Internet Telephony Services Providers' Association

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ITSPA WHITE PAPER:

Emergency Services - Technical Issues, Potential Solutions and Benefits

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Executive Summary

Internet technologies have allowed the creation of some astonishing new communications services and created a vibrant, competitive climate in the telecommunications industry. In doing so, they also have raised some integration issues with traditional network systems and processes, some of which may concern public safety.

This White Paper discusses the integration of VoIP services with existing emergency service systems and details how the challenges can be overcome (including updates on recent industry actions) and the opportunities to be gained by emergency services and citizen-consumers. A clear example of the benefits of VoIP for the improved delivery of emergency access services is that following the terrorist attack of 7th July 2005 in London, when the cellular network was essentially closed, VoIP was one of the only means by which calls could be made to friends and family. In the longer term, therefore, the "third access" (after PSTN[1] and cellular) route will become an important added public safety gain.

Issues

Almost all countries have a free-access, short-dial number to the emergency services, and often, in order to respond quickly, the caller's physical location is automatically established using Calling Line Identity (CLI) matched with on-line address and location databases.

The issues for VoIP and emergency services can be grouped under three generic headings:

1. The ability to call the Emergency Services

From a technical viewpoint, there are no limitations to the numbers than can be dialled using a VoIP service. Thus, emergency numbers can also be called using a VoIP service, whether this be via a VoIP phone, a traditional telephone handset plugged into an ATA[2], or a "softphone" used via the PC, for instance.

VoIP providers decide whether or not to offer emergency access based on practical viability, legal requirements (e.g. the level of reliability that the service must offer in case of a power cut etc), and to a lesser extent, commercial considerations.

2. Reliability

VoIP services require connectivity to the Internet to function. This in turn depends on many individual network components, in some instances including the customer's local network and PC or telephone device, the telephone network operator's cables and equipment, and that of the Internet Service Provider and the VoIP Service Providers themselves. A failure at any point will result in a call not being able to connect to an emergency number.

Whilst there is no reason why an Internet network cannot be as reliable as the PSTN – and indeed, because of its design, it will eventually become more reliable – VoIP technologies are still developing,

[1] Public Switched Telephone Network – the standard, legacy fixed telecommunications network.
[2] Analogue Telephone Adaptor, an adaptor which sits between the phone and the router, connecting an analogue telephone to a VoIP network, thus in effect turning a "regular" telephony handset into a VoIP phone.

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as are the companies that provide them. There are therefore currently several points of possible call failure for both technical and commercial reasons.

One common complaint about VoIP is its reliance on local power to function – if the customer's power fails, his telephone fails too. However, it should be noted that this is also the case for DECT (i.e. cordless phones) and mobile phones, which are commonplace in the home, and PBX equipment in the workplace. A VoIP user's local network can be protected by Uninterruptible Power Supplies (UPS), if this is seen as an issue for the user. This is not, therefore, an issue particular to VoIP.

3. Location Information

A very key benefit of certain VoIP services is their ability to be location independent, as they can route calls to IP addresses that are fixed to the end user's equipment instead of the local telephone exchange. This enables customers to take their telephones anywhere in the world, plug them into a network and make and receive calls, making communication whilst travelling and office relocations convenient and easy (with no need for number changes).

This undeniable customer benefit that arises from the nomadicity of certain VoIP services creates difficulties for emergency services when trying to locate the caller for several reasons:

1. Due to the static nature of the customer location information that is currently included in the Emergency Centre Database which holds this information, there is presently no method of confirming whether a device (and hence the caller) is actually located at the address that was originally inserted or somewhere else entirely;
2. Nomadic services will allow consumers to use their devices (whether physically or virtually) across international boundaries. How should the emergency services deal with calls from foreign visitors and how will UK calls be dealt with whilst abroad?

ITSPA's role and activities

Consumer Information

It is ITSPA's view that it is unreasonable and unnecessary to replicate the existing emergency arrangements of fixed network operators, which were designed specifically for legacy PSTN networks. However, ITSPA also firmly believes that, during the transitional period (i.e. until the aforementioned technical and commercial issues have been resolved), when VoIP providers do not provide similar emergency access services, they MUST notify their customers of the differences between using a VoIP service and a PSTN service. Consequently, at the heart of ITSPA's Consumer Code of Practice are consumer information requirements with regards emergency access.

