EENA Operations Document

Caller Location in Support of Emergency Services

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ABSTRACT

Knowing the exact location of people calling the 112 emergency number is very important for emergency services. This knowledge ensures timely interventions, verification of genuine calls and, in certain cases, identification of calls concerning the same major incident. Medical research even indicates that for certain pathologies the reduction in response time by one minute will improve the odds of survival by 24%. For example cardiac arrest survival reduces by 10% for every 1 minute delay.

Caller location information can be transmitted to the corresponding PSAP automatically with each call ('push') or following a request by the 112 call centre operator ('pull'). This document contains an overview of current 'pull' and 'push' implementations in EU countries as well as the common problems encountered, i.e. the time needed to provide the location information and the lack of standardised solutions, which hinders the transmission of location information to other PSAPs.

The document contains a full analysis of available technologies and existing implementations for the provision of location information in every context i.e. fixed and mobile telephone networks, as well as location of calls via IP based and satellite networks. For mobile and satellite networks a description of available standards for caller localisation is also included. The most common problems are analysed for each environment i.e.

- For fixed telephone networks the main problems identified are the poor verification of addresses contained in relevant data bases, the frequency of the updates, the exclusion of private numbers, the non-localisation of calls initiated through public exchanges covering multiple buildings and the non-standardisation of data formats.
- For mobile networks the main problems include accuracy of localisation, non-standardisation of information transmitted to the PSAP, lack of transparency concerning the method used to determine the location of the caller and the often long time needed to provide this information.

For each type of network the document contains recommendations to stakeholders (i.e. European and national authorities, national telecommunications regulatory authorities, authorities competent for emergency services at national, regional and local levels, network operators and emergency services), as well as relevant EENA requirements. These recommendations are in the interests of the citizen and need to be actioned quickly with any relevant legal action taken when there is failure.

In general, citizens expect to be able to contact emergency services with the technologies they use to communicate every day (i.e. through VoIP, text and instant messaging) and without unreasonable delays, while their location should be available to emergency services independently of the technology used.

For the purposes of the revision of this current document, EENA would like to acknowledge and thank Ptolemus Consulting Group and in particular Frédéric Bruneteau and Thomas Hallauer for their time, energy, expertise and commitment to the topic. They have been instrumental in updating this document and for this, EENA is extremely grateful.

Looking towards the future, EENA intends to publish a similar document to this but which will focus exclusively on the use of A-GNSS as a location methodology. The objective is to go deeper into the topic of A-GNSS for emergency calls focusing on implementation and deployment. The intention is to carry out this work during the early part of 2015.

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The first version of this document was published by EENA November 2011. The document was updated by Ptolemus Consulting Group[1] in collaboration with EENA.

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1 Introduction

Provision of accurate location information via an automated process linked to the communication network used by the caller is essential for emergency services. The availability of caller location information enables the efficient routing of the emergency call to the correct PSAP, the dispatching of the most appropriate emergency resources and a faster response time.

The main objective of the present document is to describe EENA operational requirements based on the analysis of the available technologies and existing implementations. The document covers the means for acquiring location information, how this information is delivered to emergency services (automatically or not) and how accurate this location information is.

It is worth mentioning that in the analysis of existing implementations four main problems have been revealed:

- the excessive amount of time required to deliver location data to emergency services,
- the lack of accuracy,
- reliability deficiencies,
- the need for standardisation.

This document also sets out how stakeholders should be involved in the procedure of providing the location of the caller to ensure that emergency services are provided electronically, in a minimum timeframe, with the accurate location of the caller, independently of the network and access technologies deployed. Challenges have still to be overcome in order to obtain location data with acceptable levels of reliability and accuracy.

2 Why knowledge of the location is crucial for emergency services

Knowing the location of the caller is crucial for emergency services. In many circumstances, citizens reporting an incident requiring urgent assistance are unable to provide emergency services with accurate information about the location of the emergency. Furthermore, citizens calling 112 abroad may not be able to give accurate information about their location. Provision of emergency services with precise location information will improve travellers' and tourists' safety.

Establishing the exact place of the call helps the emergency services to decide upon the most appropriate resources needed to provide assistance. This is the main reason why location should be as accurate as possible. Information about how to access the location of the emergency can reduce radically the time of the intervention. Medical research indicates that one minute reduction in response time improves the odds of survival by 24%[2].

Automatic provision of caller location is also likely to have a welcome positive impact on the reduction of false emergency calls. With this facility, emergency services can compare the location provided automatically with the one given by the caller. In case of inconsistency between them, the emergency services may have reasons to believe that the call is false. In addition to this, people can be discouraged from initiating false emergency calls if they know that they can be located and eventually prosecuted.

