscriber signs up for 911 service, there are limitations to the service that Vonage customers may never know unless they read the fine print buried on the company's Web site. According to the Texas Attorney General, customers who dial 911 to use Vonage's "911 dialling" service are routed through administrative lines at 911 call centres, not directly to call-station operators who dispatch emergency vehicles. Calls outside regular business hours may not be answered. If emergency personnel do get the call, they may not be able to identify the caller's phone number and will not have information about the caller's address. The Connecticut Attorney General has filed a similar lawsuit against Vonage.

E911 automatically identifies the location of a call to emergency dispatchers. The 911 system routes emergency calls on special trunks, through selective routers, to calling centres. The calling centres (Public Safety Answering Points) are set up and run by local public safety authorities. Carriers cooperate with one other to ensure that the routing and trunking arrangements are set up properly. Each carrier is responsible for providing its own trunking or if it chooses to purchase trunking from another provider, for ordering and paying for that trunking. Recently some incumbent LECs have moved towards allowing VoIP providers to access their E911 interconnection trunks. The concern of VoIP providers has been the cost of establishing physical trunking arrangements to get their traffic to the PSAPs. There are many of these calling centres in different parts of the US. Therefore, in order for anyone providing a national service to ensure that its emergency calls will be routed properly, physical trunking arrangements must be set up in all of these different areas. A VoIP provider is basically running an IP-enabled application, and may not have direct and indirect physical arrangements around the country. The requirement to provide 911 effectively creates the need for direct or indirect physical arrangements, which incur some cost. Some VoIP providers have tried to avoid this cost by using a software solution, in which a 911 call is simply translated into a traditional telephone number, which is then routed in the normal way. It is this approach that has led to some of the recent incidents, such as the one in Texas. A PSAP does not have a traditional number that would provide access to the 911 operators, which are instead reached through the special 911 routing and trunking arrangements. This has led some providers to use the number of the administrative office of the

PSAP, or the regular telephone number of a local police station. Nor does the standard traditional telephone routing provide the necessary prioritization and capacity to ensure that 911 calls will be delivered with a very high degree of reliability. That is what the separate trunking arrangements for 911 traffic are intended to provide. Several companies have been going ahead and putting in place their own 911 trunking arrangements, using either their own facilities or trunks ordered from other carriers. They intend to act as intermediaries, providing 911 trunking arrangements for VoIP providers. In this way, intermediation may lower the entry costs for VoIP providers with respect to 911 obligations.

In the EU, PATS providers have an explicit requirement to offer access to emergency services. It is recognised that the practicalities of call routing and handling of VoIP services could make provision of access to emergency services difficult and a similar or equivalent function would be possible but could incur high costs. In this situation, the EC took a position that VoIP providers have commercial freedom to offer services that qualify them as PATS.<sup>41</sup> When they choose to offer a service that qualifies them as PATS, they have to provide access to emergency services.<sup>42</sup> This means that if a VoIP provider is unwilling to incur the burden of providing access to emergency services, it can choose to remain PAECS provider. This approach is interpreted to give market the least distortion since the VoIP provider can enjoy rights of PATS provider if it chooses to be a PATS provider and, accordingly, its associated obligations including provision of access to emergency services.

In UK, the Ofcom took an interim position in September 2004 that until the European Commission provides further guidance on how the VoIP providers' self-declaration of whether or not the VoIP services are PATS can be implemented, it will forbear from enforcing PATS obligations against VoIP providers entering the market, even if they offer access to emergency services. Ofcom stressed that the forbearance is on the condition that providers supply adequate information to consumers about their services.<sup>43</sup>

## **2. Lawful Interception**

The ability for lawful interception of communications by law enforcement agencies is necessary to safeguard national security, defence, and/or public safety etc. This obligation to maintain interception capabilities normally applies to all telecommunications providers including VoIP service providers.

A key issue for VoIP service providers would be who should bear the costs of providing the interception facilities. The various market players associated with provision of VoIP services all wish to avoid these costs. The European Commission has advised its Member States that they should agree on common standards so that equipment manufacturers can develop the necessary products and mechanisms.<sup>44</sup>

## **3. Trans-National Service Providers**

An end-user can subscribe to foreign VoIP service providers, for example, to get a local phone number in the foreign country or to obtain VoIP service because there are no VoIP providers in the home country due to restrictive regulations. It is pointed out that telemarketers using VoIP are easy to spoof their caller ID so that it looks like they are calling from the consumers' local area. Therefore it can be harder for law enforcement to track the telemarketers down and makes it more likely that consumers can be deceived.<sup>45</sup>

With regard to protection of customers in relation to billing of service charges, the OECD Guidelines for Protecting Consumers from Fraudulent and Deceptive commercial Practices Across Borders provide one instrument which could be applicable.<sup>46</sup> According to the recommendations of the Guidelines, OECD countries should work to develop a framework for closer, faster, and more efficient co-operation among their consumer protection enforcement agencies that includes where appropriate establishing a domestic system for combating cross-border fraudulent and deceptive commercial practices against consumers,

enhancing notification, information sharing, and investigative assistance, improving the ability to protect foreign consumers from domestic businesses engaged in fraudulent and deceptive commercial practices, improving the ability to protect domestic consumers from foreign businesses engaged in fraudulent and deceptive commercial practices, considering how to ensure effective redress for victimised consumers, and cooperating with relevant private sector entities.

The type of service provision supplied from one country to another, so-called “cross-border supply (mode 1)” has been a feature in the telecommunications sector for a long time. In the context of WTO, if a WTO member did not specify some reservations in its national schedule of commitment in terms of cross-border supply when the “Agreement on Basic Telecommunications” was finalized in February 1997, the country would not be allowed to introduce new barriers, with few exceptions, to market entry against foreign entities. However, if a VoIP service supplier installed some facilities within the territory where the end-user lives, domestic regulations should apply to the facilities, no less favourably than to national operators’ facilities in an equivalent situation.