ITSPA members have also engaged with consumer groups in order to ensure that its Code of Practice meets their requirements and concerns, enabling all citizens to benefit from a wide range of VoIP services.

Location information

ITSPA members are involved in the NICC[3] working group on Location Information over IP Networks, which is investigating pioneering solutions to the issues highlighted above. For instance, emergency call handlers will now be alerted when a call being made is a VoIP call (via a "VoIP flag") and will thus know to confirm the location of the caller. Indeed, a solution for CLI via fixed networks has already been identified and is being implemented; work is also progressing on a possible solution to the issue of nomadic CLI provision (see Annex A for more information).

ITSPA members also actively participated in Ofcom's New Voice Services Consumer Information Working Group, which sought to set out the basic requirements for consumer information. ITSPA's Code of Practice aims to build upon these Guidelines. Ofcom has recently published these Guidelines for consultation[4].

[3] Network Interoperability Consultative Committee – UK industry's technical standards body (http://www.nicc.org.uk)
[4] http://www.ofcom.org.uk/consult/condocs/voipregulation/

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ITSPA White Paper: Emergency Services - Technical Issues, Potential Solutions and Benefits

1. Aim

This paper discusses the integration of new VoIP services with existing emergency service systems and details how the challenges can be overcome, as well as highlights the opportunities to be gained from having a third route to emergency services (the PSTN[5] and cellular networks being the first and second).

2. Benefits of VoIP to the Emergency Services

There are a large number of examples of how VoIP could be of benefit to the emergency services and enhance the level and quality of emergency access provided in the UK.

VoIP offers a number of technical features that are not provided by regular analogue and ISDN telephone systems. Some of these features can be utilised by emergency services to gain more information about the caller or give the caller more assistance in resolving a crisis situation. Furthermore, VoIP, when implemented correctly, actually provides a more reliable and robust means of communications than a legacy telephone system.

The Third Telephone Service

During the London 7/7 emergency, when the cellular network was essentially closed, VoIP equipped laptops where being used from WiFi points providing un-congested "mobile" telephony for those involved in contacting friends and family. VoIP in effect opened up a new method of access, and indeed was often the only channel for emergency access.

In the longer term the "third access" (after PSTN and cellular) route will become an important added public safety gain.

Video calling

The standards for creating VoIP calls, Session Initiation Protocol (SIP) and H.323, are both media independent. This means that they can be used to relay any type of real time data (sound, video and instant messages are typical examples).

More than 50% of homes in the UK now have broadband capacity. Similarly rapid rates of adoption have been demonstrated in many other countries. A typical broadband connection has more than sufficient capacity for transmitting one or more simultaneous video calls.

[5] Public Switched Telephone Network – the standard, legacy fixed telecommunications network.

Moreover, the electronic components required for video calling have become extremely inexpensive in recent times, due to the large volume of camera phones, web-cams and digital cameras in production.

A complete video calling solution is therefore more accessible in the home than ever before. It is rather easy to attach an inexpensive web-cam to a computer. The computer, with correctly installed software phone applications, then becomes a video phone. Standalone, mass produced video phones for connection to broadband are also becoming available at prices that the average consumer can afford. It is likely that such phones will become widespread by the end of 2007.

Benefits of video calling

Video calling may assist the emergency services in several ways:

- Visual diagnosis of injuries before medical staff arrive;
- Providing the caller with visual cues of how to assist a casualty, for instance, rolling a casualty into a recovery position, clearing their airway and stopping blood loss;
- Visual identification of criminals when a crime is in progress;
- The video calling system could be integrated with a security system and surveillance cameras; and
- It is entirely possible for multiple video streams to be fed to the emergency call centre simultaneously.

Multiple Network Paths

The Internet telephony system runs on top of existing Internet infrastructure.

The Internet began as a project of the US military's Defence Advanced Research Project Agency (DARPA). One of the aims of the project was to develop a network that could transmit signals between any two arbitrary points, even when some paths between the points had been closed. The Internet has successfully achieved this aim.

Several Internet standards have been developed for dynamically finding a path to route a signal. One of these standards, Border Gateway Protocol (BGP) is now used extensively by the Internet industry. If any one ISP drops off the network, due to equipment failure, bankruptcy or civil emergency, then signals are dynamically re-routed through another ISP.

