Commission for
Communications Regulation

Response to Consultation

Result of VoIP Framework Review 2006

Document No:	**06/45**
Date:	**31, August 2006**

An Coimisiún um Rialáil Cumarsáide
Commission for Communications Regulation
Abbey Court Irish Life Centre Lower Abbey Street Dublin 1 Ireland
Telephone +353 1 804 9600 *Fax* +353 1 804 9680 *Email* info@comreg.ie *Web* www.comreg.ie

Contents

1 Introduction 3

2 Decision Notice Issues 5

2.1 GEOGRAPHIC NUMBERING 5
2.1.1 Summary of consultation issues 5
2.1.2 Views of Respondents 6
2.1.3 Commission's Position 6
2.2 "076" NUMBER RANGE 6
2.2.1 Summary of consultation issues 6
2.2.2 Views of Respondents 8
2.2.3 Commission's Position 8

3 Voice Services: Associated Obligations & Consumer Issues 10

3.1 PROVISION OF VOICE SERVICES AND ASSOCIATED OBLIGATIONS 10
3.1.1 Summary of consultation issues 10
3.1.2 Views of Respondents 11
3.1.3 Commission's Position 12
3.2 ACCESS TO EMERGENCY SERVICES 12
3.2.1 Summary of consultation issues 12
3.2.2 Views of Respondents 13
3.2.3 Commission's Position 15
3.3 NUMBER PORTABILITY 16
3.3.1 Summary of consultation issues 16
3.3.2 Existing process 16
3.3.3 Views of Respondents 17
3.3.4 Commission's Position 17
3.4 CALLING LINE IDENTIFICATION (CLI) 18
3.4.1 Summary of consultation issues 18
3.4.2 Views of Respondents 19
3.4.3 Commission's Position 19
3.5 ACCESS TO DIRECTORY INQUIRY SERVICES AND DIRECTORY LISTINGS 19
3.5.1 Summary of consultation issues 19
3.5.2 Views of Respondents 20
3.5.3 Commission's Position 20
3.6 QUALITY OF SERVICE AND NETWORK INTEGRITY 20
3.6.1 Summary of consultation issues 20
3.6.2 Views of Respondents 21
3.6.3 Commission's Position 21
3.7 PORT BLOCKING AND SERVICE DEGRADATION 22
3.7.1 Summary of consultation issues 22
3.7.2 Views of Respondents 22
3.7.3 Commission's Position 23

4 Interconnection 24

4.1 INTRODUCTION 24
4.1.1 Summary of consultation issues 24
4.1.2 Views of Respondents 24
4.1.3 Commission's Position 25
4.2 INTERCONNECTION ARRANGEMENTS IN THE INTERNET WORLD 25
4.2.1 Summary of consultation issues 25
4.2.2 Views of Respondents 26
4.2.3 Commission's Position 26

5 Future Work 27
5.1.1 Summary of consultation issues 27
5.1.2 Views of Respondents 27
5.1.3 Commission's Position 28
Appendix A – Legislation 30
Appendix B - Acronyms 31

1 Introduction

As part of its role to facilitate the introduction of new and innovative products and services for the benefit of end users, ComReg, in 2004, put in place a framework to facilitate the introduction of Voice over Internet Protocol (VoIP) services into the Irish telecommunications market. In constructing this framework, ComReg was aware that due to the emerging nature of this particular market, it would be necessary to periodically review progress to ensure that any developments that could be potentially harmful to consumers were not taking place or if necessary put prompt measures in place to address these. With regards to this commitment, ComReg published an initial consultation paper (ComReg 06/13), and this document is its response.

To date, progress in relation to the take-up of VOIP services in Ireland has been modest. However with broadband user levels now exceeding 400,000 and increasing rapidly and the growing utilisation of VOIP by business over their IP-VPNs the indicators are for significant future growth. Experience in other countries such as France has illustrated that the advent of applications such as VOIP can be a catalyst for accelerated broadband take-up and that this in turn can drive the demand for local loop unbundling

The overall approach adopted by ComReg for the introduction of VOIP was to minimise the possible barriers to entry and provide as flexible an environment as possible while ensuring that consumers were informed of both the opportunities it can provide and any possible limitations. In this context the framework we introduced opened up access to telephone numbers for Service Providers (SPs) of VoIP, with both traditional geographic numbers as well as a new range of "076" numbers being made available for this purpose. This enabled VoIP Service Providers (SPs) to move from offering services that were limited to those devices with IP addresses, allowing interconnection with the traditional PSTN world.

In March 2005, following extensive discussions with the operators and potential VOIP providers, ComReg put in place a range of further measures to facilitate the activation of these numbers on PSTN networks. These are comprehensively detailed in ComReg 05/23, which sets out several Directions in this regard.

One of the challenges to the introduction of new and innovative products or services is ensuring, that where appropriate they comply with existing relevant regulations. Any telecommunications service that is sold to the public in Ireland must for instance fulfil a minimum set of requirements, ensuring that the consumer has access to such important

services as the emergency numbers 999 and 112, directory inquiries and operator assisted services. In light of these, ComReg has published a set of Guidelines for VoIP Service Providers on the treatment of consumers (ComReg 05/50), which clearly sets out Universal Service Obligations with which VoIP SPs must comply.

Many of the issues dealt with in this document have already been discussed in previous policy documents on VoIP, in particular in ComReg document 04/103, "VoIP Services in Ireland". Although the rate of growth of VoIP services to date is such that many of the issues have not progressed to such an extent that they require adjustment, ComReg is pleased to note that the rate of uptake of VoIP services is steadily increasing. ComReg believes that VoIP can be an important tool in increasing competition and ultimately consumer welfare. As part of its ongoing work programme, ComReg will be closely monitoring developments in VOIP, including the introduction of new variants such as wireless and Hosted VOIP as well as introduction of Next Generation Networks and their implications for future interconnection arrangements.

ComReg would like to thank all parties who responded to this consultation. In total, seven companies responded, and these are listed below. The non-confidential portions of these responses will be made available from ComReg's website shortly.

