

Emergency service access and the impact of compliance with General Conditions on VoIP providers

FINAL REPORT

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1 Introduction

VoIP services enable voice, data and multimedia services to be provided over a broadband Internet connection. This study focuses on the provision of voice call services, which is the feature common to all types of VoIP services.

There are four main types of VoIP voice call service: peer-to-peer services to make and receive voice calls over the Internet only, usually within the same application community; VoIP Out services to make voice calls over the Internet to the PSTN (Public Switched Telephony Network, the standard public phone network), but not to receive calls from the PSTN; VoIP In services to receive voice calls over the Internet from the PSTN, but not to make calls to the PSTN. Customers can be allocated an ordinary geographic number or a VoIP number (056); and VoIP In and Out services to receive voice calls over the Internet from the PSTN and to make voice calls over the Internet to the PSTN. Customers can be allocated an ordinary geographic number or a VoIP number (056).

This study considers the impact on VoIP providers of providing access to emergency services. Some providers surveyed provide VoIP and broadband (referred to as on-net VoIP providers)¹, others offer a VoIP service only (referred to as Internet-based VoIP providers)² and others are wholesale VoIP providers³. For those that do not currently provide access to emergency services, there is implied cost in enabling and properly administering emergency service access, as well as extra cost in call delivery. However, it is not simply the cost of calls and of the infrastructure necessary to make 999⁴ calls that is relevant.

One of the features of current European legislation means that if a VoIP service is available to the public, allows calls to and from ordinary national and international phone numbers, and provides emergency service access then it is likely to be considered a Publicly Available Telephone Service (PATS). PATS are subject to additional regulations (defined in terms of a set of general conditions) that place certain obligations on providers (e.g. a certain level of network integrity). This study also considers the consequential impact on VoIP providers of having to meet the general conditions for PATS.

2 Approach Taken

The primary input for this study was gathered by consulting a number of providers involved in the delivery of commercial VoIP services. In order to establish a broad picture of the relevant issues, a range of provider types was selected – some on-net providers, some Internet-based providers and some wholesale providers. In all, sixteen providers were consulted, though the content of the report is primarily based on information provided by the following:

- ❖ On-net providers, including BT, Thus, Orange Home UK (previously known as Wanadoo), Tiscali and Verizon
- ❖ Internet-based providers, including Vonage, Skype and Gradwell
- ❖ Wholesale providers, including Viatel, Gamma Telecom, Magrathea and Easynet

¹ These providers typically provide a VoIP service over their own broadband network.

² In this context, a retailer of a VoIP service to a customer that already has broadband service. A service provider may have some network resource but will probably not have control over the end to end path.

³ This includes providers of interconnect services.

⁴ In the UK, the emergency services can be accessed by calling 999 or 112, which is the EU-wide emergency services number. For the purposes of this study, “999” encompasses 999 and 112.

In each case, a nominated contact was sent a set of questions (see Annex 1) and was subsequently interviewed. The material differences (of size, product set etc) between the various providers consulted means that each of the interviews would focus on an intentionally general set of questions in a different way – the variance and consensus on the questions asked is summarised in Annex 2.

Supplementary information on the cost and capability of relevant technology was also sought from leading technology suppliers such as Alcatel and Cisco.

The main part of the report provides a general consensus view of the key issues in providing 999 access and the consequent impact of the PATS general conditions.

3 Cost of providing access to the emergency services

It is clear from the provider interviews that there is not an insurmountable cost barrier to the provision of emergency service access. This can be provided either by arranging for direct interconnection or by using a third party interconnect specialist. In both cases, the costs are likely to be medium (on the scale defined in Annex 1) for larger providers and low for smaller providers. They are, however, not insignificant, and would potentially be high enough to deter the smallest providers.

Irrespective of the interconnect option that is chosen, there are significant implications for the providers.