It is possible, but difficult for a country to ban its nationals from accessing and subscribing to VoIP service providers in foreign countries in the Internet environment. If countries want to keep their regulations abreast to take into account the possibilities offered by the Internet, which is ‘borderless’, they would have to co-operate and harmonize their approaches, irrespective of the characteristics of the regulations.

#### **4. Privacy and Security**

The areas of privacy and security are those where end-users are most vulnerable when they use VoIP services. The EC’s Privacy Directive, which applies to publicly available ECS, provides that processed and stored traffic data needs to be erased or made anonymous when it is no longer needed for transmission of the communication. Traffic data necessary for billing or interconnection payment purposes may be processed, but only for the period necessary and after consent has been given. Withdrawal of this consent should be possible at all times. Before giving consent, subscribers need to be informed of the purposes behind the retention of traffic data and of the types of data retained.<sup>47</sup>

Compared with the PSTN, the Internet is relatively insecure. The public Internet is vulnerable to viruses and denial of attacks, for example. However, end-users may expect their calls to be secure and their bills accurate. The EC’s Privacy Directive stipulates that it is particularly important for subscribers and users of such services to be fully informed by their service provider of the existing security risks which lie outside the scope of possible remedies by the service provider. Service providers who offer publicly available electronic communications services over the Internet should inform users and subscribers of measures they can take to protect the security of their communications for instance by using specific types of software or encryption technologies.<sup>48</sup>

## IV. COMPETITIVE SAFEGUARD ISSUES

### 1. Interconnection

The proliferation of VoIP service largely depends on the successful interconnection arrangements both between VoIP providers and PSTN operators and between VoIP providers themselves. Interconnection regimes vary across countries.<sup>49</sup>

In the short term the main type of VoIP traffic seeking to interconnect will be from IP networks to the PSTN because they would be, at least initially, in the majority (although the volume of business voice traffic remaining on IP networks may grow rapidly leaving mainly residential traffic which goes from IP networks to the PSTN). As circuit-based networks migrate to IP-based networks, interconnection would be mainly IP to IP networks via the PSTN, when the IP networks are not directly interconnected. In this case the PSTN would, in most cases, enable end-to-end connectivity. In the long run, when VoIP protocols are standardized internationally and networks are all IP-based, the most popular interconnection would be direct interconnection of IP networks to IP networks.

#### *IP to PSTN calls*

While PSTN long-distance operators or indirect access operators have to pay call origination charges to the local operators to which a caller is connected, the VoIP providers without an access network do not pay call origination charges to the broadband access provider to which the caller is connected when a call originates on IP networks.

If a VoIP call terminates on the PSTN, it is unclear what charges should be applied. In the US, the appropriate compensation for these types of calls has not yet been decided, but is being examined in pending rulemaking proceedings. In other countries, the PSTN operators would continue to levy termination charges, the amount of which would be the same with that they used to levy for using their networks, upon IP network operators (or VoIP gateway operators) for the termination of calls. The caller pays a retail price to a VoIP service provider (e.g., gateway service provider) while paying broadband access charge to his/her ISP. The VoIP provider, then, pays termination charges to the PSTN network operators.

The terminating PSTN operators would want to preserve this source of funding to support and manage their circuit-switched networks. It could still be possible that a PSTN operator with significant market power remains dominant in the voice termination market, which may require that termination charges continue to be regulated.

VoIP providers without gateway networks may enter into commercial arrangements with intermediary operators including VoIP services providers with nationwide gateway networks, alternative local PSTN operators, wireless carriers, etc. to get interconnected with incumbent PSTN operators. It may be difficult for the incumbent operator to even tell the VoIP traffic apart especially when standard geographic numbers are allocated to VoIP or when VoIP calls are delivered via through intermediary operators, who may send the VoIP calls over local interconnection trunks. This kind of intermediation relieves the VoIP providers of having to establish new interconnection arrangements and also makes it difficult for the PSTN operator to maintain any kind of discrimination in terminating charges. In Japan, Yahoo!BB, the largest VoIP



provider which has nationwide gateway networks, concluded interconnection arrangements with NTT East/West in April 2002. However, Yahoo!BB does not allow its network to be accessed by other VoIP providers.

Arguments have been put forward that the monopoly on call termination at fixed locations may be reduced if the presence management functions offered by VoIP services can effectively allow a caller to select the terminating operator to reach a called party. VoIP combined with presence management has the potential to remove the barriers to competition between networks for termination, and thereby convert the currently separate individual termination markets into a smaller number of multi-network termination markets.<sup>50</sup>

If the incumbent PSTN operator employs both circuit-based and IP-based technologies to terminate calls, how can the termination charges be set? A report to the EC argues that when a call originates on IP networks and terminates on PSTN and both the caller (or VoIP network operator) and the called party, who is connected only to an incumbent PSTN operator, have no choice as to the technology used by the incumbent PSTN operator to terminate the call, the terminating PSTN incumbent operator should charge the same price for termination, irrespective of the technology that it uses to terminate the call since neither the calling party, nor the called party is able to react to any differential price signal that might be given. And the relevant cost benchmark would be the efficient cost of supply using the most efficient technology, irrespective of the mix of technologies actually used by the incumbent PSTN operator.<sup>51</sup>

If the caller has no choice but the called party, who is connected only to an incumbent PSTN operator, has chosen a particular technology for the termination of calls and the originating operator has no choice, it may be justifiable for the incumbent PSTN operator to assess different termination charge based on the chosen technology because at least one party to the call is able to respond to a differential price signal. However, the regulation of termination charges levied by the incumbent PSTN operator still may be justified since the choice of the called party does not prevent the incumbent from exercising its market power in the termination market.<sup>52</sup>

