Next Generation 112 (NG112)

Introduction to Next Generation Emergency Services in Europe

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1 Introduction

It is estimated that 320 million[1] emergency calls are made every year in the European Union, enabling emergency services to assist citizens in all sorts of difficult situations. For the time being however, most European emergency services can only be reached through the public switched telephony or mobile networks.

Voice over Internet Protocol (VoIP) based devices and applications have become commonplace. Citizens use them to conveniently communicate, send and receive information. At the same time the existing legacy emergency services infrastructure (circuit-switched) is unable to embed the enhanced services and technology. In a few years, all mobile phones will be smart phones with an abundant choice of applications. Text messaging and instant messaging are an ever more common communication means, increasingly replacing the traditional two-way voice telephone call and SMS. Pictures and videos from phones and PDAs are shared instantly with friends and colleagues around the world, and social networks have become a media by themselves. Video and text based communications are replacing traditional systems such as teletypes for the deaf and hard of hearing. Cars are being fitted with telematics systems that automatically initiate a voice call and provide valuable data when a car is involved in an accident (eCall). Geographical location based services are increasingly used to submit or lookup close points of interest or friend's current position. Modern mobile phones from which an emergency call might be placed have the potential to transmit life saving location information with the call. Enterprise workers expect to be able to place an emergency call from a campus or building complex environment and have a first line response dispatched to the specific location, be that a building within a campus or a floor in a building or an office on a floor.

All over the world, citizens expect to be able to contact emergency services with technologies they use to communicate every day[2]. Thus, European citizens have clear expectations about the availability of 112 emergency services with the enhanced capabilities of technologies being used in daily life.

It should be noted that there are concrete signs indicating the current migration towards Next Generation Emergency Services in Europe. Although store and forward services are not part of NG112, services enabling SMS to 112 are being deployed all over Europe, for instance in Estonia, Iceland, Luxembourg, Sweden, the United Kingdom and the Region of Madrid. In some cases SMS is only available for people with disabilities in order to make 112 accessible for them, in others all citizen can contact emergency services using SMS. They highlight the need for text-based communications in emergency situations. Next Generation/ Internet communications providers such as Skype are trialling access to 112 in the United Kingdom (Skype out, thus audio only). In the framework of 112 accessibility for people with disabilities, the European Commission is currently funding the REACH112 (REsponding to All Citizens needing Help) project that is deploying IP-based communications between citizens and 112 services, enabling emergency calls to be made with video and real-time text. Other initiatives such as the PEACE (IP-Based emergency application and services for next generation networks) project have also been funded by the EU.

Although Europe is most certainly very active in deploying parts of the NG112 service, these initiatives are disparate and uncoordinated. This document aims at providing a general introduction to NG112 and a look at the challenges to be faced in Europe. It then advocates the creation of a harmonised NG112 service description, reusing as much as possible the available international standards in cooperation with international organisations and with the involvement of all relevant stakeholders.

2 What is Next Generation 112 (NG112)

NG112 is defined by two major aspects:

- Interoperability between emergency services: NG112 enables the several Public Safety Answering Points to be part of a common emergency service IP-network, providing them with redundancy and interoperability features. This network should support data and communications needs for coordinated

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[1] Estimate based on COCOM, EGEA and information provided by EENA emergency services' members

[2] http://www.redcross.org/www-files/Documents/pdf/other/SocialMediaSlideDeck.pdf

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incident management between PSAPs and provide a reliable and secure environment for emergency communications.

- Communication between citizens and emergency services: NG112 is designed to enable citizens to reach an authority (e.g., PSAP) by calls using VoIP, text messaging, instant messaging, real-time text, pictures and videos. It could also provide emergency services with more data such as telematics and health data. NG112 enables the delivery of calls, messages and data to the appropriate Public Safety Answering Point (PSAP) and other appropriate emergency entities and makes call handling easier.

Within the NG112 concept a variety of technologies, related to hardware, software, data and operational policies and procedures are required. The PSTN was designed to switch circuits and then enable communication to occur over those circuits. The nature of this networks means that emergency calls are detected at the earliest ingress point in the network, the local exchange. The PSTN is increasingly being replaced by IP-based services that provide a packet service that directs data to and from the Internet.

The local exchange will be replaced by VoIP, application and Internet service providers. Communications over the Internet only require an IP address and access to the Internet; they do not require other subscription services such as voice providers and the like. Consequently any device suitably connected to the Internet that can reasonably be expected to make an emergency communication should be allowed to do so, and citizens that use next generation communications should be allowed to do so without hindrance. NG112 has to provide IP-network communication infrastructure with standard interfaces from call and message services.

One of the challenges is to ensure that all these communications can be achieved in a reliable fashion as fast as possible, with minimal delay, as delays have potentially disastrous consequences.