Respondent	**Category**
ALTO	Network Operators Association
BT Ireland	Fixed Network Operator
eircom	Fixed Network Operator
O2	Mobile Network Operator
Skype	VoIP Service Provider
UPC Broadband Ireland Ltd.	Cable Network Operator
Vodafone	Mobile Network Operator

2 Decision Notice Issues

2.1 Geographic numbering

2.1.1 Summary of consultation issues

As set out in the consultation paper, ComReg document 06/13, service providers providing services classified as both Electronic Communications Services (ECS) and Publicly Available Telephone Services (PATS)[1] are entitled to allocations of geographic numbers. ComReg's initial position was that the current numbering arrangement with respect to geographic numbering is satisfactory, at least for the short to medium term. Reasons for this include the preservation of the inherent geographic location information provided by this type of number, which, among other uses, is used by the Emergency Services to determine the geographic location of the caller. In addition, only a very small proportion of these geographic lines are currently operated by means of a technology other than the traditional PSTN/ISDN. Geographic numbering also imparts a certain level of tariff information, (i.e. the tariff associated with the call can be easily determined to be of a local or national rate), which most people readily understand.

The nature of VoIP means that in contrast to legacy networks, geographic numbers could technically be utilised without regard to the physical geographic location of the end-user and area for which the number is allocated. If this is allowed to happen, any user anywhere in the world could request an Irish geographic number, or potentially even multiple numbers from many different geographic areas. This could lead to an excessive demand for Irish geographic numbers from outside of the state, which could trigger costly capacity-based number changes, without clearly identified Irish-based economic benefits in return.

Number changes, which are instigated only as a last resort, are expensive (both in terms of overhead for the involved network operators and the ancillary expenses incurred by consumers in altering stationery, advertising material etc.). This cost, which is certainly not trivial, must be borne by the network operator, service provider and end users. It is primarily borne by those consumers who live in the affected area. Furthermore, if a number change were brought about by the allocation of numbers to consumers or end users located outside the state, then it is clear that the major part of its cost would not be borne by those users. ComReg considers that this is not a desirable scenario for Irish consumers.

[1] Please see Appendix B for the formal definitions of both ECS and PATS.

Given the current level of VoIP penetration in the Irish market and the risk of enforced number changes from a further relaxation in rules, ComReg indicated in the consultation paper that, in its view, the current rules[2] surrounding the allocation of geographic numbers should remain in place for the immediate future.

Q. 1. Do you agree with ComReg that the rules surrounding the allocation of geographic numbers should remain in place for the immediate future? If not, please describe the changes you would wish to see and explain why you feel these are needed, given the availability of highly-flexible "076" numbers (as discussed in the next section).

2.1.2 Views of Respondents

Five respondents felt that the current rules surrounding the use of geographic numbers are sufficiently liberal. One further party felt that ComReg should allow unrestricted use of geographic numbers, whilst one other felt that geographic numbers should only be allocated to those service providers offering a PATS service. One of the respondents in favour of maintaining existing rules did comment that since number changes were expensive, ComReg should conduct a separate review of the National Numbering Scheme in order to ensure that its operation is done in as efficient a manner as possible. One other respondent also noted that it may be possible to widen the boundaries of the current Minimum Numbering Areas to allow for porting within a greater geographic region.

2.1.3 Commission's Position

ComReg believes that responses to this consultation show that the current rules surrounding the use of geographic numbers are sufficiently liberal to allow VoIP service providers to develop and offer services to the Irish public on a par with those service providers offering PSTN-based services.

2.2 "076" number range

2.2.1 Summary of consultation issues

In 2004, ComReg decided to open a range of numbers – the "076" range –specifically for IP based services[3] with fewer regulatory restrictions than other ranges. The

[2] The rules permit these numbers to be used for VoIP purposes but they must only be allocated to end-users or termination nodes located within the Minimum Numbering Area (MNA).
[3] Decision No.8 of 04/103

elimination of geographic restrictions make these numbers especially attractive to VoIP service providers as this facilitates the full nomadic element that is a distinguishing feature of many VoIP services. ComReg set the retail tariff ceiling for calls to this number range[4] at the national rate of the originating service provider. Prior to the launch of services using this number range, it was necessary (as it would be for any new number range) for interconnection rates between operators to be agreed. Following a range of informal industry consultations and a formal public consultation, ComReg intervened in the interest of enabling consumers to benefit from the advantages of VOIP and to move the framework forward in such a way that benefited all undertakings. A single retail price point[5] was determined as the best way forward (i.e. equivalent to but not linked to *eircom*'s then local rate[6]). This did not however preclude service providers from entering into commercial negotiations to establish additional retail rates and /or to other underlying wholesale interconnection rates. The wholesale interconnection rate used influences the retail rate that end-users are charged.

A review by Analysys on ComReg's behalf of a sample group of providers prior to the publication of the consultation paper 06/13 confirmed a broad consensus in favour of this approach. A single price point was both simple and easily understood and that such clarity was considered important to the adoption of VOIP at this time. ComReg therefore concluded at that stage that there was no necessity to alter these arrangements at that time.

2.2.1.1 Awareness of range

During interviews with key stakeholders prior to this consultation, it was clear that the take-up of numbers from the "076" range remained low. Among the reasons suggested for this were:

- the need for a broadband connection for residential users;
- many people prefer to transfer their current numbers rather than get new numbers;
- consumers are still unsure of unclear of the costs associated with calls to "076" numbers.

However, at that point, services using this code had only been active for a matter of months. ComReg believes it is reasonable to presume that uptake of "076" numbers will continue to grow as general awareness increases and more services become available.

[4] The maximum charge that can be applied to calls to "076" numbers shall not exceed the standard national rate of the network operator from which the call is made

[5] ComReg document 05/23 (Directions to Enable Opening of Access to VoIP Services using 076 Number Ranges)

[6] The current actual per second rates are 0.0679c, 0.0174c and 0.0174c for daytime, evening and weekend respectively

One point that arose from the discussions held by Analysys with the various stakeholders on this particular topic was that there is a growing demand from consumers for a single number that could enable contact across the myriad of different communication methods used today (e.g. mobile, fixed, wireless etc.), in line with the growing convergence of telecommunications as a whole.

Q. 2. Do you agree that the existing arrangements with respect to the "076" number range adequately fulfil the current requirements of VoIP service providers?

Q. 3. Do you agree with Analysys' comment that the "076" number range could be used as a single point of contact across a variety of access mechanisms?

2.2.2 Views of Respondents

Of the respondents who replied to this question, the majority were in favour of the current interconnection settlement rates, although two did comment that further rates may be required in the future in order to allow for a multitude of service offerings. One respondent strongly believes that the existing interconnection settlement rates should be removed, and the market allowed to find its own equilibrium in this respect, as arbitrage could, "*allow VoIP service providers to book settlement rates as a source of hidden revenue*". The respondent likens this scenario to the mobile world, where mobile network operators "… *may be charging termination rates that far exceed their costs*."