If direct interconnection is preferred, then considerable investment of time and effort has to be made as it is likely to take between 12 and 18 months to establish a fully operational interconnect with the emergency services provider. The main reason for this is exacting data format requirements – it is not easy to establish a fully compliant data set and then to complete a stringent series of data submission tests.

The alternative is to use one of the specialist interconnect providers (such as Gamma Telecom or Magrathea). As well as arranging physical interconnect, these providers can format the data supplied by the VoIP service provider so that it complies with that demanded by the emergency service operator. Whilst it lifts a significant burden from the VoIP provider in accessing emergency services, the use of an intermediary may cost more and also has operational implications.

The key issue in using a 3rd party to interconnect with the emergency service operator is that there may be a loss of flexibility, when compared to direct interconnect. This is because one of the items of data that can be passed to the emergency service operator is a code that is intended to identify the originating provider. On the premise that there would be a limited number of directly connected providers, there is little provision for a large supply of these codes. Hence, an intermediary, who may only have one or two identifiers, cannot readily indicate which of the providers it supports has originated a call. The consequence of this is that the emergency service operator cannot readily make direct contact with that provider if, for example, there is a need to confirm location information.

Whichever option is chosen by the VoIP provider to interconnect with the emergency services, there will be some set up costs.

- ❖ If direct interconnect is chosen, this will be a payment to BT or Cable & Wireless – the addition of a schedule to an existing interconnect agreement⁵ or the establishment of a new interconnect agreement.
- ❖ If interconnect via a 3rd party is chosen, the cost will be a direct charge levied by the chosen supplier.

In addition to this, there is the cost of the actual 999 calls (at a premium rate, about 50-60p per minute). They are free to the consumer but, in both cases, the cost has to be borne by the VoIP provider.

Establishing simple access to the emergency service operator is only a first step in a more complex chain of requirements. The two issues that need to be examined at the same time are the quality of location information that can be associated with a call and the ability to deliver the call reliably and without interruption⁶.

Traffic sent over the interconnect link to the emergency service operator can be marked according to type. A flag is available to identify the nature of voice traffic, so VoIP calls can be marked and, if required, a location check can be carried out. The extent to which accurate location information can then be provided varies according to the type of provider. VoIP providers that deliver services over an established network only assign a phone number (and, possibly, an IP address) to a customer. They rely, at present, on the customer to supply location information, which can be relayed to the emergency service operator. Some service providers are trialling more sophisticated location methods to cope with the nomadic potential of a VoIP customer, though this is expensive⁷ and yet to be deployed.

In the short term, the only realistic option open to a provider is to proactively check location on a regular basis but this still requires customer input. If the provider is also a network operator, it is possible to associate the customer's phone number with their location in much the same way as for a standard phone line. This requires separate pieces of data to be associated (Assigned telephone number, IP address, circuit identity, etc) and is a potential cost for some providers.

The integrity of the network over which an emergency service call is delivered is the subject of one of the general conditions for PATS and is discussed in the next section.

4 Consequential impact of the General Conditions

As stated above, the provision of emergency service access may result in a VoIP provider being classified as a PATS provider. This means that they would then be obliged to meet the general condition for PATS⁸.

The feedback from several of those consulted, notably the providers providing services (at least, in part) over 3rd party networks, was that the requirements of several of the general conditions would

⁵ For VoIP originated emergency calls, the relevant BT schedule is 125C, issue 4.

⁶ Both of these issues are, to some extent, addressed by the emergency service interconnect providers. For example, the recently issued BT schedule for VoIP-originated emergency calls (125C, issue 4) sets requirements for location information and call carriage standards. See http://www.btwholesale.com/application?pageid=editorial_one_column&nodeId=navigation/node/data/Pricing_and_Contracts/Reference_Offers/Telephony/navNode_Telephony

⁷ In the US, Vonage has demonstrated an automatic location detection system based on the user device. The development cost of the system is estimated at \$50M.