Multiple calls for the same incident can cause unnecessary overload to emergency services. The location of the caller can be also useful to decide if a call refers to an already identified incident.

Emergency services need updated location data independently of the technology the caller is using to contact them (fixed telephony, mobile phone, SMS if possible, voice over IP, etc.) and of the provider of the telecommunication service (all providers, international or national roaming situations, etc.).

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[2] See Colin O'Keeffe, Jon Nicholl, Janette Turner, Steve Goodacre, "Role of ambulance response times in the survival of patients with out-of-hospital cardiac arrest" Emerg Med J doi:10.1136/emj.2009.086363 (available at emj.bmj.com/content/early/2010/08/25/emj.2009.086363.abstract)

3 Abbreviations

The positioning methods specified by 3GPP make use of the following abbreviations:

- A-GNSS Assisted Global Navigation Satellite System
- A-GPS Assisted Global Positioning Systems
- DGPS Differential Global Positioning Systems
- FDD Frequency Division Duplex
- GLONASS GLObal'naya NAvigatsionnaya Sputnikovaya Sistema (Engl.: Global Navigation Satellite System)
- GNSS Global Navigation Satellite System
- GPS Global Positioning System
- IPDL Idle Period Downlink
- LBS Location Based Services
- LMU Location Measurement Unit
- Node B UMTS base station
- OTDOA Observed Time Difference Of Arrival
- QoS Quality of Service
- QZSS Quasi-Zenith Satellite System
- RAN Radio Access Network
- RNC Radio Network Controller
- RTT Round Trip Time
- SAI Service Area Identifier
- SAS Stand-Alone SMLC
- SBAS Satellite Based Augmentation System
- SFN System Frame Number
- SRN Signal-to-Noise Ratio
- SRNC Serving RNC
- TDD Time Division Duplex
- TOA Time Of Arrival
- UE User Equipment
- URA UTRAN Registration Area, is a collection of cells that are used for fast moving UE's in Connected mode when they are not transferring any data
- UMTS Universal Mobile Telecommunication System
- U-TDOA Uplink – Time Difference Of Arrival
- UTRAN Universal Terrestrial Radio Access Network

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4 Methods for the provision of the caller location

4.1 Description

Two different methods are used for the provision of the caller location information. In the 'push' mechanism the location of the caller is received by the PSAP with all calls. Caller location information is provided to PSAPs handling 112 calls automatically with every 112 call and is available without delay for the 112 call handler as soon as the call is answered.

In the 'pull' mechanism the PSAP operator asks for the location, if needed. Caller location is provided upon specific request by the 112 call handler, through an electronic request to a database or otherwise through a verbal request to the appropriate telecom operator. It is also possible that an automatic call for location information is generated by the information system of the PSAP.

'Push' and 'pull' are used all over Europe. Advantages and disadvantages for both methods are well-known. The critical point is time. Both methods are acceptable if the time needed to make the caller location available is within the timeframe of receiving and handling emergency calls, as defined by emergency services.

4.2 Problems in the existing implementations

The most important problem encountered is the **time needed to provide the location**. Emergency situations require an immediate response and delays to obtain the location data are unacceptable. The location data shall be available as soon as the call reaches the authority handling emergency calls.

We can also conclude from the information given by the countries that **no standardised solutions** are implemented. This is actually a significant impairment with respect to many European implementations. It is worth to mention that the lack of standards makes it very difficult to forward the location information to other PSAPs even in the same country.

In October 2014, the Electronic Communications Committee published a Report (ECC Report 225[3]) on "Establishing Criteria for the Accuracy and Reliability of Caller Location Information in Support of Emergency Services". It provides an analysis of the caller location solutions available in order to implement the relevant legislative provisions of the Universal Service Directive by competent regulatory authorities in CEPT countries.

[3] http://www.ecodocdb.dk/doks/doccategoryECC.aspx?doccatid=4

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5 Fixed telephony

5.1 Overview of the provision of location information mechanism

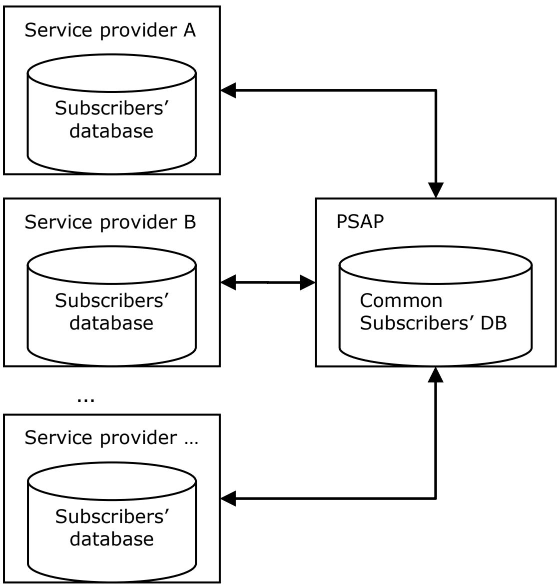
The location of calls coming from fixed telephony is based on data owned by telecommunication companies. As there are many companies, each of them has to make its information accessible.