BGP and other similar protocols are only of use to those homes and businesses having more than one connection to the Internet. Although this is quite uncommon in the home, more and more businesses are investing in this technology.

Benefits of Multiple Network Paths

When the emergency services accept calls from the Internet, it would be highly desirable to use BGP to accept signals from a diverse range of ISPs.

A properly implemented BGP network ensures that reliability is increased.

Inclusion of out-of-band data

Technically, it would be rather easy to incorporate out-of-band data into VoIP telephones for use in emergency calls.

The data might include information about the caller's language, exact location within a large building, medical or disability information, and even real-time environmental data.

The IETF SIP protocol does not currently define a standard for storing such data in telephones or relaying such data to the correct place in a secure manner. However, such a standard would be easy to implement in software and would quickly be adopted by manufacturers of handsets.

To implement such a standard, concerns about privacy may need to be thoroughly investigated. The data would normally be inserted into the telephone at the time it was installed, and the accuracy of the data may diminish over time.

3. Issues relating to the provision of emergency access using VoIP

This section sets out the practical and technical issues relating to the provision of emergency access using VoIP in order to explain the areas where further work is needed in order to improve the level of provision.

Note: the following issues arise only where VoIP is installed as a replacement for traditional PSTN telephony (i.e. not where it is only being used as a secondary line). Most residential users retain a PSTN line, which they would invariably use to make an emergency call. At present, a PSTN line must be retained as a condition of receiving broadband access. Should this requirement cease in future, so that a user's only method of making a call would be over their broadband connection, these issues may become more universally pertinent.

Identifying a Telephone – Softphones

Many people use a software application installed on their computer that makes the computer behave like a traditional telephone. This is often referred to as a "softphone". This has put "telephones" in places where they could never have been before – particularly rental and student properties.

However, in these situations, someone unfamiliar with the computer or softphones may not know how to operate the softphone and visitors to the premises may not even realise that the softphone is present.

Knowing what to Dial - Dial plans

Someone unfamiliar with the VoIP phone (whether this be a softphone or a VoIP handset, for example) may encounter difficulty dialling an emergency number.

Similar problems can occur with traditional PBX systems. For example, in some offices it is necessary to dial a 9 to get an external line before dialling an emergency number. In other offices, the caller must press a button marked "line 1" or "line 2" for instance.

VoIP can bring some of these same dialling patterns into the home (although for the vast majority of domestic VoIP users this will not be so). In some cases, a VoIP phone may be connected, through the Internet, to an office PBX. This will become increasingly common in the case of home workers. Some VoIP companies also require special digits to be dialled before a number when making a call to an outside number.

Telephone software configuration

A VoIP telephone (or ATA device which converts a normal analogue telephone to use the Internet) requires a number of settings to be entered before it can be used. Typically, the device must be told its IP address, the address of a server, a username and a password, amongst other things.

It is quite possible for a device to be plugged into the electricity but not have the correct settings. In this case, it may not be obvious to every user that the phone is unusable. The phone may appear to be switched on, and a dial tone may be audible, but the telephone will not work.

Emergency call routing

From a technical viewpoint, any VoIP telephone can call any telephone number anywhere, including emergency numbers. VoIP providers decide whether or not to offer emergency access based on practical viability, legal requirements (e.g. the level of reliability that the service must offer in case of a power cut etc), and to a lesser extent, commercial considerations.

VoIP providers have the choice to either absorb the cost of allowing free access to emergency services, making a call chargeable (in which case a customer of a pre-paid service would need credit on their account in order to make it) or disallow the call. Currently, VoIP providers tend to either provide free 999 access or do not provide access to 999/112 numbers.

Address location

Using the traditional Public Switched Telephone Network (PSTN), location information can be rapidly obtained from the Emergency Centre Database, which is the centralised database used by the emergency call operators to establish a caller's location. This is because in the PSTN world, a consumer's telephone number relates to a specific location.

The situation is somewhat different in the VoIP world. In terms of how addresses are located: when a VoIP customer is calling from his usual fixed address, as registered with the service provider, this address will be transmitted to the emergency services call centre in the normal way. However, verification of the location of the consumer often has to be done on a "trust" basis unlike in the PSTN world, each number can be traced to a specific end point.

Moreover, a VoIP handset can be plugged into any internet connection (in the UK or worldwide) so the emergency call centre could be misled as to the caller's actual location at the time of the call.