If the caller is able to choose a particular technology on a call-by-call basis and the called party has not chosen, it might be possible to regulate the termination charges incurred using only one of the two technologies on the condition that the quality of service offered using the two technologies must be compatible. The regulated product should be the one based on the lower cost technology, which is the most efficient technology.<sup>53</sup>

In the United States, narrowband dial-up Internet service providers (ISPs) connected to the PSTN are regarded as customers rather than as interconnecting networks. Thus, although ISPs carry long-distance or international calls, they do not pay usage-sensitive interconnection charges (neither access nor reciprocal compensation charges.)<sup>54</sup> Rather they typically pay a flat monthly charge plus a per-minute or per-call charge for originating calls to PSTN operators as local end-users. The exemption of ISPs from interconnection charges provides an incentive to competitive local exchange carriers (CLECs; alternative fixed operators) to target and attract the dial-up ISPs, who primarily or solely receive traffic from the incumbent local exchange carriers (ILECs), as their subscribers in order to become net recipients of local traffic from ILECs.

The FCC envisioned a bill-and-keep regime in April 2001 to overcome all the inefficiencies related with inter-carrier compensation in its Notice of Proposed Rule Making in the matter of Unified Inter-carrier Compensation Regime. For example, the FCC suggested a "Central Office Bill and Keep (COBAK) regime as one possibility for a unified inter-carrier compensation regime. COBAK is the default interconnection rule that would apply to all types of carriers that interconnect with, and to all types of traffic that passes over the local circuit-switched network. According to COBAK, no carrier may recover

any costs of its customers' local access facilities which consist of the loop serving the customer's premises and the end-central office that serves the customer's loop; and the calling party's network is responsible for the cost of transporting the call to the called party's end-central office.<sup>55</sup> In 2005, the FCC issued a further notice, seeking comment to refresh the record it had originally established in 2001. While comments have been received from various parties, no clear consensus has emerged for compensation for calls connecting with the circuit-switched PSTN, and the FCC has not yet adopted a new system.

### ***PSTN to IP call***

This type of call has the greatest potential to create conflict between providers. In the United States, the appropriate compensation for these types of calls has yet been decided, but is being examined in pending rulemaking proceedings. In other countries, according to a 'Calling Party's Network Pays' system which is widely applied, if a call originates on the PSTN and terminates on IP networks, the PSTN operators owe a termination charges to VoIP service providers. However, the relevant elements to assess the actual costs are unclear when it is not obvious how the call will be routed by the IP-based network operator to terminate a call and how the cost is calculated in the use of IP network.

If subscribers to VoIP operators are allowed to get geographic local phone numbers, VoIP operators likely would support the application of the reciprocity principle, meaning that interconnection fees which have been calculated for an efficient incumbent with market dominance shall be copied and applied in exactly the same manner on an alternative network operator just establishing its business.<sup>56</sup> It is also possible that VoIP network operators may want to claim higher IP interconnection charges due to their lack of economies of scale, although IP networks generally are thought to have lower costs than circuit-switched networks.

From the perspective of PSTN operators, the request of reciprocal compensation from VoIP providers could appear as 'free-riding' since all they provide for terminating calls would be some elements of the network facility such as servers and gateways. The alleged 'free-ride' on PSTN operators' investment potentially could reduce the incentives for the PSTN operators to invest in infrastructure, to the detriment of investment and innovation in electronic communications.<sup>57</sup> However, it seems likely in reality that VoIP operators might not charge PSTN operators for IP termination while PSTN operators would still charge VoIP operators for the same call in the opposite direction, due to the VoIP providers' weaker negotiating power.

It is possible that a PSTN subscriber places a call to a subscriber of a VoIP provider by dialling a local phone number with local rates when the called party travels overseas. For example, Vonage is offering a "virtual phone number" to its customers. The virtual phone number is "a way for people outside your local calling area to call you for the price of a local call if you choose a virtual phone number in their local calling area. The numbers are for incoming calls only, so they ring to the primary Vonage line. (Let's say that you live in New York where your Vonage primary number has area code 718. Your mom lives in Florida. Her area code is 561. You could get a virtual phone number in area code 561 that rings to your 718 line. Now mom doesn't have to pay long distance charges when she calls you.)"<sup>58</sup> In this case, the originating PSTN operator should only have to pay for local termination charge to the VoIP company since the caller pays the PSTN company only a local rate in the Calling Party Pays context. In the United States, the FCC has not yet addressed what compensation should apply for this type of call.

If a VoIP service provider, using geographic numbers, carries a VoIP call over a managed network, it seems likely for the VoIP provider to ask the PSTN operator to pay actual costs for use of network facilities incurred during the call path just as mobile operators do. In mobile networks, non-reciprocity of interconnection charges has been the principle used in the majority of European countries whereas the fixed networks market was established on the basis of reciprocal interconnection charges<sup>59</sup>.

If non-geographic numbering ranges were to be made available for VoIP services, then new retail tariffs and interconnect arrangements would be necessary. However, because of the fact that VoIP services are cannibalising their services, the traditional PSTN operators have every incentive to delay negotiations. If this is the case, regulatory intervention may be required in order to ensure that VoIP service providers with a dedicated non-geographic number range can operate. However, as noted in paragraph 56, this would not be the case where VoIP providers can make use of alternative PSTN operators who are allocated non-geographic numbers as an intermediary to interconnect with incumbent PSTN operator and where carrier selection is in operation for local calls.