On the other hand, one other respondent believed that this system is both transparent and easily understood by end users.

Most respondents agreed that, going forward, the "076" numbers could be used as a single point of contact in a technologically converged world. Two (mobile) respondents disagreed however, believing that this premise was not sufficiently explored and in any case lies outside the scope of this consultation.

2.2.3 Commission's Position

Having considered the views expressed by all respondents, ComReg is satisfied that introduction of the current interconnection settlement regime facilitated VoIP service providers in successfully launching new competing services using the "076" number range. ComReg again emphasises that the availability of this initial interconnection

settlement rate does not preclude interconnected operators from negotiating further settlement rates.

Having considered the views expressed by all respondents, ComReg does not believe that there is any evidence of market distortion at this time.

The "076" number range was initially launched in October of 2004. Following several immediate applications for, and allocations of, these numbers, it became apparent that none of these allocations were being activated on the PSTN. In light of this ComReg undertook a subsequent consultation, which set out its opinion and reasons why further intervention was required to facilitate the opening of this number range. These reasons included the continuation of the fundamental telecommunications principle, that of any-to-any communication (i.e. the ability to call any telephone number from any other telephone number). ComReg considered all responses to this document, and the resulting document (Decision Notice D5/05[7]) was published in March of 2005.

Further to the discussion regarding the possibility of the "076" range of numbers becoming a mechanism allowing consumers to have a single point of contact, ComReg believes that this issue will be more appropriately dealt with by the marketplace. Nevertheless, if, in the event of such demand, and if intervention by ComReg is required for whatever reason, this will take place in an appropriately transparent and proportionate manner and only after sufficient consultation with all stakeholders.

[7] ComReg document 05/23

3 Voice Services: Associated Obligations & Consumer Issues

3.1 Provision of Voice Services and Associated Obligations

3.1.1 Summary of consultation issues

The term Voice over Internet Protocol (VoIP) can be applied in many different contexts. A VoIP service could be one that is indistinguishable by the end-user from a traditional PSTN service offering the same functionality as a traditional service including the use of a handset, or it could be one that looks and feels very different to the traditional service (e.g. it may use a PC and a headset instead of a handset). In some cases the consumer may expect to surrender their existing PSTN subscription entirely, and rely on a different type of access mechanism, e.g. cable or wireless broadband access.

All service providers intending to offer an electronic communication service to the public must provide a notification to ComReg of this intention. This notification entitles the service provider to a General Authorisation, which is subject to a set of conditions.

Further to these conditions, all services which qualify as Electronic Communications Services (ECS) must comply with a basic set of legislative obligations. If the service further satisfies the criteria to be categorised as a Publicly Available Telephone Service (PATS), then further legislative obligations apply. Perhaps the most crucial difference between the provision of an ECS or PATS is that when providing a PATS VoIP service, access to the emergency services **must** be ensured. Other PATS-related obligations include user rights such as access to directory inquiry and operator assistance services, the right to have an entry in a directory, and various network related obligations[8].

Because of the variety of categorisations and different services that can be offered using VoIP, and because there can be varying levels of consumer protection with these different services, it is vital that consumers are aware of the differing varieties of VOIP available in the marketplace and the services they can offer. The failure of service providers to clearly define what consumers should expect could potentially result in some damage to the VoIP market. Further to this, in July 2005, ComReg issued a set

[8] See ComReg document 05/50 (Guidelines for VoIP Service Providers on the treatment of consumers) for a full explanation of the obligations and rights of telecommunications service providers.

of guidelines to VoIP service providers that clearly explained their obligations, and how service providers should comply with them.

Despite the above measures, it was apparent from the discussions between Analysys and the various service providers, that there was confusion as to exactly what constitutes a PATS. In order to ensure that both consumers and service providers could establish exactly what types of services should be offered with these classifications, ComReg proposed that a consumer-oriented register be established to clearly identify whether the services offered by each individual service provider are classified as PATS or ECS, and to describe also the key obligations of each of these categories. ComReg noted that this would enable consumers to verify exactly what was being offered by their service providers and what their obligations in this regard were. It would also enable service providers to ensure that they were correctly classified[9].

In addition to those obligations that result primarily from the Universal Service legislation, obligations may also result from the market review process. If, as a result of this process, an Undertaking is designated as having Significant Market Power (SMP), appropriate obligations may be imposed. These may take the form of remedies intended to resolve the competition problems identified during the review process. Such obligations lay outside the scope of the consultation.

Q. 4. Do you agree that ComReg should publish and maintain a list, aimed at consumers, of those VoIP services classified as PATS and those classified as ECS, in order that the consumer might have a clear reference point of which obligations their Service Provider ought to offer? If not, are there alternative approaches that you would rather see?

3.1.2 Views of Respondents

Of the respondents who replied to this question, three believed that such a register would confuse consumers, who would not necessarily be familiar with the concepts of ECS and/or PATS. One respondent felt that the register would not be used in the manner envisaged. Another believed that while the register might be a useful resource, it may only have a marginal impact. All respondents felt that it is important to ensure that the consumer is aware of any limitations in the product being sold to them. One

[9] When notifying ComReg of their intention to carry on communication services in Ireland, VoIP service providers should take careful note of the existing VoIP framework, including ComReg documents 04/103 and 05/50.

respondent did feel however that the creation of such a register may have a negative impact on those services that do not fulfil the PATS' criteria, by creating the idea that these services are in someway inferior. One view was expressed that the correct opportunity to explain these differences to consumers was at the point of sale.

3.1.3 Commission's Position

ComReg accepts that the majority of respondents opposed the creation of such a register, suggesting that it might only serve to confuse consumers, and at worst might create an assumption that services classified as ECS are in someway inferior (rather than different) to those classified as PATS. This was never ComReg's intention. It remains a key principle of ComReg however, that consumers and end-users should be aware of any important limitations of the service of which they may avail. To that end, when dealing with complaints against or disputes involving VoIP SPs, ComReg will take into account the extent of their compliance with the VoIP guidelines[10]. Service providers will also be expected to place a prominent link to these guidelines on their website. As a specific step, VoIP Service Providers must immediately ensure that the ECS/PATS classification of their services notified to ComReg is correct and re-notify if necessary following any corrections.