Although provision could be made for a consumer to update his location data when he uses the VoIP service at a different site, this is not always practical and there can be quite a significant timelag before the information in the Emergency Centre Database is updated. This is because the updating of the Emergency Centre Database is not sufficiently automated and because data cannot always be communicated directly to the Database, but has to go through a VoIP providers BT interconnected partner.

At present, this problem with regard ascertaining a VoIP caller's location is alleviated by the transmission of a "VoIP Flag" along with the VoIP call, so that the call handler is alerted to ask the caller his location. However, there are clearly concerns that the person making the emergency call may not always be in a position to speak, and there is the issue of helping emergency call centres identify hoax calls more rapidly.

ITSPA is involved in an NICC task group which is looking specifically at solutions to this issue (see annex A). In future there could be two new approaches to solving the problem:

a) Devising mechanisms for updating customer location information in real time.
b) Using the customer's IP address and integrating with broadband ISPs to determine location information.

The Emergency Services prefer option b), the integrated solution.

In the short term, the updating of the Emergency Centre Database could be made more automated in order to help improve the accuracy of the consumer location information.

Network reliability

Internet connections in homes can be less reliable than regular telephone lines. This is because there is not always enough bandwidth available in the broadband provider's network to maintain the connection.

Additionally, unlike in the traditional PSTN world where control over the network from the caller to the recipient is easily established, the VoIP service provider does not have end-to-end control over the underlying network. Therefore, reliability will also depend on the commercial relationship a VoIP service provider has with a broadband provider (and it must be noted that the already large number of broadband (including WiFi) providers continues to increase).

This lack of guaranteed reliability creates two potential problems:

- The network may not be functioning at all when a call needs to be made;
- The network may cease to function while a call is in progress.

The lack of reliability in homes is gradually stabilising as both the technology and businesses that run them mature and bandwidth continues to increase. In business premises, the Internet connection may indeed be more reliable than the telephone line, depending upon how much the business has invested in it.

Power Outages

A traditional telephone service will continue to function in the event of an electricity outage due to the small current transmitted to it over the copper, which is known as "line powering". IP phones or devices connected via the user's computer will not continue to work if there is no power.

However, this is not a problem that is unique to IP phones: cordless (DECT) phones have battery limitations and will fail to work if there is no power to the base station; and many office PBXs fail to work during power outages (unless they have a properly maintained battery backup).

Required standards

Standards bodies, such as the ITU and IETF, have defined several standards for the Internet network and Internet telephony applications. However, the current standards provide no specific features for access to emergency services over VoIP.

4. Possible Solutions

The following section details a number of the possible solutions to the issues highlighted in the previous sections. Work is already well underway to implement many of these solutions proposed.

Consumer Information

VoIP is a relatively new technology and many consumers are only just beginning to experiment with and use VoIP services. Consumer information is therefore essential in order to ensure consumers are able to make informed choices about the communications options on offer. In particular, it is important for consumers to understand the differences in emergency access capabilities between PSTN services and VoIP services, particularly where the VoIP device used resembles a traditional phone. ITSPA's Code of Practice was drafted with the consumer in mind – it seeks to ensure that sufficient clarity is provided to the consumer with regards the availability of emergency access.

Labelling and announcements

Many of the above issues can be addressed by the labelling of devices which resemble traditional PSTN telephones so that their emergency access capabilities are known. If calls to 999 are attempted from devices incapable of making the connection, recorded announcements can also be used to direct the caller to use an alternative telephone. The ITSPA Code of Practice details the labelling and announcement provisions which all ITSPA members are required to abide by (http://www.itspa.org.uk/cop.htm) in order to ensure consumers have the necessary information with regards emergency access functions.

Phone configuration standard

A standard exists that allows any GSM mobile to dial an emergency call through any GSM mobile network, in any country, with or without a SIM card in the phone. A similar, cost effective standard for VoIP could benefit VoIP telephone users.

In order to address the emergency access via VoIP issues (including location information), a standard would have to answer such questions as:

- How does the telephone discover its IP address? DHCP[6] is a standard that already serves this purpose, but there may be other ways that a phone can find an IP address in an urgent situation.