It would not be rare that PSTN operators are also owners of local ISPs who have local internet backbone networks. In this case, VoIP providers, even when they have some access networks, need to pay for the use of the ISPs' networks owned by PSTN operators to receive calls from PSTN callers. In this case, the PSTN ISPs are very likely to ask a high price for the transit service.

### ***IP to PSTN to IP call***

This case happens when two VoIP users are subscribing to the services of two different VoIP services providers, which do not have direct interconnection with each other and any traffic between them has to be transited through the PSTN. Basically, this case is identical to the IP to PSTN case and PSTN to IP case in the previous paragraphs.

The repeated protocol conversion through gateways will degrade call quality by increasing latency and may also degrade speech quality. In the long term, there will be a need to avoid such multiple PSTN to IP conversions.<sup>60</sup>

### ***IP to IP call***

The Internet is not directly regulated and its borderless structure would make regulation very difficult to implement. In this regard, most member countries take a hands-off approach to the Internet. However, it may be necessary that national regulatory authorities should be empowered to step in when market failures are obvious.

In the long run, all voice networks will be IP based. At the moment, it is difficult to predict how the market will develop in terms of IP to IP interconnection arrangements. It has been suggested that termination rates could be differentiated by quality of service classes, such as, for example, whether the call originates and terminates on the same network ("on-net call"<sup>61</sup>) or on different networks ("off-net call") or end-to-end quality of service, rather than by voice termination.<sup>62</sup> The bits for voice communications will be part of the internet data stream. Voice traffic uses only a small amount of bandwidth, compared with video. It means that the marginal cost of VoIP voice traffic among IP traffic is likely to be extremely low, so that it would be highly unlikely that termination charges would be determined on the basis of voice packets.

It has been pointed out that several factors are holding back the development of the Internet into an integrated services network. Managing congestion on Internet service provider (ISP) networks is not yet well developed, and often results in inadequate quality of service (QoS), for example, for VoIP. Although it is possible to provide superior QoS (e.g. consistent voice-grade QoS) on ISP networks, when achieved, QoS is often not retained between ISPs due to technical reasons such as software (in some cases hardware) incompatibility. Notwithstanding these difficulties, it is pointed out that a market will develop between networks to co-operate at the service level to manage QoS and that the 'managed network' services will then compete against best-effort services provided by other parties so that customers will choose the level of service they want to purchase.

Besides the technical problems of QoS on the Internet, there could be a concern that a dominant ISP (e.g. internet backbone provider) could degrade interconnection with competing ISPs and the dominant ISP may have an incentive to charge a higher rate for calls that go off their networks (“off-net” calls) than for calls that remain on their networks (“on-net” calls”), this may cause subscribers to choose larger networks, which could cause competitive networks to tip into monopoly. If there are several backbone networks, the greater flexibility of routing in packet networks, as well as a range of service providers, can limit the possibility of creating a terminating monopoly power by the terminating carrier.

### ***The Effect of a Decrease of PSTN Traffic on Interconnection Charges of PSTN***

As voice traffic migrates from PSTN to IP networks, PSTN interconnection charges are expected to increase as PSTN traffic decreases. As total PSTN usage minutes decrease and the cost of fixed PSTN networks remains constant, the per-minute network usage cost (interconnection charge) could rise if the network operator wants to recoup losses in demand by raising their access prices. If this is the case, the rise of PSTN interconnection charges will, in turn, raise calling prices on the PSTN, providing an incentive to customers to substitute IP calls. However, this scenario may only be realised where end-users can access only PSTN networks without having other choices such as broadband or cable modem access. In a competitive environment, raising PSTN interconnection charges would only hasten the decline. In this situation the option the PSTN operators would have is to develop new services, and hope that the new revenues can grow fast enough to make up for the erosion in the old service revenues.

With lower VoIP retail prices, the value of PSTN facilities may need to be re-evaluated to reflect the decrease in the market value of those assets. This would lead to a write-down in the value of network assets. If these write-downs are allowed to be reflected into the cost base of interconnection charges of PSTN facilities, PSTN interconnection charges will rise, in turn this will increase calling prices on the PSTN, and finally give an incentive to customers to migrate to IP calls. Some analysts have pointed out that regulators should not allow the write-downs to go into the cost base for PSTN interconnection charges in that the risk that new technology will reduce the value of existing assets faster than anticipated is clearly one component of the overall risk faced by telecommunication operators and, no doubt, will have been factored into the returns demanded by investors for the use of their capital through a weighted average cost of capital (WACC) that includes an allowance for such risk.<sup>63</sup>

## **2. Ensuring unrestricted access and use of the Internet**

Since VoIP is just one of applications which can be delivered over multiple platforms, unrestricted access to Internet services to the reasonable degree would ensure competition in VoIP market by allowing a consumer to reach any independent VoIP provider without interference from the firm that provides the consumer’s broadband access or Internet access.

From the technical point of view, access networks operators are in a position to block access to specific services because these services use specific user datagram protocol (UDP)<sup>64</sup> and transmission control protocol (TCP) port numbers (e.g. port 80). As a result, an ISP can block the application by setting its firewall to refuse traffic to or from certain UDP and/or TCP ports, or by blocking traffic to or from specified IP addresses. Access providers could set artificially low rate caps on throughput to certain addresses or ports (or artificially increasing latency on certain routes). While such measures may require additional hardware and/or software to implement them, they are not technically impossible. However, non-dominant provider is unlikely to block access to specified addresses or ports because customers will go elsewhere<sup>65</sup> and even dominant providers would have little incentive to do so where there is platform competition.