The following aspects have to be taken into account:

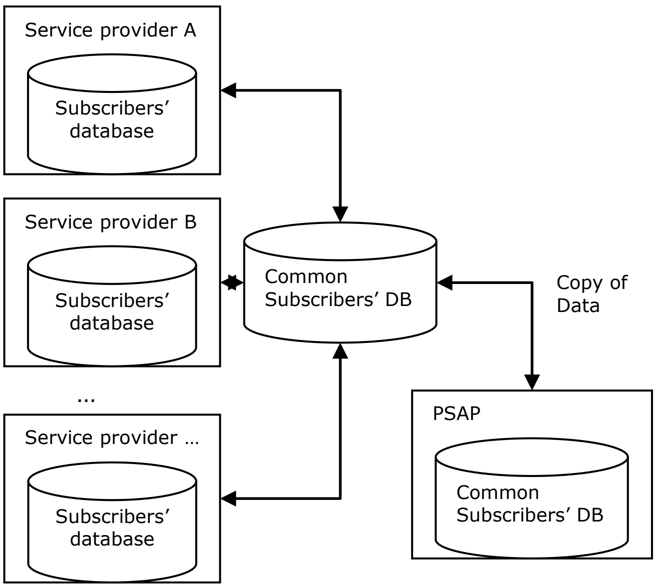
- The centralisation or decentralisation of data coming from all telecommunication companies: in some countries a central database comprises data from subscribers from all companies, in other cases there are different databases, normally one for each company.
- Location of the data: the database or databases can be stored in the PSAP or not.
- How emergency services access data: if the database is not located in the PSAP it can be accessed remotely.
- Accuracy of the data:
  - How often they are updated: changes in subscribers' data may occur daily;
  - Standard format: it is necessary that all data respects the same structure;
  - Correctness of the address (national number portability included);
  - Availability of caller ID and address for calls coming from a campus network;
  - Existence of private numbers.

The following figures represent an high level overview of how these data are stored and accessed by PSAPs in European countries:

Database stored in the PSAP

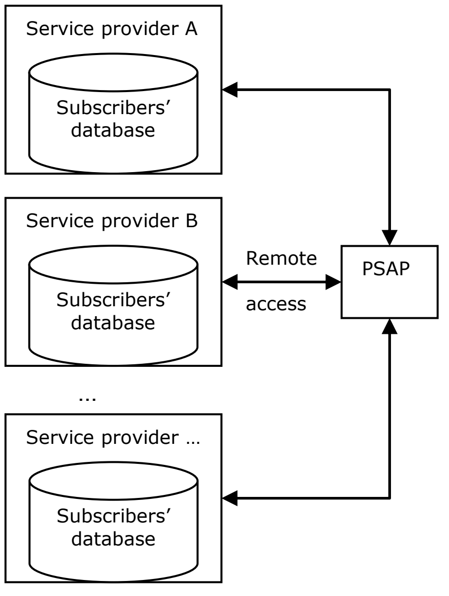


The PSAP receives data from all service providers, creates an integrated database and stores it in the PSAP. (e.g. Lithuania)

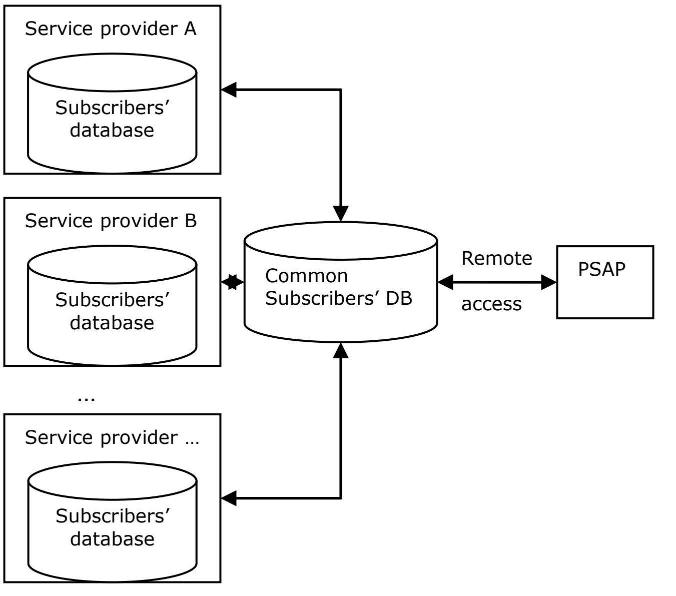


An external organisation creates the databases containing data from all service providers. The PSAP copies this DB and stores it in the PSAP.