3.2 Access to Emergency Services

3.2.1 Summary of consultation issues

The guaranteed provision of uninterrupted access to the emergency services is required of any service classified as PATS. This access must be provided free of charge to the end-user. Although it is not obligatory for ECS service providers to offer the same level of uninterrupted, guaranteed access to the emergency services, ComReg has in the past strongly encouraged that this be offered. In any case, if limitations with respect to this access exist, the customer must be clearly informed of these. The approach that service providers offering ECS VoIP services should take has been previously set out by ComReg 05/50[11]. This approach includes providing clear information to this effect to all potential *users* (and not just customers) of the service at the points of sale and use and in any user guide provided by the service provider. It was also noted that those Undertakings that operate public telephone networks[12] are obliged to provide caller location information[13] to the emergency services.

---

[10] ComReg document 05/50 (Guidelines for VoIP Service Providers on the treatment of consumers)

[11] Section 4.5.1 of ComReg 05/50

[12] Public Telephone Network (PTN) means an electronic communications network which is used to provide publicly available telephone services; it supports the transfer between network termination points of speech communications, and also other forms for

3.2.1.1 Nomadic use

During the interviews held by Analysys Consulting, stakeholders agreed that nomadic users of their services did create a particular challenge for providing access to emergency services. This was despite the current relatively low proportion of consumers using the VoIP service in a nomadic manner. In the consultation paper, ComReg encouraged service providers to develop solutions that would support the provision of call location information, as a minimum by enabling users to manually update their contact information whenever they are moving their locations.

Q. 5. Are you in agreement with ComReg's comments on how access to emergency services should be handled in a VoIP context?

Q. 6. Do you consider that the VoIP service providers should be required to implement a process to ensure that the current location of nomadic users is kept up to date for the purposes of providing caller location information to the emergency services agencies? How would you consider that this might best be achieved?

3.2.2 Views of Respondents

The majority of respondents agreed with the principal objective outlined by ComReg, although differing in the practicalities of achieving this.

One party agreed fully with ComReg and the position it has set out in relation to dealing with calls to the emergency services. This party did not however favour making mandatory a process to ensure that the caller location information of nomadic users be provided to the emergency services agencies, specifically because there is a current absence of established standards governing this process.

A further respondent felt that most service providers offering a telephony service would want to include at least basic access to the emergency numbers 112 and 999. This respondent felt that the provision of this service should not compel the provider to notify itself as a fully PATS-compliant service and that these service providers should have the choice to opt-in or out of providing such a service. This party felt that providing a mechanism whereby current caller location information could be made available to the emergency services agencies would be too expensive to implement, and may not be technically feasible. For those service providers offering services classified as PATS, the party felt that technical challenges such as these should be

communications, such as facsimile and data. (S.I. No. 308 of 2003) (Universal Service Regulations)

managed through co-operation between the service providers and the call handling agencies and emergency authorities.

Another respondent was concerned that the existing requirements around access to the emergency services do not incentivise service providers to provide this facility. This party cited research by Ofcom (the UK regulator) which noted that consumers would not purchase a primary phone replacement if this service did not offer this type of access. This respondent suggested that research be carried out in an Irish context in order to determine the best way to approach this issue. This party further noted that since the emergency service call answering facility is currently under review by the Department of Communications, Marine and Natural Resources (DCMNR), any future requirements of VoIP service providers should be taken into consideration during this review.

A provider of VoIP services indicated that it does not offer access to the emergency services, because it could neither guarantee the successful completion of such a call nor ascertain the location of the caller. Customers are specifically informed that this is the case. This particular service is not marketed as a fixed line replacement service. This respondent noted that there is currently no satisfactory technical solution to support the identification of the location of nomadic users, though there are bodies seeking to resolve this issue. Given these considerations, this respondent felt that it would be unwise for a regulatory requirement to be mandated on service providers prior to a technical solution being available.

One respondent also agreed with ComReg in relation to this issue, but noted that the delivery of a voice service is also conditional on a power source being available. That response also noted that Ofcom had a policy of forbearance, i.e. if a service provider wished to provide access to the emergency service it would not automatically be considered to be providing a PATS service. This respondent made the point that the location of the caller cannot always be verified, due to the nomadic nature of VoIP. Because of this, and the absence of established standards to deal with this issue, ComReg should not make this a mandatory requirement at this time.

One mobile operator felt that access to the emergency services should be available irrespective of the technology used to provide the voice service. Where the caller location information is available, that too should be provided to the extent feasible. This operator also believed that a process that allows users to manually update their

[13] S22(2) of S.I. 308 of 2003 (Universal Service Regulations)

location could be implemented, if the cost of implementation did not outweigh the benefits. Alternative solutions should be implemented as they become available.

3.2.3 Commission's Position

ComReg notes and welcomes the responses to this particularly important issue. As quoted in the original consultation, Recital 36 of the Universal Service Directive clearly states that

> *"It is important that users should be able to call the single European emergency number "112", and any other national emergency telephone numbers, free of charge, from **any** telephone."*

In line with current legislation, (which has been clearly set out in the VoIP guidelines (ComReg document 05/50)) service providers who offer a service classified as PATS must offer guaranteed, free-of-charge access to the emergency services numbers 112 and 999. This is not optional, and should not be seen as such.

Service providers who offer services classified as ECS, and that use numbers, must ensure that customers are advised of any limitations of their services (including, but not limited to the provision of guaranteed access to the emergency services), vis-à-vis what those customers might legitimately expect compared with what would traditionally be expected from a service classified as PATS. For the avoidance of doubt, this is not an option as ComReg has previously directed on this matter[14].

For other services that do not use numbers, ComReg expects service providers to make certain that both customers and end-users are made aware of any such limitations.

ComReg will continue to monitor international developments by standards bodies as well as any applicable practical processes experienced in other countries, and evaluate these in an Irish context. ComReg also notes and, where appropriate, will continue to work/liaise with the Department on this issue.

These comments are in line with past formal decisions made by ComReg, and therefore no further new decisions are required here.

[14] Decision 2 of ComReg 04/103.

3.3 Number Portability

3.3.1 Summary of consultation issues

Number portability allows consumers to change their service provider, whilst retaining their telephone number, and is a key facilitator of consumer choice and effective competition. Its availability in the mobile market has seen an increase in the mobility of consumers across mobile service providers, thus increasing competition in that market. Legally speaking, it is both an obligation and a right between those service providers offering PATS services, regardless of the technology used to deliver those services. Number portability is also a reciprocal obligation, in other words, if a service provider wishes to be a recipient of number portability, it must also be prepared to be a donor.