In European Union, if a network access provider with significant market power were to restrict unreasonably end-user choice for access to Internet portals and services, it would be considered abuse of a dominant position, leading to regulatory remedies as outlined in the Access Directive.<sup>66</sup>

### **3. Potential Effects of Vertical Integration on Regulatory Regimes**

An issue for consideration is whether vertical integration of ISPs and other market players could have effects that might require regulatory review. Over the last few years some incumbent telecommunication operators have bought back, or are buying the ISPs in which they have had a major share. As examples, France Telecom re-acquired Wanadoo, Deutsche Telekom (DT) is in the process of reabsorbing T-Online (ISP), and Belgacom resumed control of Skynet. Spanish incumbent Telefonica bought out its former ISP, Terra Networks. Some critics have argued that the vertically integrated companies could begin predatory pricing through “triple-play” packages of phone, Internet and TV services, that hurt competitors. These critics have also argued that such vertical integration may result in less transparency in pricing between the parent and subsidiary and it is possible that the incumbent operators discriminate in favor of its own ISP.<sup>67</sup> However, a regulatory effort to prevent bundled pricing could wind up protecting certain market players from the effects of structural change in the market and keeping high prices. For example, in the US, regulation prevented the bundling of long distance with local services for many years. The entry of wireless carriers not subject to these rules allowed them to bundle flat-rated packages of local and long distance calling, which in turn put downward pressure on the pricing of all long distance services. In this sense, it is not clear how a regulator can step in and restrict the composition or the pricing of bundles, or establish transparency in transactions with affiliates.

In the EU context, with the take-up of VoIP services, the state of relevant markets of “wholesale unbundled access to metallic loops and sub-loops for the purpose of providing broadband and voice services” and “wholesale broadband access” will be linked to the regulation of relevant retail markets of “access to the public telephone network ‘at a fixed location’ for residential customers” and “access to the public telephone network ‘at a fixed location’ for non-residential customers” if the phrase ‘at a fixed location’ is interpreted in a broad basis. VoIP services enable a linking between apparently unrelated markets.<sup>68</sup>

There could be structural changes possible for the Internet, such as integration with equipment manufacturers, and perhaps also with a PSTN operators. If anti-competitive harm were demonstrated as a result of such integration and the leverage of traditional market power across markets and possible leverage of network effects, it may be appropriate to review the applicable regulatory regime.

The regulatory reactions to these potential vertical integrations in the IP world can not be prejudged presently in that until now the players in the Internet are playing well without the need for regulatory intervention.

### **4. Impact on the Relevant Markets**

As mentioned earlier, in the Netherlands, the regulator announced that VoIP services were not ‘substitutable’<sup>69</sup> and, thus, did not fit in the existing fixed market definitions at the retail level, therefore they were not allowed to include VoIP services in the regulations which are being applied to PSTN operators.

The recommended list of relevant markets by the EC at the retail level defines fixed-line telephony as separate markets where fixed retail markets are divided into “access, local, national or international” on the one hand and into “residential or non-residential” on the other hand. Therefore, at first sight, it could be

thought that VoIP service did not fit in this market categorization. There is no separate market definition to accommodate VoIP service in the recommended list of market definitions by EC.

However, in the EC, VoIP providers claim that VoIP service is a substitute for PSTN voice service and, thus, should fall under the same PSTN voice market definitions. They point out the situation where most of subscribers to broadband access are also those to telephone lines of the PSTN operators in the DSL broadband access context. They argue that PSTN operators ‘bundle some minutes of PSTN voice with their basic telephone line rental when an end user subscribes to VoIP over DSL (the end user will clearly wish to use the bundled PSTN voice minutes before using VoIP service)’<sup>70</sup>. Furthermore, VoIP providers request that a customer subscribe to a competitive broadband access provider without having the burden of a line rental charge via an ‘unbundled bitstream’ product that are priced to include relevant local loop costs.<sup>71</sup>

In this system, it seems that even though the markets for VoIP and PSTN voice are separate, the concerns of the preceding paragraph could be addressed provided that VoIP service market is recognized as one of relevant markets. If it is evaluated that the PSTN incumbent is leveraging its dominant position in the DSL and PSTN call markets to disadvantage competitors in separate new markets including VoIP market, the regulatory remedies could be imposed on the incumbent PSTN operators.

If VoIP service is included in the fixed voice market, it would reduce the market dominance of PSTN incumbent operators since the boundary of the relevant market is enlarged.

## REFERENCES

<sup>1</sup> Statement of commissioner Kathleen Q. Abernathy Re: IP-Enabled Services, WC Docket No. 04-36.

<sup>2</sup> <http://www.telegeography.com/press/releases/2004-11-15.php>

<sup>3</sup> According to the World Telecommunication Policy Forum report, PSTN refers to traditional circuit-switched telephone networks offered by public telecommunication operators (PTO), as well as integrated services digital networks (ISDN), and public land mobile networks (PLMN).

<sup>4</sup> The Opinion of Telecommunications Advisory Committee & Observatory for Rights on the Internet to BIPT in Belgium, *Opinion on the opportunities and challenges associated with the development of the Voice of IP-services*, 18 May 2005, p.2 ([www.bipt.be/comcon/index.html](http://www.bipt.be/comcon/index.html)).

The two advisory bodies to Belgium regulator defines VoIP as *the electronic communication service offered to the public for the purposes of conveying speech wholly or partly over an IP network, where at least one of the network connection points is connected to an IP network, where at least one of the network connection points is connected to an IP network*. The term “speech” is restricted to a service for the delivery of individualised information characterised by some form of confidentiality, thus excluding FTP, file sharing, broadcasting, etc. “Network connection points” is a physical point or radio interface by which the end user is offered access to a public electronic telecommunication network. Thus VoIP offerings must have at least one of the end users directly connected to an IP network.

<sup>5</sup> Framework Directive, Recital 18.