⁸ The definitions for all of the general conditions can be found at http://www.ofcom.org.uk/telecoms/loi/g_a_regime/gce/gcoe/

usually be met as a matter of good business practice. For instance, GC3, which requires proper and effective functioning of the network, would be a prerequisite in a competitive market. Hence the cost of meeting the condition would already be factored into operational plans. But this is not a universal view.

For on-net providers who currently provide a ‘best efforts’ service over their own network, a change in the regulatory position would have direct and significant impact. In particular, the additional equipment needed to increase the levels of service availability and resilience would have to be included as a cost of compliance for providers in this position.

Even for those providers who see GC3 superseded by good business practice, there is a caveat on the extent to which this general condition is met. This is concerned with their span of control. For example, an Internet-based provider that provides VoIP on top of a customer’s established broadband connection does not have direct control over the network that carries the call. They can manage the routers, servers and network links (e.g. Internet connections) under their own control and, in this respect meet the requirement of GC3. They cannot ensure network resilience where they have no visibility of the carrier⁹.

The notion of ensuring end to end integrity by establishing service level agreements (SLA) with all of the network operators that their service might use has been considered but discounted – not an issue of cost but more of impracticality.

The issue, which hinges on the separation of service provision and network operation, is explained in some detail in several of the responses to the initial consultation on VoIP (notably from Skype and Vonage). A couple of observations that do not appear in the consultation feedback are that most of the network operators that carry VoIP services are themselves VoIP providers so there should, in practice, be a common level of network integrity across services providers. In addition, the fact that the service levels contained in service level agreements are typically based on predicted performance modified by acceptable risk means that it is not feasible to establish a predictable overall level of service.

Most of the remaining general conditions were seen either as ‘business as usual’ or as being relatively straightforward to meet, in spirit, if not precisely. Taking each of the remaining GCs that apply to PATS in turn, the relevant issues are:

GC4 - Emergency Call Numbers, which requires access to 999 and 112 at no charge and, if technically feasible, to make caller location available

As explained in the previous section, this is not seen as being particularly difficult to achieve. The set-up costs (to arrange interconnect, to update procedures etc) and the ongoing costs (of the emergency service calls themselves) are not excessive and would be bearable for all but the smallest VoIP provider.

The time taken to meet this condition can be significant – in the order of a year – if the provider is setting up for the first time. Even if adding a schedule to an existing interconnection agreement, stringent data format requirements impose a burden on the provider.

Also, there is an apparent bottleneck for interconnecting to an emergency service operator when a VoIP provider chooses to interconnect with the emergency services through a 3rd party provider.

⁹ Ofcom has since clarified that VoIP providers should take all possible steps to ensure network integrity and reliability and should do so to the greatest extent possible, but only for the aspects of the network that they control. *Guidelines on the application of PATS obligations to VoIP service providers*, in *Statement on the Regulation of VoIP Services*, 29 March 2007, Annex 5

Finally, the accuracy of location information is, at present, largely dependent on customer provided data. It is possible for a VoIP provider that also supplies a customer's access link to map phone number to location but there is no guarantee that the result will be correct as the customer may move to a different point of connection to their service and this would not be detectable.

For a provider that delivers over third party networks, the collation of data required to establish location would be complex and is, as yet, undefined. In the longer term, there is the prospect of automated location information that can cope with the nomadic potential of VoIP.

GC5 - Emergency planning, which also requires a provider to make provision for disaster recovery

Following on from the comments on GC3, this condition is readily met by those providers who seek to establish a business edge by ensuring that the resilience and availability of the network elements over which they have control.

The providers who would have to upgrade their network to comply with GC3 would also face significant cost in meeting GC5.

GC8 - Operator Assistance, Directories and Directory Enquiry Facilities, which requires access to DQ and provision of information to subscribers in a local area on all users in that area, irrespective of network

The consensus view is that most of this condition does not pose a significant burden and would largely be met as a matter of course. The only part that would require some (probably small) outlay would be the provision of directories.