In ComReg document 04/103, and pursuant to the decision to allow allocation of geographic and non-geographic numbers to ECS service providers[15], ComReg decided[16] that as a condition of allocation, those service providers are required to support number portability, once it is offered on a reciprocal basis. This is currently achieved using existing geographic and non-geographic number portability processes. For the new range of "076" numbers, full reciprocal number portability must be supported by all number assignees. As a matter of practicality and proportionality, ComReg has decided to defer these number portability obligations for the "076" range of numbers until early 2007 or until a significant quantity of these numbers are in active use, whichever comes first. It was proposed that this implementation should occur at an appropriate stage during the first 6 months of 2007. At that stage, a suitable approach could be to introduce a new number portability process specifically for the "076" range of numbers that would retain the inherent flexibility that IP offers, although the option of extending existing processes to "076" is also not precluded.

3.3.2 Existing process

Separate processes, agreed by industry members, already exist for both geographic numbers and non-geographic numbers (of which the "076" range is part). The purpose of these processes is to define the method for establishing and maintaining the Geographic and Non-Geographic Number Portability (GNP and NGNP) service between operators. Although these processes are fully functional, the primary purpose of such a process can be achieved in a simpler manner on an all-IP network. ComReg therefore proposed that it may be more appropriate, to put in place a new process for the porting of numbers from the "076" range. Such a new process could take

[15] Decision 2 of ComReg document 04/103
[16] Decision 12 of ComReg document 04/103

advantage of technologies such as ENUM and also fully leverage the adaptability of IP.

Q. 7. Do you agree that the existing processes for number portability (for both regular geographic and non-geographic) are adequate, for use in a VoIP context?

Q. 8. Do you consider that a number portability process developed specifically for the "076" range of numbers might be beneficial (i.e. cheaper and quicker) in terms of retaining the inherent flexibility of IP and should be further explored?

3.3.3 Views of Respondents

The majority of respondents agreed that existing number portability processes would be sufficient to offer this facility to consumers, in the short to medium term, subject to low levels of actual porting. There was a general theme through most of the responses reflecting the feeling that as the level of porting increases, these manual processes will have to be upgraded and streamlined to an automated process that facilitates efficient and cost-effective porting. Furthermore, it was generally agreed amongst respondents that having numerous porting processes for each number type is both expensive and inefficient. One party noted that as porting in an all-IP world is a relatively trivial issue, regulatory intervention should not be required.

One respondent felt that number portability should be strictly limited to those services classified as PATS. This party believes that if number portability is available to service providers opting-out of offering a PATS service; this could confer on them an unfair opportunity, thus distorting market development. One mobile service provider felt that further safeguards may need to be put into place to protect the transfer process given that the characteristics of VoIP services may be different to those of conventional services.

3.3.4 Commission's Position

The current position of ComReg on number portability has been set out in ComReg document 04/103, and is summarised below.

Currently, those service providers offering services classified as PATS must offer number portability, regardless of the number type involved. This is also a right of these service providers, as number portability works on a reciprocal basis: those who

receive numbers from other service providers must also offer them. This right/obligation is clearly outlined in the current legislation[17].

All service providers offering service that use a number from the "076" range must also support number portability; this has been a condition of allocation of these numbers from the onset.

All those providers offering services classified as ECS using geographic or non-graphic numbers (apart from numbers from the "076" range) must offer number portability to a PATS provider, once it is offered on a reciprocal basis.

ComReg continues to believe that number portability is a crucial mechanism that encourages the development of competition in the telecommunications market. Ensuring that a user can retain their telephone number reduces the switching costs that that user suffers in transferring to an alternative supplier.

Having considered all responses, ComReg believes that given the current level of VoIP uptake in Ireland and notwithstanding the practical issues associated with the actual process of number portability, the current situation should be maintained for the immediate future. This means that, number portability rights are guaranteed to those service providers offering services classified as PATS, as well as those (PATS or ECS) providing services based on the "076" range, and using existing GNP or NGNP processes. While ComReg agrees that multiple processes can lead to inefficiencies in terms of implementations and resource requirements, it does feel that given the importance of number portability it is necessary to ensure that all users are able to avail of this facility as soon as possible. Nevertheless, ComReg shares the view that the possible use of new more efficient processes (e.g. in principle for VoIP purposes) should be considered and will therefore raise this as an issue to be addressed by the appropriate industry process group at the earliest opportunity.

3.4 Calling Line Identification (CLI)

3.4.1 Summary of consultation issues

Calling Line Identification is a mechanism that displays the number of the calling party on the called party's phone. While there may be technical differences in the way that CLI is provided over IP and PSTN based networks, ComReg's position (as put forward in the original consultation paper) was that CLI should only be provided if its veracity

[17] S26(1) of S.I. 308 of 2003 (Universal Service Regulations)

can be guaranteed. If this cannot be guaranteed then the CLI must be set to "Unavailable". Detailed guidelines, which have been adopted by ComReg, have been documented by the European Telecommunications Platform (ETP), in Issue 4 of "Guidelines for Calling Line Identifications" [document number (02)51][18]. Prior to this consultation no stakeholder interviewed by Analysys Consulting indicated they had technical problems related to VoIP in complying with these existing requirements around CLI.

Q. 9. Do you agree that the existing guidelines surrounding the use of CLI are reasonable and technically feasible in a VoIP context? Please give a brief explanation if you disagree.

3.4.2 Views of Respondents

All respondents who answered this question felt that the existing requirements are adequate, reasonable and can be implemented in an IP context. Several parties commented that if any changes to these guidelines are required, these changes should be discussed by the Numbering Advisory Panel (NAP) prior to their implementation.

3.4.3 Commission's Position

ComReg agrees that the existing requirements are reasonable and adequate, and is pleased to note the agreement that they are appropriate to the IP context. Should any changes be required due to developments in the marketplace, ComReg also agrees that these should be discussed by the NAP prior to their implementation.

3.5 Access to Directory Inquiry Services and Directory Listings

3.5.1 Summary of consultation issues

A listing in the National Directory Database (NDD) must be offered to customers of any service classified as PATS. Directory Inquiry and Operator Assistance services must also be offered by these VoIP PATS providers. ComReg believes that these services should be offered as a matter of public service, and therefore should also be available to users of ECS services. During the pre-consultation interviews, both PATS and ECS VoIP service providers stated that they have not experienced or do not anticipate any technical difficulties in providing the aforementioned services to their users.