<sup>6</sup> The UK regulator, Ofcom, uses a new terminology “Voice over Broadband (VoB)” referring to services that allow end users to make and receive calls over a broadband connection, for example using DSL or cable. (Ofcom, consultation document “Numbering arrangements for Voice over Broadband services”, p. 8. <http://www.ofcom.org.uk/consult/condocs/vob/vobs/?a=87101>), VoIP is defined at Newton’s Internet Dictionary as “The technology used to transmit voice conversations over a data network using the Internet Protocol. Such data network may be the Internet or a corporate Intranet, or managed networks typically used by long distance and local service traditional providers and local service traditional providers and ISPs that use VoIP.” (this is quoted in the report by NTIA, Advisory Committee on International Communications and Information Policy report, p. 3).

<sup>7</sup> This paper, however, does not provide how and what type of VoIP services should be classified as part of the traditional voice services.

<sup>8</sup> A reduction in carrier revenues attributable to increase in VoIP market share would affect the sustainability of universal service funding only if (1) USF funding is based on carrier revenues or (2) VoIP providers are not required to contribute to USF.

<sup>9</sup> Telecom Public Notice CRTC 2004-2, “Regulatory framework for voice communication services using Internet Protocol,” 7 April 2004, para. 25.

<sup>10</sup> <http://www.crtc.gc.ca/eng/NEWS/RELEASES/2005/r050512.htm>; The Chairman of CRTC, Charles Dalfen, said “Why did we find that VoIP is a telephone service? Because Canadians use it as a telephone service, it’s being sold as a telephone service and it functions as a telephone service,” “It provides two-way

real-time voice communications to and from anyone with a telephone number on the public switched telephone network anywhere in the world. This decision is consistent with the focus in the *Telecommunications Act* on services rather than technologies.”

<sup>11</sup> In the United States, the 1996 Telecommunications Act defined “telecommunications” to mean “the transmission, between or among points specified by the user, of information of the user’s choosing, without change in the form or content of the information as sent and received.” The Act then defined “telecommunications service” to mean “the offering of telecommunications for a fee directly available to the public, regardless of the public, or to such classes of users as to be effectively available to the public, regardless of facilities used.” An “information service” consists of “the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications, and includes electronic publishing, but does not include any use of any such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service.” The Act also defines the term “common carrier” and “carrier” to include “any person engaged as a common carrier for hire, in interstate or foreign communication by wire or radio.” The commission had concluded that the “telecommunications service” definition was “intended to clarify that telecommunications services are common carrier services. Various regulatory obligations and entitlements set forth in the title II of the Act for the “common carriers.” The title II of the Act imposes certain requirements on common carriers, including requiring carriers to provide service on just, reasonable, and nondiscriminatory rates and terms; to comply with tariffing requirements for dominant carriers; to meet certain certification and discontinuance requirements; to comply with interconnection obligations; to contribute to the universal service fund; to comply with disability accessibility requirements; and to comply with privacy requirements. In addition, a separate statute, the Communications Assistance for Law Enforcement Act or CALEA, requires certain providers to build capabilities into their networks to provide access to law enforcement for authorized wiretapping.

<sup>12</sup> ANALYSYS report to EC, Annex A8.

<sup>13</sup> FCC New Release, *FCC rules that PULVER.COM’s Free World Free Dialup Service should remain free from unnecessary regulation*, February 12, 2004.

<sup>14</sup> FCC Declaratory Rulings on AT&T Petition, WC Docket No. 02-361 (April 14, 2004), para. 1, 4, 7, 24.

<sup>15</sup> FCC New Release, *FCC finds that Vonage not subject to patchwork of state regulations governing telephone companies*, November 9, 2004.

<sup>16</sup> Statement of commissioner Kathleen Q. Abernathy regarding Vonage Holdings Corporations Petition.

<sup>17</sup> According to last sentence of Article 6(c), Framework Directive, “ECS does not include information society services, as defined in Article 1 of Directive 98/34/EC which do not consist wholly or mainly in the conveyance of signals on electronic communications network.”

An “information society service” is any service normally provided for remuneration, at a distance, by electronic means and at the individual request of a recipient of services. For the purpose of this definition, “at a distance”: means that the service is provided without the parties being simultaneously present. “by electronic means” that the service is sent initially and received at its destination by means of electronic equipment for the processing (including digital compression) and storage of data, and entirely transmitted, conveyed and received by wire, by radio, by optical means or by other electromagnetic means. “at the individual request of a recipient of services” means that the service is provided through the transmission of data on individual request. (Analysys Consulting Final report for the European Commission, 28 January 2004, p. A10).

Some firms related with VoIP and associated convergence services offerings argue that their peer-to-peer (P2P) software for VoIP services (e.g. “MSN messenger”) and additional features allowing to make calls to PSTN fall under the definition of “information society service.” Accordingly, they argue that their



offerings do not come under the EU regulatory frameworks, which means that, in particular, they have no obligations to fund universal service [The reply comments of Skype (p. 2) and Microsoft(p. 4) on European Commission's consultation document, *The treatment of Voice over Internet Protocol (VoIP) under the EU Regulatory Framework*].

18 PAECS providers have rights to provide an Electronic Communications Network or Electronic Communications Services, consideration of application to use public rights of way, right to negotiate interconnection, right to have numbers and right to apply for the right to offer Universal Service. Obligations include notification of the NRA, financing of Universal Service Obligations, making contracts with consumers, publishing Quality of Service, making available information for directory enquiry services and directories, access to directory enquiry & operator assistance services by end-users, taking appropriate measures to safeguard security of services, and privacy obligations, etc.

(European Commission's consultation document, *The treatment of Voice over Internet Protocol (VoIP) under the EU Regulatory Framework*, Annex, p. 21-25).