The only aspect that was of concern was operator assistance, a feature that some saw as an unknown in terms of cost to provide.

GC10 - Transparency and Publication of Information

This condition is met as a matter of course by all of the providers interviewed in this survey and can be reasonably taken as a normal business practice.

GC11 – Verification of Metering and Billing (a condition that only applies to providers with £40M turnover)

This condition does not apply to the majority of the respondents (on the assumption that the turnover threshold relates to VoIP service revenue) but it could incur a high cost if it had to be met.

GC12 - Itemised Bills

This is met as a matter of course by all providers interviewed in this survey and can reasonably be taken as a normal business practice (though the suppression of free calls on the customer bill may incur a small cost).

GC13 – Process to deal with the non-payment of bills – proportionate measure to recover money

This is normally covered under normal business practice, although some cost would be incurred by some providers to meet the condition.

GC15 - Special measures for end-users with disabilities, including consultation with representative bodies and support for disabled users, such as access to emergency services via text and, where appropriate, priority repair)

In general, the requirements of this condition were not seen as a problem but this view is dependent on the extent to which the specific requirements in the condition are enforced. Most of the providers considered that adequate text facilities could be provided but that it would be difficult (and so costly) to provide the particular fax modem and text relay facilities defined in GC15.

5 Level of Cost

Given the wide variation in the types of provider that provide (at least part of) a VoIP service, it is not practical to give a definitive statement on the impact of mandating 999 access and the consequential PATS obligations.

There are, however, some common themes between providers and the table below offers a consensus view of the requirements that will probably have most impact and, for each, the costs that are likely to be faced.

Requirement	Set-up Cost	Ongoing Cost
999 Access	The majority view is that this is fairly straightforward to implement and would be relatively inexpensive.	Also straightforward, and not likely to be a significant cost.
General Condition 3	Potentially a high cost, if the provider has to upgrade their network and coordinate customer location information. For some providers (mostly service providers) this condition, in as far as it can be achieved, is met as a matter of course.	If the set up cost is high, there will be consequential ongoing cost (e.g. in maintenance).
General Condition 8	Several providers would incur some cost in providing directory information but generally not a problem.	The requirement for provider assistance is ill understood and potentially costly.
General Condition 11	Does not apply in most instances, but a high cost for an provider that does meet the criteria in this condition.	The ongoing cost of meeting this condition would be medium.
General Condition 15	Not costly to provide text and messaging support for disabled users but potentially expensive to meet the condition as currently stated.	Once facilities that meet this condition are in place, the ongoing cost would be minimal.

The remaining conditions are unlikely to place a burden on most providers as they are met in the normal course of business.

6 Conclusions

It is clear from the information gathered in this survey that the impact of changing the regulatory position on VoIP varies according to the specific circumstance of the provider but there are common themes.

It appears to be uniformly the case that for any VoIP provider, it is reasonably straightforward, if possibly time consuming, to establish emergency service access. The typical cost of this would be of the order of £10-20k, split between interconnection (possibly to a 3rd party) and data preparation (formatting of customer information) costs.

In some cases the consequential general conditions for a PATS provider are met in the normal course of business. In general, this applies to providers with their own servers, routers etc but whose traffic is carried by other providers. A VoIP provider that has its own network would have to invest specifically to meet the network integrity requirement of GC3 for that network: a potentially high cost.

It is clear that the interpretation of the general conditions has significant impact of the likely cost of meeting them. GC15 is a case in point as some providers would consider that the provision of reasonable support for disabled users (which can be achieved at minimal cost) is satisfactory, whereas others have worked on the basis that the precise requirement of GC15 should be met, a potentially high cost.

Annex 1 – Questions for Providers

The following letter was sent to a selection of candidate providers (a mix of on-net VoIP providers, Internet-based VoIP providers and wholesale VoIP providers – sixteen in all) as a request for information from Ofcom.