Q. 10. Do you have any particular comments on the topic of VoIP services and the provision of Directory Inquiry and Operator Assistance Services, and Directory Listings?

[18] http://www.etp-online.org/downloads/02_051_CLI_Guidelines_Sep_2002.pdf

3.5.2 Views of Respondents

Of the parties who responded to this question, one commented that if a service provider is offering a service classified as PATS, then all the relevant obligations must be fulfilled. One fixed line operator felt that only those providers offering PATS should be obliged to offer an NDD listing, Directory Inquiry and Operator Assistance services, although services not offering these services should ensure that customers clearly understand this.

Another respondent felt that an NDD listing should not be mandatory, and should be left as a matter of end user preference.

3.5.3 Commission's Position

Customers of those services classified as PATS must be able to have their number listed in the National Directory Database (NDD), should they so choose, as well as providing access to Directory Inquiry and Operator Assistance services. This is in line with the PATS obligation clearly set out in the Section 21 of the Universal Service Regulations. Although services classified as ECS are not obliged to offer these facilities, it is entirely possible that a combination of market demand and a desire to be seen as offering a full product listing will ensure that these services are provided to the majority of ECS customers. In any case, ComReg encourages ECS providers to offer some or all of these facilities. Where ECS operators are not themselves providing such facilities, it should normally be possible to route customers to the facilities offered by one or other PATS provider.

3.6 Quality of Service and Network Integrity

3.6.1 Summary of consultation issues

Some VoIP services may have limitations in respect of network performance that may impact the reliability and/or general quality of service experienced by consumers. These limitations could include a lack of in-line power to handsets and interruption of communications. Many of the stakeholders interviewed by Analysys Consulting agreed that consumers should be informed of these limitations. Some of these referred directly to ComReg's guidelines[19] on this and on related issues. Quality of service, particularly voice quality, seemed to affect those providers who did not have control over the underlying access network. However, it was generally expected that quality issues will lessen as greater bandwidth becomes available to the end user.

[19] ComReg document 05/50

In ComReg's initial policy document on VoIP services, it clearly stated that a condition of allocation for numbers from geographic ranges is to ensure that customers are advised in their contracts (at a minimum) of "limitations of their service vis-à-vis what those customers might legitimately expect compared with what would traditionally be provided by a PATS service"[20]. This condition applies regardless of the classification of the service which is being provided. ComReg has advised on how this can be done in the aforementioned guidelines document.

Q. 11. Do you have any proposals on how the existing guidelines (specifically with relation to quality of service and network integrity issues) could be further clarified or improved to best serve the consumer interest?

3.6.2 Views of Respondents

Of those respondents who replied to this question, three agreed that the existing guidelines are adequate. Of these, two commented on the fact that there seems to be no detailed minimum requirement for services classified as PATS. One party felt that given the current nascent stage of the market for VoIP services, continued review of the market and the application of these guidelines should be carried out on an ongoing basis. Another respondent felt that existing legislatively based network integrity requirements may not be technically possible in the context of VoIP services. This respondent believes that these requirements are more applicable in a PSTN environment and that any limitations in the prospective service should be communicated to the customer at the point of sale, where there is an opportunity to ensure that there is an available alternative, rather than at the point of use, where such an alternative may not be available.

3.6.3 Commission's Position

ComReg is pleased to note the support for its VoIP guidelines. These set out how service providers of VoIP services should inform their customers and end-users as to how the service being offer would differ from that which might legitimately be expected or that they had traditionally experienced. ComReg acknowledges there may be a point regarding the application of PSTN-centric network integrity requirements, but believes that once consumers are sufficiently informed of the service they can expect to experience, they will be able to make informed decisions relevant to their respective situations. ComReg also believes that as the national telecommunications network migrates towards a network based primarily on an all-IP platform (i.e. a Next Generation Network (NGN)), requirements regarding network integrity are likely to be

[20] Decision 2(d) of ComReg document 04/103

specified accordingly. Having considered the responses, ComReg concludes that no changes need be made to the guidelines at this time in respect of network integrity or call quality.

3.7 Port blocking and service degradation

3.7.1 Summary of consultation issues

Activities such as port blocking[21] can result in the degradation of the service experienced by VoIP users. Although some stakeholders mentioned that port blocking is an issue that is becoming more prevalent, they also pointed out that this did not currently seem to be a deliberate tactic on the part of the port blockers. Port blocking can take place at the modem used by the user or at any point in either the directly or indirectly connected ISP's network.

Q. 12. Do you agree that the deliberate practices of port blocking or other forms of deliberate service degradation is in principle unacceptable, and if special cases arise then the party carrying out the blocking/throttling must inform the affected parties?

3.7.2 Views of Respondents

All respondents felt that deliberate port blocking or service degradation was unacceptable or intolerable, but equally, no one felt that this was currently an issue in the marketplace. One party felt that ComReg should have the ability and authority to intervene in the event of these practices becoming commonplace, whilst another party felt that the market was best placed to deal with these issues. Two parties felt that it was important that network operators should be allowed to prioritise traffic and ensure effective network management. On the other hand, it was felt by one operator that port blocking and service degradation should be openly condemned and the practices would be incompatible with the fundamental rights of citizens to receive and impart information without interference.

[21] A "port" is an IP subaddress. IP has 36,000 ports; "well-known" port numbers are usually assigned to specific protocols and applications and the other ports are available for use by miscellaneous applications, for example, e-mail, HTTP, Telnet, FTP, and protocols such as SIP. Port blocking and throttling are commonly used as tools to optimise network performance. If however a VoIP service uses one of these "well-known" ports, and this port is blocked, or its service throttled or degraded, this will affect users' ability to use VoIP.

3.7.3 Commission's Position

ComReg is pleased to note respondents views that there aren't any current pervasive issues with deliberate port blocking or service degradation resulting in the degradation of VoIP service in the Irish market. In general, ComReg agrees with respondents that such practices are unacceptable and should be condemned when discovered. ComReg also supports the view that at least initially the marketplace ought to be allowed to deal with any such issues should they arise. However ComReg would reserve the right to intervene should such an approach prove to be ineffectual.