19 Id. para.4.2.

20 <http://www.t-regs.com/index.php?option=news&task=viewarticle&sid=292> (31 March 2005). According to this report, OPTA has made it very clear in its statement that it does not rule out that VoIP will be considered to be part of these fixed telephony markets. If this were to be the case, OPTA could find that KPN has SMP, also for services delivered using VoIP. If OPTA would come to this conclusion, the regulator would be able to apply the same remedies to KPN's provision of VoIP services as it could for traditional fixed telephony services. The result of the market definition and market analysis exercises will not be known before October 2005.

21 In Japan, VoIP services fall under the heading of "telecommunications services." According to the Telecommunications Business Law, "telecommunications" means "transmitting, relaying or receiving codes, sounds or images by wire, radio or any other electromagnetic method." "Telecommunications Service" means intermediating communications of others through the use of telecommunications facilities, or any other acts of providing telecommunications facilities for the use of communications of others."

22 Telecommunications Business Law, Art.9, 16.

23 "Telecommunications carrier" means any person who has obtained registration from the MIC (Minister for Internal Affairs and Communications) or has submitted a notification to the Minister.

24 A protocol that translates normal telephone numbers into a format for storing and retrieving Internet addressing information. For example, +82 2750 1437 is mapped into 7.3.4.1.0.5.7.2.2.8.e164.arpa by reversing the order of the telephone number dialled. It is noted that via ENUM, users can reach telephone, fax, email addresses, web page, etc.

25 Normally SIP address looks like jameslee@oecd.org.

26 Ofcom Statement on *Numbering arrangements for new voice services*, 6 September 2004, at para 4.1 – 4.5.6.

Location Independent Electronic Communications Service means where: *i)* the Numbering Plan of the Communications Provider offering the service has no geographic significance; *ii)* the location of the Customer's Apparatus identified by a given Telephone Number at the time of use is not necessarily permanently associated with a particular Network Termination Point; *iii)* number translation to a Geographic Number is not involved; and *iv)* the service is not a Mobile Service.

27 Framework Directive Art. 10 and Authorization Directive Art.5(3) & (4).

- 28 European Commission's consultation document, *The treatment of Voice over Internet Protocol (VoIP) under the EU Regulatory Framework*, para. 7.; Regarding geographic numbers, the document states that "offering geographic numbers can be a very important element in the business proposal of a publicly available ECS provider to its prospective clients; this could be linked to the importance attached by users to having a geographic number, or to tariff structures that favour calls to geographic numbers.
- 29 <http://www.regtp.de/en/aktuelles/pm/03045/index.html> (23.08.2004).
- 30 [http://erg.eu.int/doc/publications/erg0512\\_voip\\_common\\_statement.pdf](http://erg.eu.int/doc/publications/erg0512_voip_common_statement.pdf)
- 31 Id.
- 32 The minimum voice quality is measured by two dimension; R figure which is general voice transmission quality rate, and End-to-end delay.
- 33 Universal Service Directive Art. 19.
- 34 Ofcom's statement on *Numbering arrangements for new voice services*, 6 September 2004, para 3.106, 3.107 ([http://www.ofcom.org.uk/consult/condocs/vob/nvs\\_statement.pdf](http://www.ofcom.org.uk/consult/condocs/vob/nvs_statement.pdf)).
- 35 [www.vonage.com/media/pdf/res\\_09\\_01\\_04.pdf](http://www.vonage.com/media/pdf/res_09_01_04.pdf), p. 4.
- 36 Id.
- 37 European Commission's consultation document, *The treatment of Voice over Internet Protocol (VoIP) under the EU Regulatory Framework*, at para. 2.7.2.
- 38 <http://www.itbusiness.ca/index.asp?theaction=61&sid=58524>
- 39 Telecom Decision CRTC 2005-21 (4 April 2005).
- 40 [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-258818A1.doc](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-258818A1.doc)
- 41 EC Information Society Directorate General comments on draft OECD paper (STI/ICCP/TISP(2005)3).
- 42 EC Information Society Directorate General comments on draft OECD paper (STI/ICCP/TISP(2005)3).
- 43 Ofcom's statement on *Numbering arrangements for new voice services*, 6 September 2004, at para. 5.4, 5.9.
- 44 EC's information and consultation paper on VoIP at 5.5.2.
- 45 US FTC comments on draft OECD paper (STI/ICCP/TISP(2005)3).
- 46 OECD, *The Impact of Voice over Internet Protocol: International Voice Services*, DSTI/ICCP/TISP/RD(2004)3, November 2004, para. 36.
- 47 EC's information and consultation paper on VoIP at para. 5.5.1.
- 48 Id. at para. 2.7.8.; Directive on Privacy and Electronic Communications (2002/58/EC), Recital 20.
- 49 In the EU, all PAECS providers have right to negotiate interconnection. When the negotiation fails, regulator intervenes. The fixed operators with significant market power were required to provide interconnection according to the principles of transparency, non-discrimination and cost orientation. Also in the United States, legislation provides the vehicle for interconnection. The 1996 Telecommunications

Act imposes a general duty on all telecommunications carriers to interconnect with the facilities and equipment of other telecommunications carriers, and also specifically requires incumbent local exchange carriers to negotiate interconnection agreements with their competitors and to interconnect at any technically feasible point within their own network at cost-based and non-discriminatory tariffs. In Australia, access regulation applies to all operators, both as access seekers and access providers. To fall within the access regime, particular services must be “declared” by the ACCC. Achieving any-to-any connectivity is a principal objective of the access regime. Accordingly, any service that is necessary to achieve any-to-any connectivity is declared under this regime. Consequently, interconnection services have been declared by the ACCC, which means that interconnection obligations are imposed on all operators. In Canada, the CRTC has taken a similar approach, having established a regulatory framework in which all local exchange carriers are required to interconnect with each other and with all long distance carriers and wireless service providers. Within exchanges, the costs of interconnection are shared equally. In Japan, all the telecommunications service providers are subject to obligations of interconnection of their networks and the payment of interconnection charges. The type-I designated operator (NTT East/West) has obligation to provide interconnection with all telecommunications on a cost basis.