You will be aware that Ofcom has recently consulted on the approach that it should take to the regulation of voice services carried over the Internet Protocol (22nd February 2006 <http://www.ofcom.org.uk/consult/condocs/voipregulation/voipregulation.pdf>). Given the rapid increase in the use of such services and the potential that they may become the prime, or even sole, source of telephone contact for an increasing number of consumers, Ofcom wishes to explore in more detail the implications of requiring VoIP providers to provide access to emergency services through the 999 or 112 codes.

There will be further consultation on this matter, but in order to provide a sound foundation for proposing regulation, Ofcom would like to understand the technical and cost implications of any such action. To this end it has retained our company to approach key providers in the industry on its behalf to request some information from you and, in some cases, to follow that up with a more detailed discussion (which can probably be carried out by telephone).

If Ofcom should require all VoIP providers to provide emergency access, then it is likely that the service may be considered to be a Publicly Available Telephone Service (PATS) in terms of EU legislation (see http://www.ofcom.org.uk/telecoms/loi/g_a_regime/gce/gcoe/), and this could lead to the imposition of the General Conditions described in the guidelines mentioned above. Before taking any position on this subject, Ofcom would like to understand the implications, in particular which parts of the potential additional obligations would be most onerous, and which parts could be implemented with little impact.

Notwithstanding any information that you provided under the consultation mentioned above, we would very much appreciate any contribution you can make to the questions we have included below. We have tried to minimise the amount of work this puts you to by asking for general orders of magnitude but if you have more detailed information to hand that would be very helpful. Similarly, if there are some questions that you are unable to answer, please let us have the information you are able to provide.

We do not wish to impose rigid deadlines for a response, but do need to be able to bring our work to a conclusion within a reasonable time, so would like to be able to start writing our report for Ofcom, having obtained the data available and followed up with any discussions that may be necessary by the 21st September. We would appreciate any input you can provide at your earliest convenience prior to that date. E-mail responses are acceptable and should be sent to my e-mail address as shown below. If you have any queries in relation to the questions, please do not hesitate to contact me, or my colleague Mark Norris (Tel: 01728 860058, e-mail mark.norris@intercai.co.uk) and we will do our best to help.

Yours sincerely

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Information requested by Ofcom:

In the following questions, we use 999 generically as the emergency service access code, but this includes 112 where appropriate.

We have graded costs into three levels, low medium and high, for both one-off and continuing costs. If you have more detail that would be appreciated, but if not, the levels that we assign to these grades are as follows:

One off costs: Low < £50,000

Medium > £50,000 and < £500,000

High > £500,000

Ongoing costs: Low < £20,000 p.a.

Medium > £20,000 p.a. and < £200,000 p.a.

High > £200,000 p.a.

If possible, we would like to understand, in relation to each cost, and depending on the method of providing the service, which costs may be transferred from existing services (e.g. PSTN providers).

In the following questions, the detail of the General Conditions obligations can be found at <http://www.ofcom.org.uk/static/archive/ofel/publications/licensing/2003/cond0703.htm> .

The information requested by Ofcom is as follows:

1. Do you currently offer 999 access over your VoIP service?
2. If not, how would you go about providing it if required by regulation, assuming there were no other obligations? (A general description only would be sufficient)
3. What would be the costs (one-off and ongoing) be, in the terms described above, of providing the service if there were no other consequential obligations?
4. For each of the following General Conditions (as listed below), what would be the one-off and ongoing costs of meeting the Condition, and in broad details, what work would that entail? (Please include whether you would be unable to meet the General Condition for any reason, for example if you have to rely on a third party for some part of the service).
 - General Condition 3 – Proper and Effective functioning of the network
 - General Condition 4 – Emergency call numbers
 - General Condition 5 – Emergency planning
 - General condition 8 – Operator assistance, directories and directory enquiries
 - General Condition 10 – Transparency and publication of information

- General Condition 11 – Metering and billing (please state whether you are exempt from this condition under its terms)
- General Condition 12 – Itemised bills
- General Condition 13 – Non-payment of bills
- General Condition 15 – Special measures for end-users with disabilities

Annex 2 – Overview of Consensus and variability of responses

Many responses were provided in confidence, so, to give an overall picture of the level of consensus across the providers interviewed, this Annex summarises the feedback, without attribution.