Database not stored in the PSAP



The PSAP accesses the databases of the service providers.



A database with data for all service providers is remotely accessible to the PSAP.

5.2 Problems in the existing implementations

Telephone's address location data are **not properly verified** prior to sending them to the emergency services. Telephone locations are not compared via computer software to the maps used by emergency services for the area served by a 112 system.

For fixed telephones the address location of the subscriber (mostly but not always the same location as the telephone unit) and the telephone number are normally stored and most of **databases are not updated** as frequently as needed. There is no real-time location information used in any European country, i.e. there is no dynamic connexion between PSAPs and the operators' database, therefore a great deal of inaccurate location information exists in the fixed line databases.

Databases often do **not include private numbers**, and in fact, most systems only have numbers and locations of published directories.

When the citizen is **calling from a campus or a building complex** the location stored in the database for this phone number is frequently the one of the main building and not the real address of the office or the location where the call is initiated.

In some countries emergency services receive the data from the telecommunication companies in different formats. This format should be **standardised**.

5.3 Recommendations to Stakeholders

Many stakeholders should be involved in the provision of location information to emergency services. The following table contains recommendations about the role to be played by stakeholders.

Stakeholder	Action
European Authorities	Directive mandating the availability of caller location to emergency services

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	• in a standard format • available automatically with the call as soon as the call reaches the PSAP • availability of the exact location inside a campus or building complex network Establish a network of experts to ensure sharing of experiences and exchange of best practices Verify the correct implementation
National Governments	Law transposing the European Directives, mandating operators to make caller location available to emergency services
National telecommunications regulatory authorities	Ensure that telecommunication operators comply with legal requirements for the provision of location information to the PSAPs • caller line identification has to be accessible for emergency calls • availability of subscribers' databases for emergency services • update for all telecommunication operators • one standard for all providers
Campus or building complex owners	Set-up the technological infrastructure needed to make the exact location of the caller available to emergency services
Authorities Competent for Emergency Services (national/regional/local)	Ensure that emergency services have the necessary means (including budget) to adapt their systems to caller location
Telecommunications operators	Ensure clients' database availability to National telecommunications regulatory authority or Emergency Services and regular updating of these data
Emergency services	Integrate access to the database into their systems Verify there are no inconsistencies in data (correct address)
Standardisation organisations	Create a standardised format for structured data

5.4 EENA Requirements

EENA members have concluded that the following features are required:

Update of the Database	At least every 24 hours
Access to the database	Continuous (7x24) and real-time
Integration with GIS	Available
Time to caller location provision	≤ 3 sec average, ≤5 sec 90%
Accuracy	Address of fixed line where the call is initiated
Availability of caller location in case of subscribers not listed in directory services	Yes
Standardised data string for all fixed line operators	Yes, with structured data
Access to database in case of technical failure (fall-back facility)	Available
Database availability	99,995%
Data security	Encryption of the database, secure access

6 Mobile Network

6.1 Description of Available Technologies for the Caller Location Calculation

The following sections contain an overview of location methods. The aim of this document is not to describe them in depth but to give some examples of the available technologies that could be used to improve existing implementations in Europe.

- Network based techniques use the service provider's network infrastructure to identify the location of the handset. They can be implemented without affecting the mobile phones.
- Handset based technologies requires the installation of client software or special hardware on the handset to determine its location. In the case of smartphone accessing location, it doesn't require additional software of hardware but a connection to the relevant API, generally made available by the smartphone maker.
- Hybrid solution are using a variety of sensors and network information to provide more accurate and faster handset-based location.

6.1.1 Cell ID

The Cell ID is the identity number associated with a cell, which is designated by the network operator. This information is used in the network during normal operation to identify the connection point of the mobile to the network. The operator knows the co-ordinates of each cell site and can therefore provide the approximate position of the connected mobile.

The Cell ID positioning considers the location of the base station to be the location of the caller and communicates the sector information. The network cannot guarantee that the serving cell, which is used to estimate the handset location, is the closest to the caller. The accuracy of this method depends of the size of the cell. It can vary from a few meters in urban locations to 10 to 30 km especially in flat countryside and water surfaces. The underlying issue is that mobile phone networks are optimised for coverage, capacity and call handling with minimum number of cells rather than for locating phones. This method can be used regardless of the type of phone but the provided accuracy and reliability are not according to emergency services needs.