- How does the phone recognise emergency calls? The DHCP server could give the phone a list of emergency numbers for the local jurisdiction. Alternatively, the phone could query a public database server that determines the phone's country by looking at the IP address and then give the phone a list of valid emergency numbers for that country.

- Where does the phone send the emergency calls to? Does it send them to the local telephone server in an office, to the Internet Service Provider, to the VoIP company, or directly to a server operated by the emergency services? This behaviour can also be determined dynamically by querying a public database or a DHCP server.

- Should the phone be able to submit information to the emergency services out-of-band, for instance, the user's preferred language, address/location data? Such information could be manually entered into the phone or entered from a DHCP server. The information could be relayed to the emergency services using an XML format or the SIMPLE protocol.

Location discovery standards

Location discovery is a problem that must be addressed through co-operation between the emergency services and ISPs. There are several details to be worked out:

- If the call originates behind a proxy IP[7], the emergency services must be able to find the real IP where the call originates. It is important to have a mechanism for the emergency services to distinguish proxy/NAT server IPs from the IPs of real users;
- Once the user's real IP is known, the emergency services must be able to discover the geographic location where that IP address is used;
- The emergency services must be able to determine if a call is originating from a different country and either direct the call to the correct country, or at the very least make sure the operator who takes the call is aware that the caller is abroad. Such calls may relate to emergencies within the country, for instance, a crime about to take place.

Work in progress

An NICC task group looking at emergency location information over IP networks is currently discussing a solution to this problem and has highlighted the following possibilities (for further information, please see the annex):

[6] Dynamic Host Configuration Protocol - protocol for assigning dynamic IP addresses to devices on a network.
[7] An IP address is a 32-bit number that identifies each sender or receiver of information that is sent in packets across the Internet.

- The 999 operator system could query a combination of VoIP provider and broadband ISP with an IP address, which will then return a physical address. It is recognised that this system would only work where the ISPs had a commercial incentive to "opt-in" to the system. However, where all the data is within one organisation (e.g. Wanadoo) it seems a viable technological solution option. The public's right to privacy must also be respected. Likewise, the Internet industry would expect the data to be protected from commercial exploitation by rivals.

- The taskgroup is discussing how to *teach* devices their location through the network, such that they can then update the VoIP provider (and hence 999 operators) automatically. The NICC group is following standards activities in the IETF and ETSI where most of this work is being done.

- Work is also underway to assess the value of customer provided data and how that may be updated in near-real time. There are also issues to do with allowing VoIP providers who do not directly own a BT Interconnect to update the 999 system directly (most BT auxiliary services are tied to an interconnect contract). These discussions are ongoing.

Further Observations

With an ever growing number of homes and businesses in the UK having Internet access, the following scenario is increasingly possible: a citizen may find that he has no available means of telephone access, but he does have Internet access (for example when a mobile phone has run out of battery or has been stolen, but where the WiFi enabled PDA continues to function; or when there is an intruder in one's flat at night in a high-rise apartment and the WiFi enabled laptop in the bedroom is the only accessible communications device). This not only highlights the importance of VoIP as the third means of access to emergency services, but the need to ensure emergency services are also prepared for this social change. For instance, Police Forces etc should be encouraged to include an email address for online reporting or indeed SIP or H323 links.

5. ITSPA Position

It is ITSPA's view that it is unreasonable and unnecessary to replicate the existing emergency arrangements of fixed network operators, which were designed specifically for legacy networks. However, ITSPA also firmly believes that during the transitional period until the aforementioned technical and commercial issues are resolved when VoIP providers do not provide similar services, they MUST notify their customers of the differences between using a VoIP service and a PSTN service. Consequently, at the heart of ITSPA's Consumer Code of Practice are consumer information requirements with regards emergency access.

ITSPA members have also engaged with consumer groups in order to ensure that our Code of Practice meets their requirements and concerns, enabling all citizens to benefit from a wide range of VoIP services.

ITSPA members also participated in Ofcom's New Voice Services Consumer Information Working Group, which sought to set out the basic requirements for consumer information. ITSPA's Code of

Practice aims to build upon these Guidelines. Ofcom has recently published these Guidelines for consultation[8].