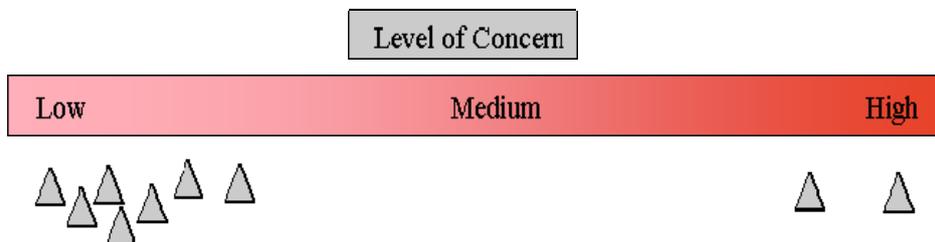
For the three key questions asked of providers in this study, there were some points of consensus and a general spread of opinion. Both are illustrated below.

Question 1. Technically and operationally, how might providers enable 999 access?

There was a fairly uniform response in terms of what had to be done to enable 999 access:

- Arrange interconnection, either directly with an emergency service provider (BT or Cable and Wireless) or indirectly through a third party (specialist interconnect provider);
- Although there is a general preference among providers for direct interconnection, the mechanics of establishing 999 access is not seen as a problem, irrespective of how it is achieved;
- The main issue that does need to be addressed in enabling 999 access is the formatting of customer information, as required by emergency service operator.

However, the level of concern about achieving this was polarised, as illustrated, with two providers significantly more worried about providing 999 access than the majority. This disparity of view does not reflect any great difference of opinion over the mechanics of provision, more the difference in circumstance between providers (i.e. different size of operation, installed base).

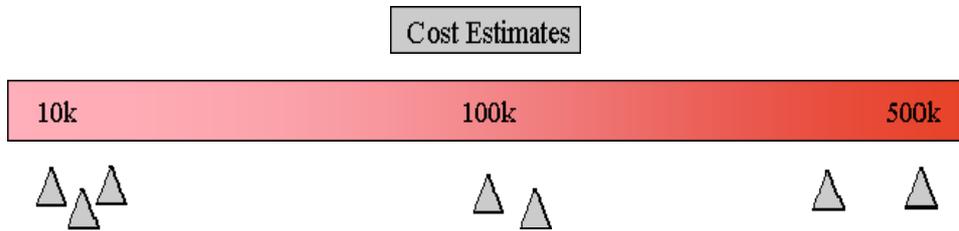


Question 2. What are the costs of enabling 999 access if there are no obligations on the quality of such access?

Again, there was consistency in the identification of line items that would contribute to the cost of implementation:

- The cost of the interconnect itself, which is relatively low (in the majority of cases, an extension to an existing arrangement);
- The collection, storage and maintenance of customer information, specifically to enable their location;
- Administration and general overheads.

But again there was significant variance in the absolute level of cost that would be incurred in implementation. The difference of view is less marked in this instance and, to a large extent, driven by the size of provider.



Question 3. What are the costs of complying with PATS regulations?

In the answer to this question (which is addressed in detail in the main body of the report), the providers interviewed differentiated between known cost (such as those incurred in upgrading a network to increase resilience), assumed cost (such as facilities for the disabled, which may be provided in a number of ways) and unknown costs (such as the provision of provider assistance, the requirement for which was not always understood).

Notwithstanding any differences in interpretation of the requirements in the General Conditions, the overall picture of compliance cost across the providers interviewed is as illustrated.