NG112 also has to be designed to ensure that relevant information such as caller location can be conveyed in real-time with the call. The ability to transmit location information with the call, rather than via lookups based on telephone number, should be a very significant advantage enabled by NG112. NG112 needs to allow for a decoupling between the telephone number and the caller's location and provide standard interfaces for location information, databases and data management services, consistent with Internet standards and cognisant of the technical specificities and limitations of Internet-based services and applications.

Over time, additional information, such as a reference where available to building schematics for electrical, mechanical, plumbing and gas should also be conveyed with the call, so that the call-taker has the best possible relevant information to determine and dispatch the most effective response.

By nature, the NG112:

- is to be designed with open standards and to utilise standard components, that can genuinely and easily be rolled out by all relevant stakeholders
- should support interoperability, dealing with the issues of disparate legislative, operational and geographical constraints
- should enable a coordinated approach to create a network architecture (system-of-systems) giving the EU Member States flexibility to deploy NG112 systems

3   Challenges with NG112

3.1   European Union vs Member States competence

The European Union is made up of many independent countries. This reality challenges us to multiply efforts to overcome additional difficulties:

- Legal aspects: each European country has its own legislation. NG112 has to be deployed in all countries taking this fact into account.

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- Emergency services organisation[3]: the organisation of the emergency services is a national competency. In some countries it is even a regional competency. The fact that several patterns in emergency services organisations coexist within the EU should be borne in mind when designing the NG112. For instance in some countries it has been decided to route the 112 calls to a local emergency service, in others a centralised PSAP filters 112 calls and then transfers them to regional emergency service, etc.

- Technological infrastructure: it can differ from country to country. The technological development can be very basic in some countries and very advanced in others.

- Telecommunication regulation: the telecommunication and Internet regulation is for some aspects a national competence and for others a European competence.

NG112 is not yet a fundamental policy goal at the EU and the national level of the member states. Some existing country regulations and statutes arguably do not help enable NG112. All the technology development will only be as effective as the policies and rules that enable the implementation of NG112 to ensure a high level of public safety in the EU in the future. This is the challenge and the opportunity for policy makers and causes need for regulatory (and legislative) adaptations.

3.2   Challenges related to the mobility of Europeans

Millions of citizens are travelling through all European countries every day. This reality was one of the main reasons for the creation of a common emergency number. Therefore, this fact has to be kept in mind also in the framework of NG112. Consequently, the following issues have to be taken into account:

- Roaming: access to the emergency services has to be ensured in roaming circumstances.

- Languages: there are many languages spoken in the European countries. Emergency services and citizens have to be able to communicate.

- Accurate location: travellers have more difficulties to provide emergency services with accurate information about the incident location

For NG112 to be successful it must be mindful of the fact that it will also need to support emergency communications from Internet devices belonging to international travellers. Consequently it is an imperative that access to the NG112 network complies with general Internet protocols and standards.

4   Conclusions

Today's legacy emergency services infrastructure is not in the position to support the current communications and operational requirements. The architecture of the legacy system is based on circuit switched telephony designed to enable telephone calls to 112, not data. Simply put, the emergency services infrastructure has not kept up with technology and is badly in need of modernisation. This is essential, but equally important to enabling technology, is the fact that NG112 also requires the modernisation of EU and national emergency services policies, regulations and statutes.

Next Generation 112 ensures that citizens have more ways to contact emergency services using the same types of technology as those they use to communicate every day. It also makes possible that 112 PSAPs receive more and better information about emergencies of all magnitudes and improves interoperability between emergency services. Consequently, response time and operation cost will be reduced, while effective response will increase significantly. It represents also an opportunity to improve the access to emergency services for special groups of citizens with disabilities.

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[3] http://www.eena.org/ressource/static/files/National112Systems_models.pdf

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Nevertheless, it is true that efforts are required to settle all challenges that have been described in this document. Legal environment, distribution of competences, disparities between emergency services organisations and their technology are only some of the difficulties to be dealt with during the development and deployment of NG112.

It is also true that significant work has already been accomplished to design next generation emergency services technology. Internet protocols and standards are the future of emergency communications. For instance ECRIT and Geopriv working groups in the IETF NG112 have already defined standards applicable to Next Generation 112. The next step should be to describe a theoretical technical description of the Next Generation 112 service.

In conclusion, the development of the communication methods used daily by citizens obliges emergency services to modernise. This transformation lies in opening emergency services access to the Internet. It is true that access to emergency services is a highly sensitive public safety segment and this is the reason why we have to confront important challenges. But we cannot be discouraged by these facts and we have to concentrate our efforts to advance and create a standardised, common and valuable NG112 model in Europe.

5   References

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