4 Interconnection

4.1 Introduction

4.1.1 Summary of consultation issues

Interconnection between IP-based and PSTN-based service providers can be provided by a number of mechanisms, utilising either circuit-switched technology or IP interconnection. IP-to-IP interconnection already occurs quite seamlessly, while the "076" range of numbers allows IP-PSTN interconnection. The latter requires that a gateway exists at the point of interconnection, which translates the IP packets to circuit-switched traffic and vice versa. Currently, separate gateways exist for each path of interconnection, which implies a cost of implementation. Where several gateways are traversed through certain call types, the resulting multiple translation of the traffic may result in service degradation.

As already noted, interconnection on an all-IP level already operates successfully. In the consultation paper, ComReg described in some detail the two main methods of interconnection in this context, peering and transit arrangements. Peering arrangements generally do not involve any billing procedure, while transit arrangements generally do, albeit not in the traditional per-unit sense. Stakeholder discussions revealed that parties who interconnect in this manner do not perceive the costs involved in this translation to be significant, and a requirement for a regulated product did not seem to exist. Interconnection between parties is normally a matter of commercial negotiation (apart from that involving the operator designated with Significant Market Power (SMP), in which case any wholesale interconnection offer is explicitly prescribed by the Reference Interconnect Offer (RIO)).

Q. 13. Do you believe that there is any requirement at this stage of development in the Irish VoIP industry for commercially negotiated VoIP interconnection products? If so, how would you see this occurring?

4.1.2 Views of Respondents

Of those respondents who replied to this question, most felt that between the existing arrangement and the possibility of negotiating future, more technologically efficient ones, the issue of interconnection should be more appropriately left to the market to handle. Commercial negotiations would therefore be the appropriate mechanism. One respondent did feel that ComReg should only intervene if there is demonstrable market failure or where there is a lack of cost effective wholesale IP access offerings.

4.1.3 Commission's Position

ComReg currently agrees with the common position put forward by the respondents to this issue, i.e. that any new VoIP interconnection product should be brought about through commercial negotiation between interested parties. Nevertheless, if a situation of market failure were to arise, ComReg is obliged to intervene in order to redress the situation. Likewise, if any authorised provider comes to ComReg with a dispute with another authorised party, ComReg is obliged to investigate and if necessary intervene[22].

4.2 Interconnection arrangements in the Internet world

4.2.1 Summary of consultation issues

4.2.1.1 Peering

Existing public Internet interconnection arrangements typically use a standard peering agreement. This can either be through a public peering mechanism, such as the neutral peering exchanges available in many different countries, or through a private arrangement between two or more internet service providers. In the latter case, the size of an ISP will dictate the bargaining power that they can leverage in negotiating independent peering arrangements with others. Smaller ISPs are generally unable to gain access to these types of arrangements and therefore are more visible as members of neutral exchanges.

4.2.1.2 Transit arrangements

Transit interconnection arrangements in the context of the public Internet are different from peering arrangements in that they involve a separate charge for traffic. Some neutral Internet exchanges offer IP transit products and act as a clearing house for the interconnecting parties. One advantage of using an exchange rather than negotiating an independent agreement with an individual transit partner is the availability of many potential partners, at probably better terms.

Q. 14. Do you believe that the current IP interconnection arrangements are satisfactory? Are there any areas which you believe would benefit from further development? If so, please give a brief description of these.

[22] Section 31 of the Framework Regulations 2003.

4.2.2 Views of Respondents

Although the respondents to this question gave varying answers, a theme amongst them was the request that ComReg should facilitate a discussion on Next Generation Networks (NGNs) by industry stakeholders. Further measures at this time were considered to be unnecessary by one network operator.

4.2.3 Commission's Position

ComReg agrees that extensive discussions on Next Generation Networks (NGNs) and their implications for the interconnection models currently used in the Irish marketplace should take place between industry stakeholders. In light of this ComReg will facilitate a number of bi- and multi-lateral meetings with these stakeholders in the near future, the purpose of which will be to establish the groundwork required to ensure that the migration to NGNs will be as smooth and efficient as possible.

5 Future Work

5.1.1 Summary of consultation issues

ComReg has consistently been pro-active in relation to the introduction and facilitation of new and innovative products such as VOIP that can benefit end-users in terms of enhancing choice and competition. The availability of both geographic and non-geographic numbers for these services has enabled the initial migration of users from the PSTN to VoIP. ComReg will continue to monitor the Irish VoIP market, together with other national and international developments in the IP world.

ComReg noted that other elements that could impact on this existing VoIP framework include the present review of the 2003 Regulatory Framework by the European Commission, the ongoing market review process, and the introduction of various technological-based changes, including NGNs, ENUM and/or alternative access network such as WiMax.

ComReg continuously encourages industry members to discuss these technical inter-operator issues together, that they might better understand the impacts these technologies might have on all aspects of their business models and how they might affect their future evolution in the marketplace. The formation of a body to represent and communicate the interests of members to policy makers, the wider business community and the various consumer bodies could be one method of facilitating such discussion.

ComReg finally noted that the document "Guidelines for VoIP Service Providers on the treatment of consumers" may be updated, depending on the outcome of this consultation paper.

Q. 15. What further measures could VoIP service providers and/or ComReg undertake in order to increase consumers' awareness of the "076" number range, and the benefits, limitations and related issues associated with VoIP services?

5.1.2 Views of Respondents

The majority of respondents to this question felt that no further intervention by ComReg was required in the market at this time. One party felt that an important challenge for both ComReg and the wider industry is to ensure that consumers are well educated as to the services and technology available without discouraging developments in the sector. This education should include the advantages as well as disadvantages of such services,

and comparative information could be made available on ComReg's consumer website, www.askcomreg.ie.

5.1.3 Commission's Position

ComReg agrees that consumers should be clearly informed regarding any significant differences between innovative VoIP services and any limitations that might be experienced vis-à-vis traditional PSTN based services. It was always ComReg's expectation that the advantages of such new services would be clearly marketed to consumers. It is ComReg's opinion that the primary source of such information to the consumer should be the service provider, as it is the service provider who is best placed to describe their product or service. On the other hand, ComReg notes that an independent source of unbiased information can be a valuable tool to any consumer wishing to investigate alternative telecommunications services. Recognising this, ComReg will ensure that the short, jargon-free, user guide entitled "Voice over Internet Protocol (VoIP): A Guide"[23], together with the aforementioned Guidelines for Service Providers, are published on ComReg's consumer-orientated website www.askcomreg.ie.

Given the concerns expressed by many respondents in relation to the specific issue of accessing emergency services, ComReg will also undertake to consider this issue further in its future work program.