6.1.2 Cell ID with Timing Advance

The measured time between the start of a radio frame and the arrival of data to the cell of the mobile network can be added to the data of the cell identification. This period of time is called Timing Advance (TA). Information derived from the wireless network can also be incorporated to the Cell ID based method. This way accuracy can be improved.

6.1.3 Cell ID with Timing Advance and Received Signal Strength

Advanced systems determine the sector in which the mobile phone resides and estimate also approximately the distance to the base station. Further approximation is ensured by interpolating signals between adjacent antenna towers. Qualified services may achieve a precision of down to 50 meters in urban areas where mobile traffic and density of antenna towers (base stations) is sufficiently high. In rural and desolate areas base stations may be kilometres apart and therefore locations are determined less precisely.

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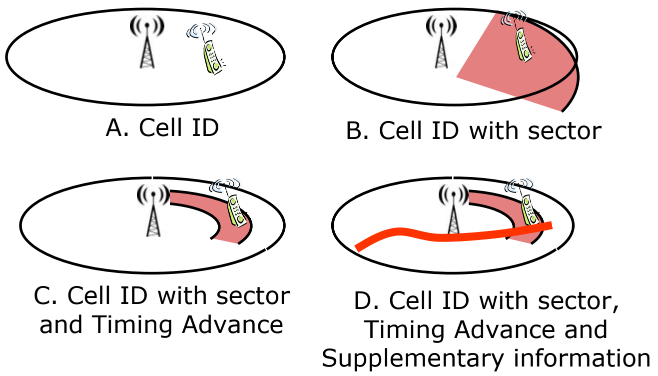

6.1.4 RF Pattern matching method

The RF Pattern Matching technology is based on the observation that the radio environment and signal strength varies from location to location due to features such as terrain, buildings and cellular signal coverage. If enough elements of the radio environment can be measured with sufficient accuracy, each set of measured values provides a radio signature that uniquely identifies a particular location. RF Pattern Matching can provide high accuracy location information.

6.1.5 Uplink measurement methods

This section contains some examples of the available uplink measurement methods:

- Time of Arrival Method (ToA): This technology uses the absolute time of arrival at a certain base station. The time of arrival (ToA) is the travel time of a radio signal from a single transmitter to a remote single receiver. The time is a measure for the distance between transmitter and receiver. Time of arrival data from two base stations will narrow a position to two circles and data from a third base station is required to resolve the precise position with the third circle when matching in a single point.

- Angle of Arrival (AoA): The angle of arrival mechanism locates the mobile phone at the point where the lines along the angles from each base station intersect. AoA (Angle of Arrival) requires specialised receivers at the base stations in addition to the construction of directional antenna arrays on the existing cell towers.

- Uplink-Time Difference of Arrival (U-TDOA): It is a real time locating technology for mobile phone networks that uses multilateration (hyperbolic positioning) based on timing of received signals. Location Measurement Units (LMUs) are co-located at the Base Transceiver Stations (BTSs) to calculate the time difference measurements used to determine the location of a mobile phone. The technique is a network-based location technology, so it can locate any phone. It can also locate any phone in any environment – including indoors and in urban areas with tall buildings. The accuracy is within 50 metres. Typically, the time to first fix is about 6 or 7 seconds in GSM and about 10 or 11 seconds for UMTS.

6.1.6 Downlink measurement technologies

- Enhanced Observed Time Difference (E-OTD): The location is estimated using measurements made by the mobile phone, rather than by the base station. The location method works by multilateration.

- OTDOA-IPDL Method with network configurable idle periods: The OTDOA-IPDL method involves measurements made by the user equipment and Location Measurement Unit of the UTRAN frame timing (e.g. SFN-SFN observed time difference). These measures are then sent to the SRNC while, in networks which include an SAS, they may be forwarded to the SAS. Depending on the configuration of the network, the position of the UE is calculated in the SRNC or in the SAS. Alternatively, the user equipment may perform the calculation of the position using measurements and assistance data.

6.1.7 LTE and 4G cellular network based location

Getting positioning information from 2G and 3G is akin to reverse-engineering. The network is in place and technologies are created to read its inner workings. With LTE, positioning was taken into account during the development and standardisation process. This results in some signalling channels dedicated specifically to positioning providing an almost continuous update of location information.

So while LTE enables a wider range of services, better QoS and resource management it is also able to provide environment-agnostic positioning for both existing and new commercial as well as non-commercial services.

The design philosophy behind LTE is characterised by decentralised radio-access network architecture, a minimised number of node levels, and that the positioning architecture should be transparent to the underlying radio network. Moreover, a positioning node is introduced to take on some tasks of LTE positioning functionality.