50       Analysys, final report to European Commission (28 Jan 2004), para. 2.8.5.

51       Id.

52       Id.

53       Id.

54       In United States, existing intercarrier compensation rules may be categorized as follows: *access charge rules*, which govern the payments that interexchange carriers (“IXCs”) and CMRS carriers make to LECs to originate and terminate long-distance calls; and *reciprocal compensation rules*, which govern the compensation between telecommunications carriers for the transport and termination of local traffic. However both sets of rules are subject to various exceptions (*e.g.*, long-distance calls handled by ISPs using IP telephony are generally exempt from access charges under the enhanced service provider (ESP) exemption).[FCC, NPRM in the matter of Developing a Unified Intercarrier Compensation Regime CC Docket No. 01-92 (April 27, 2001) at para. 6.

55       For example, assume that there are two local networks (A & B), A has several central offices connected to a tandem switch, while B has just one central office switch. B interconnects with A at A’s tandem switch. In this case, if a customer of B calls a customer of A, B would have to pay A for the cost of tandem switching and transport from the tandem to the called party’s central office, but B would not have to pay termination costs. Thus, A could not charge B for any part of the cost of the local switch or the called party’s loop. [Patrick DeGraba, *Bill and Keep at the Central Office As the Efficient Interconnection Regime*, FCC working paper, December 2000, para. 36].

56       [http://userpage.fu-berlin.de/~jmueller/its/conf/berlin04/Papers/ruhe\\_paper.pdf](http://userpage.fu-berlin.de/~jmueller/its/conf/berlin04/Papers/ruhe_paper.pdf), at para. 2.3.

57       [www.vonage.com/media/pdf/res\\_09\\_01\\_04.pdf](http://www.vonage.com/media/pdf/res_09_01_04.pdf), p. 5.

58       [http://www.vonage.com/no\\_flash/features.php?feature=virtual\\_phone\\_number](http://www.vonage.com/no_flash/features.php?feature=virtual_phone_number).

59       Analysys, Final report to European Commission (28 Jan 2004), para. 1.

60       Analysys, Final report to European Commission (28 Jan 2004), p. 72.

61       “On-net” traffic means traffic that is interchanged between hosts connected to the same AS and hence routed with an interior gateway routing protocol (IGP), in contrast to “Off-net” traffic which is routed between different ASes by an exterior gateway routing protocol (EGP). AS signifies Autonomous System, a collection of routers under the administrative control of a single organisation forms. AS is also known as

a routing domain. Networks within an AS have a common addressing and routing policy. ASes are identified by numbers which are assigned by one of the three Registries ARIN, APNIC, and RIPE. AS has a common set of addressing and routing policies is implemented.

62 Cullen International, Regulatory implications of the introduction of next generation networks and other new developments in electronic communications (16 May 2003), at para. 4.4.4.

63 Analysys Consulting, Final Report to the European Commission, at para. 2.9.3, p. 107.

64 A connectionless protocol that , like TCP, runs on top of IP networks but unlike TCP/IP, UDP/IP provides very few error recovery services, offering instead a direct way to send & receive datagrams over an IP networks. It is used primarily for broadcasting message over a network.

65 ANALYSYS, Final report to the European Commission, *IP Voice and Associated Convergent Services* (28 January 2004), at para. 2.7.1.

66 Id.; Recital 6 of the Access Directive says: In markets where there continue to be large differences in negotiating power between undertakings, and where some undertakings rely on infrastructure provided by others for deliver of their services, it is appropriate to establish a framework to ensure that the market functions effectively. National regulatory authorities should have the power to secure, where commercial negotiation fails, adequate access and interconnection and interoperability of services in the interest of end-users. In particular, they may ensure end-to-end connectivity by imposing proportionate obligations on undertakings that control access to end-users. Control of means of access may entail ownership or control of the physical link to the end-user (either fixed or mobile), and/or the ability to change or withdraw the national number or numbers needed to access an end-user's network termination point. This would be the case for example if network operators were to restrict unreasonably end-user choice for access to Internet portals and services.

67 [www.swidlaw.com/pubs/files/spies%20Comm%20Comm%20Daily%20Competitors%20Urg%20Regulators.pdf](http://www.swidlaw.com/pubs/files/spies%20Comm%20Comm%20Daily%20Competitors%20Urg%20Regulators.pdf)

68 ANALYSYS, Final report to the European Commission, *IP Voice and Associated Convergent Services* (28 January 2004), at para. 2.8.5.

69 The widely accepted starting point for economists for delineating the boundaries of a product market is (*i.e.*, the process of market definition) is the application of what is known as the “hypothetical monopolist” test. In essence, the question that has to be answered under this test is: could a firm that was the only present and future seller of the relevant products or services in the geographic area where competitive economic conditions are similar impose at least a “small but significant and non-transitory” increase in price? In other words, starting from a competitive price, would it be profitable, over a period of about one year, to implement a hypothetical small (in the range of 5 to 10 %) increase in price? This will depend on the degree of consumer switching to other products (demand substitution) and additional supply (supply substitution).

70 [www.ectaportal.com/uploads/2984ECTAVoIPposition.pdf](http://www.ectaportal.com/uploads/2984ECTAVoIPposition.pdf), at para.1.2.2.

71 Id.