On a technical level, ITSPA has been actively working to resolve many of the issues outlined in this paper over the past 18 months. For instance, ITSPA members are involved in the NICC[9] working group which is investigating pioneering solutions to the issue of on location information over IP networks. Further to this work, emergency call handlers will now be alerted to when a call being made is a VoIP call (via a "VoIP flag") and will thus know to confirm the location of the caller. Moreover, a solution for CLI via fixed networks has already been identified and is being implemented; work is also progressing on a possible solution to the issue of nomadic CLI provision.

6. Glossary

ATA	Analogue Telephone Adaptor, an adaptor which sits between the phone and the router, connecting an analogue telephone to a VoIP network, thus in effect turning a "regular" telephony handset into a VoIP phone.
BGP	Border Gateway Protocol
CLI	Calling Line Identification
DARPA	Defence Advanced Research Project Agency
DHCP	Dynamic Host Configuration Protocol - protocol for assigning dynamic IP addresses to devices on a network
H323	A standard for real-time multimedia communications and conferencing over packet-based networks
IETF	Internet Engineering Task Force (http://www.ietf.org/)
IP	An IP address is a 32-bit number that identifies each sender or receiver of information that is sent in packets across the Internet.
ITSPA	Internet Telephony Services Providers' Association – The UK's VoIP trade body (http://www.itspa.org.uk)

[8] http://www.ofcom.org.uk/consult/condocs/voipregulation/
[9] Network Interoperability Consultative Committee – UK industry's technical standards body (http://www.nicc.org.uk)

ITU	International Telecommunication Union (http://www.itu.int/home/)
NICC	Network Interoperability Consultative Committee – UK industry's technical standards body (http://www.nicc.org.uk)
PBX	Private Branch Exchange - a private telephone switch that provides switching (including a full set of switching features) for e.g. an office or campus.
PSTN	Public Switched Telephone Network – the standard, legacy fixed telecommunications network
SIP	Session Initiation Protocol – a signalling protocol for VoIP
Softphone	A software application installed on a computer that makes the computer behave like a traditional telephone
UPS	Uninterruptible Power Supplies
VoIP	The ability to make voice calls over any Internet connection, particularly broadband, using Voice over Internet Protocol (VoIP)

ANNEX 1: NICC 999 Location Information over IP Networks Task Group

Activities Summary

As a result of OFCOM and Industry concerns regarding the implementation of 999 on VoIP Networks, specifically with respect to the identification of a VoIP subscriber's location, a NICC working group was formed, chaired by John Medland of BT 999 Services.

BT, C&W (Bulldog), Energis, Wanadoo, Vonage, Gradwell dot com Limited, Magrathea are amongst those companies represented.

VoIP presents a particular challenge for 999 operators, because a telephone with any area code can be plugged into any internet connection (world wide) and so the caller may be dialling the UK emergency services whilst not within the country (or indeed, they may be in the UK with an overseas number). At present, the 999 system is keyed from the PSTN caller id.

Initially, the working group is tasked with evaluating better mechanisms for identifying the location of VoIP subscribers. A second phase to the project may include discussions of Interconnect with BT 999 service over SIP.

The working group has split the location problem into several chunks:

1. Location of Domestic, Static VoIP Customers
2. Location of Mobile or Nomadic VoIP Customers
3. Location of business customers connected via private network

Principally, there are two approaches to solving the problem:

c) Relying on the customer to provide accurate data and ensuring that we have real time mechanisms for updating that.
d) Using the customers IP address and integrating with broadband ISPs to determine location information.

It's worth noting that traditionally, 999 operators have a preference for "operator provided data" as it is seen to be more accurate than "customer provided data".

Initially, we have focused on solving the problem for (1) through a mechanism based on the Mobile Location Gateway – where by the 999 operator system can query a combination of VoIP provider and broadband ISP with an IP address, which will then return a physical address. It is recognised that this system will only work where the ISPs have a commercial incentive to "Opt-in" to the system, but where all the data is within one organisation (e.g. Bulldog VoIP, Wanadoo Talk, BT Retail, etc.) it seems a viable technological solution option.

Future work is considering how we can *teach* devices their location through the network, such that they can then update the VoIP provider (and hence 999 operators) automatically. The NICC group is following standards activities in ITEF and ETSI where most of this work is being done.

Secondly, we have begin discussing the value of customer provided data and how that may be updated in near-real time. There are also issues to do with allowing VoIP providers who do not directly own a BT Interconnect to update the 999 system (most BT auxiliary services are tied to an interconnect contract). These discussions are ongoing.