The LTE positioning protocol (LPP) is a point-to-point protocol that can be used in both user- and control-plane. Also, the procedures can be executed in parallel to reduce latency. In the user-plane, the secure user-plane location (SUPL) protocol is used, while the LPP Annex (LPPa) is for control-plane positioning but can also support user-plane positioning.

In release 9 of LTE[4], three additional device-assisted methods became available, namely the E-Cell-ID, OTDOA and A-GNSS. Specifically, the E-Cell-ID method, also being network-based, utilises cell IDs, radio frequency (RF) measurements from multiple cells, timing advance, and angle of arrival (AOA) measurements.

Release 9 also include known methods that do not require any additional standardisation, namely RF fingerprinting, Adaptive E-Cell-ID (AECID) and hybrid positioning. Hybrid positioning simply refers to the method of combining positioning results obtained from using different methods.

6.1.8 Wi-Fi based location

The Wi-Fi positioning solution is based on a company building and maintaining a global database of Wi-Fi access point MAC addresses and their precise locations. This data is then used by a Wi-Fi-enabled device to triangulate the user's position. Access to Wi-Fi location is generally enabled through API licencing with the main OS providers.

This access includes the ability to combine Wi-Fi-based triangulation data with cellular base station triangulation (creating a database of base stations of all operators) and - when available - GNSS to provide reliable and accurate position data under a wide range of conditions, including tall buildings and indoor.

Wi-Fi location's reach depends on the concentration of cells in an area. Since they are mostly privately owned Wi-Fi Routers, accuracy is proportional to urban concentration. This means that while Wi-Fi location is very reliable, it is not appropriate for caller's location on motorway for example.

However, because it works indoors and offers a very fast time to first fix in urban environments, Wi-Fi is well placed to be part of the location mix available to application developers. We believe that since the technology is available, indoor location should be part of the expectation of E112.

[4] Source: T. Wigren, "Adaptive Enhanced Cell ID fingerprinting localization by clustering of precise position measurements," IEEE Transactions on Vehicular Technology, vol. 56, no. 5, 2007, pp. 3199 – 3209.

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6.1.9 Global Navigation Satellite System based technologies

Assisted GPS (A-GPS): Standalone GPS/GNSS operation uses radio signals from satellites alone. A-GPS /A-GNSS additionally uses network resources to locate and also uses the satellites faster as well as better in poor signal conditions. In very poor signal conditions, for example in a city, these signals may suffer multipath propagation where signals bounce off buildings, or be weakened by passing through atmospheric conditions, walls or tree cover. When first turned on in these conditions, some standalone GPS/GNSS navigation devices may not be able to work out a position due to the fragmentary signal, rendering them unable to function until a clear signal can be received continuously. In the case of mobile phones, if a GPS/GNSS signal cannot be received, or if the handset does not contain a GPS/GNSS chip, a fall back to network based location methods is required.

A-GPS SIM: is a hybrid positioning solution comprising A-GPS/A-GNSS, GPS/GNSS, RF Pattern and Cell ID methods to ensure performance both outdoors and indoors. The assisted GPS/GNSS receiver module is embedded in a standard size SIM card for legacy, new GSM and 3G phones. For retrieving the assistance data from the server and for transmitting the location data to PSAP, A-GPS/A-GNSS SIM can use GPRS, like A-GPS/A-GNSS phones do, but also USSD and SMS to support mid tier and low tier phone models. Although USSD and SMS are not as fast as GPRS, those can be used concurrently with a voice call, which is important in case of emergency calls. No software or hardware modifications are needed for the phones and no or only minimal modifications for the network. A-GPS/A-GNSS SIM supports both automatic transmission of location information to PSAP when 112 is called and PSAP or network initiated requests. The smart card security features of the SIM can be used to encrypt the location data and to prevent unauthorised tracking of citizens.

Hybrid positioning systems: are systems for finding the location of a mobile device using several different positioning technologies. Usually GPS/GNSS is one major component of such systems, combined with cell tower signals, wireless internet signals or local positioning systems. These systems are specifically designed to overcome the limitations of GPS/GNSS, which is very exact in open areas, but works poorly indoors or between tall buildings. Wi-Fi signals may give very exact positioning, but only in urban areas with high Wi-Fi density - and depend on a comprehensive database of Wi- Fi access points. There are situations where A-GPS/A-GNSS could fall back to another high-accuracy location technology like U-TDOA. In fact, in optimal situations where A-GPS/ A-GNSS and U-TDOA can work, both location technologies can be employed, and the calculations can be combined to offer location accuracies superior to either technologies working individually.