ComReg previously noted that various elements may impact this VoIP framework and the regulation of VoIP services in general. One such element is the review now underway of the 2003 Regulatory Framework by the European Commission. If it is the case that any amendments to this VoIP framework become necessary as a result of this review, these will be carefully considered and where required, implemented in a transparent and careful manner.

Another important element that could possibly impact this VoIP framework is the ongoing market review process. The issues discussed in this and previous VoIP documents have been primarily related to Universal Service obligations. It has been noted, but is important to restate, that any obligations that result from this market review process (i.e. remedies imposed as a result of the finding of SMP in a relevant market) are dealt with in a separate workstream, and entirely distinct from those discussed here.

Developments outside the narrow VoIP arena may also have a dramatic impact on the development of the market for such services. The widespread adoption or implementation of Next Generation Networks could be one such development. In line

[23] ComReg document 04/103a

with the opinions expressed in this document, ComReg will initiate a set of bi- and possibly multi-lateral meetings to discuss the implications of such a development.

As a final point, ComReg reiterates the obligation on all authorised providers to ensure that they are correctly authorised for the services that they provide, and to re-notify ComReg if this is not the case.

Appendix A – Legislation

"Authorisation Regulations" means the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2003 (S.I. No. 306 of 2003).

"Framework Regulations" means the European Communities (Electronic Communications Networks and Services) (Framework) Regulations, 2003 (S.I. No. 307 of 2003).

"Universal Service Regulations" means the European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulation, 2003 (S.I. No. 308 of 2003).

Regulation 22 of the Framework Regulations, vests ComReg with the responsibility of administering the national telecommunications numbering resource. Regulation 14 of the Authorisation Regulations requires ComReg to define the conditions to be attached to rights of use of numbers.

Appendix B - Acronyms

CLI (Calling Line Identifier) is a facility that enables identification of the number from which a call is being made.

CPS (Carrier Pre-Selection) is the facility offered to customers which allows them to opt for certain defined classes of call to be carried by an operator selected in advance (and having a contract with the customer), without having to dial a routing prefix or follow any other different procedure to invoke such routing. The CPS operator need not be the access provider.

DDI (Direct Dial In) is a switchboard's capability to route an incoming call to the extension dialled without the intervention of an operator.

E.164 Standard is an ITU-T standard that defines the international public telecommunication numbering plan.

ECN (Electronic Communications Network) means transmission systems and, where applicable, switching or routing equipment and other resources which permit the conveyance of signals by wire, by radio, by optical or by other electromagnetic means, including satellite networks, fixed (circuit- and packet-switched, including Internet) and mobile terrestrial networks, electricity cable systems, to the extent that they are used for the purpose of transmitting signals, networks used for radio and television broadcasting, and cable television networks, irrespective of the type of information conveyed.

ECS (Electronic Communications Service) means a service normally provided for remuneration which consists wholly or mainly in the conveyance of signals on electronic communications networks, including telecommunications services and transmission services in network used for broadcasting, but excludes:

(a) A service providing, or exercising editorial control over, content transmitted using electronic communications network and services; and

(b) An information society service, as defined in Article 1 of Directive 98/34/EC, which does not consist wholly or mainly in the conveyance of signals on electronic communications networks.

ENUM (Electronic NUMbering or alternatively tElephone Number Mapping) is a protocol for converting an ordinary telephone number into a format that facilitates Internet-based look-up of any kind of addressing information.

ETP (European Telecommunications Platform) is a body that deals with the needs of the European telecommunications market from the point of view of industry. Its remit includes: the European regulatory framework, its implementation, the converging communications sector, and the global information society.

IETF (Internet Engineering Task Force) is the Internet standardisation body.

ISP (Internet Service Provider) provides Internet service to consumers.

MNA (Minimum Numbering Area) is a defined geographic area that is equal to or one of a few subdivisions of an STD area. Location portability (of geographic numbers) may not extend beyond an MNA's boundaries, for practical (PSTN-oriented) reasons.

NDD (National Directory Database) is a record of all subscribers in the state, including those with fixed, mobile and personal numbers, who have not refused to be included in that record.

NNC (National Numbering Conventions) is the set of rules under with the Irish National Numbering Scheme is managed and administered. It includes the conditions of use for different number types.

NP (Number portability) between operators enables a customer to transfer from one operator to a second operator, while retaining the same number provided the customer remains at the same address or at least within the same MNA. *Note GNP refers to Geographic NP and NGNP to Non-geographic NP.*

NRA (National Regulatory Authority) is the relevant regulatory authority in each country. In Ireland, the NRA is ComReg.

PATS (Publicly Available Telephone Service) means a service available to the public for originating and receiving national and international calls and access to emergency services through a number or numbers in a national or international telephone numbering plan, and in addition may, where relevant, include one or more of the following services: the provision of operator assistance, directory inquiry services, directories, provision of public pay phones, provision of service under special terms, provision of special facilities for customers with disabilities or special social needs or the provision of non-geographic services or both.

POP Point of Presence is a facility where the local telephone exchange, switch, transmission equipment, etc. is located.

Port Blocking A "port" is an IP sub-address. IP has 36,000 ports; "well-known" port numbers are usually assigned to specific protocols and applications and vice versa, for example, e-mail, HTTP, Telnet, FTP, and protocols such as SIP (Session Initiation Protocol) used by VOIP. If a VoIP service uses one of these "well-known" ports, and this port is blocked, this will affect users' ability to use VoIP.

Public Telephone Network (PTN) means an electronic communications network which is used to provide publicly available telephone services; it supports the transfer between network termination points of speech communications, and also other forms for communications, such as facsimile and data.

Public Switched Telephone Network (PSTN) means **t**he telecommunications networks of the major operators, on which calls can be made to all customers of all PSTNs.

SMP (Significant Market Power). The Significant Market Power test is set out in various European Directives, including the Interconnection Directive, the Amending Leased Lines Directive and the Revised Voice Telephony Directive. It is used by the NRA to identify those operators who must meet additional obligations under the relevant directive. It is not an economic test; rather it requires a consideration of the factors set out in the test within a specified market.

STD (Subscriber Trunk Dialling) is another term for NDC (National Destination Code), without any dialling prefix (e.g. '0').

TDM (Time-Division Multiplexing) is a method of putting multiple data streams in a single signal by separating the signal into many segments, each having a very short duration. Each individual data stream is reassembled at the receiving end based on the timing.