6.1.10 Other technologies

Indoor proximity detection: where operators deployed indoor coverage infrastructure using distributed antenna systems (DAS), it is possible to add "proximity sensors" which can identify which DAS port a device is using and isolate it's potential location to a specific part of the building (office, airport, stadium). This provides 100% indoor yield to GPS/GNSS type accuracy in environments where GPS/GNSS often fails to work. A variety of sensors can be used in such an environment but we see Wi-Fi and Bluetooth Low Energy as the two main contenders.

6.2 Transmission of the caller location information

There are at least two approaches to deliver caller location automatically from mobile telephony networks to PSAPs:

1. Using IP connectivity between the PSAP and the mobile telecommunication network system: software should make the match between the received caller location data and the corresponding voice call.

2. Coding location data in the signalling channel, which delivers 112 calls to the PSAP: PSAPs gets 112 call and caller location at the same time.

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6.3 Caller location accuracy and reliability

- Situation in the European Union

In the last published document COCOM 13-04REV1 "Implementation of the European emergency number 112 - Results of the sixth data-gathering round"[5], published by COCOM 14 March 2013 Member States were asked to provide the level of accuracy and reliability provided by network operators to the PSAP.

18 Member States reported that for the location of the caller from mobile networks the accuracy was given by the Cell/sector ID providing a high reliability of the data transmitted to the PSAP operator. However, there was no information on the usefulness of the data transmitted, the accuracy reported ranged from 30 to 5000 meters.

Only Denmark reported on the use of a 112 App which could provide an accuracy of 10 to 60 meters.

- Situation in the United States of America

High-accuracy location has been implemented within the United States for a large majority of calls made to the North-American emergency number 911 since the regulatory authority (FCC) has defined caller-location accuracy requirements for e9-1-1[6]:

E911 Phase 1: Wireless network operators must identify the phone number and cell phone tower used by callers, within six minutes of a request by a PSAP.

E911 Phase 2:

- 95% of the devices must be location capable by December 31, 2005.
- For handset-based solutions: the accuracy required is 50 meters for 67% of calls and 150 meters for 95% of calls
- For network-based solutions: the accuracy required is 100 meters for 67% of calls, 300 meters for 95% of calls
- Wireless network operators must provide the location coordinate of the caller within six minutes of a PSAP request. Accuracy rates must meet FCC standards on average within any given participating PSAP service area by September 11, 2012.

In July 2011, the FCC also announced a proposed rule requiring, 'handset based' and 'network based' location techniques to meet the same accuracy standard by 2019.

Yet tests made in Washington DC in July 2014 illustrated the problem. The Public Safety Network analysis of D.C. Office of Unified Communications had to release data demonstrating that only a small fraction of the calls were being accurately located by each networks.

Carrier	Total Calls	Phase I location (Cell-ID)	% of calls located	Phase 2 location (GPS)	% of calls located
AT&T	31135	30332	97.4	803	2.6
Leap	6151	5168	84	983	16
Sprint	19694	15099	76.6	4595	23.3
T-Mobile	22883	22147	96.7	736	3.2
Verizon	13899	10485	75.4	3414	24.6

Source: Findme911.org

[5] http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=4447

[6] http://www.fcc.gov/pshs/services/911-services/enhanced911/Welcome.html

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The trend is for fewer calls to be located by the wireless operators. Hybrid location has moved to GPS/GNSS only with the smartphone penetration. Also, the majority of calls are now made from smartphones while indoor, they are not being located.

In Feb 2014, the FCC **proposed rules to add indoor location** in the E911 requirements.

- The wireless network providers would be required to provide horizontal location (x- and y-axis) information within 50 meters of the caller for 67% of 911 calls placed from indoor environments within two years of the effective date of adoption of rules, and for 80% of indoor calls within five years.
- The wireless network providers would be required to provide vertical location (z-axis) information within 3 meters of the caller for 675 of indoor 911 calls within three years of the adoption of rules, and for 80% of calls within five years.

In June 2014 the CTIA sent an open letter to the FCC alerting:

"The E-911 Phase II experience teaches that location accuracy benchmarks should be grounded in verified data, not aspirational target-setting. The Cellular Telecommunications Industry Association (CTIA) highlighted that there is no evidence that any location technology solution currently available or under consideration is capable of satisfying the Commission's proposed location information requirements on a nationwide basis within the timeframes proposed by agency."

In November 2014, NENA announced a consensus plan to meet the FCC's challenge to improve 9-1-1 indoor location accuracy and published a roadmap[7] to achieving improved location accuracy for both outdoor and indoor 9-1-1 calls.

6.4 Problems in existing implementations

Currently most European countries are using a basic Cell-ID solution with or without timing advance. It is important to mention that the statistical average **accuracy** of this system is more than 500 meters (considering urban and rural areas). However, there are now more sophisticated Cell-ID based methods, which would provide much higher accuracy.

According to the 2014 COCOM's "Report on the Implementation of 112"[8] (see annex A of this document), automatic caller location information provided to emergency centres, is currently limited to Cell-ID only. This technology is highly inaccurate (precise to a range of 40km in some areas) and is of dubious value in locating callers in need of assistance. In addition, the delay in delivering location information is, in some countries, as high as 150 minutes.

Interestingly, reports from 2010 (see annex B) showed a very similar picture, the only real difference being that Denmark is now the only country with an E112 app that provides precise location.

Delivery of caller location from telecommunication operators to the PSAPs should be **standardised**. It will help interoperability and data exchange between different PSAPs.

The method that operators actually use to determine the devices' location should be completely **transparent** to the emergency services.

The **time** needed to provide caller location has to be in keeping with the emergency services needs. It has to be possible to **update** the location information.

6.5 Description of Available Standards

[7] http://www.nena.org/news/202869/9-1-1-Leaders--Wireless-Carriers-Answer-the-Call-to-Improve-9-1-1-Indoor-Location-Accuracy.htm

[8] http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=4447

The standard positioning methods supported within Universal Terrestrial Radio Access Network – UTRAN - are:

- Cell ID based method
- Observed Time Difference of Arrival - OTDOA - method that may be assisted by network configurable idle periods
- Network-assisted Global Navigation Satellite System – GNSS - methods
- Uplink Time Difference Of Arrival - U-TDOA
- Radio Frequency Pattern Matching – RF Pattern Matching

Document		Description
3GPP TS 43.059 V12.0.0	"Functional stage 2 description of Location Services (LCS) in GERAN (Release 9)"	Describes how standards-based positioning methods are seamlessly added within GSM (2G) RAN
3GPP TS 25.305 V12.0.0	"Stage 2 functional specification of User Equipment (UE) positioning in UTRAN (Release 9)"	Describes how standards-based positioning methods are seamlessly added with UMTS (3G) RAN
ETSI TS 102 164 V1.3.1	"Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); Emergency Location Protocols"	Specifies the protocol that is used by the local emergency operator to obtain the location information that is registered on the operator location server
3GPP TS 36.355 v12.2	"Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)"	Specifies the LTE positioning protocol (LPP)

6.6 EU Existing Implementations

Some examples of the type of mobile calls location information received by emergency services in European countries are shown in this section of the document. The data is based on the Electronic Communications Committee (ECC) Report 143 "Practical improvements in handling 112 emergency calls: caller location information" (April 2010), information given by EENA members and updated from the 2014 Communication Committee Implementation Report (see annex A).

Country	**Type of caller location information**
Austria	Cell ID: base station number or location. Some operators provide Sector ID
Belgium	Cell ID: base station number and location
Bulgaria	Cell ID: coverage of the Cell
Croatia	Cell ID and angle of coverage
Cyprus	Cell ID/ Sector ID
Czech Republic	Depending on the network operator, the caller location provided is area with radius from 1 km/70% to 5 km/70% or the Best Server Base Transceiver Station
Denmark	Cell ID or 112 App using smartphone hybrid location.

Country	**Type of caller location information**
Latvia	Cell ID/ Sector ID
Lithuania	Cell ID: 95% of mobile location data must be provided within 20 seconds from call set-up moment.
Luxembourg	Cell ID
Malta	Cell ID
Hungary	Cell ID / Sector ID
Netherlands	Cell ID
Poland	Cell ID/ Sector ID Timing advance technology with accuracy of 100 m to 1 km

Estonia	Coordinates	Portugal	Cell ID
Finland	Cell ID/ Sector ID and also more accurate information based on the best available calculation method depending on the operator	Romania	Cell ID/ Sector ID
France	Cell ID: base station number and location	Slovenia	Cell ID/ Sector ID
Germany	Cell ID/Sector ID	Slovakia	Cell ID/ Sector ID
Greece	Cell ID: Depending on the network: Cell Area, Cell Set, Cell ID, Base station Address, Azimuth, and maximum coverage distance	Spain	Cell ID /Sector ID
Hungary	Cell ID/Sector ID	Sweden	Cell ID, with or without timing advance
Ireland	Cell ID	Switzerland	Time and ellipse plus optional information
Italy	Cell ID	United Kingdom	Cell ID, with or without timing advance

6.7 Recommendations to Stakeholders

Location technology has evolved and accuracy and reliability possibilities have been improved. The distance between what is technologically feasible and the current implementations in the PSAPs continues to grow. We believe the overall approach should be to use what exists and is readily available today rather than expect investment in new infrastructure.

As we expect smartphones penetration to reach 100% by the end of this decade, device-based location is today much better than any other available location means in terms or reliability, accuracy and availability. Therefore, the use of GNSS in smartphone should be mandated.

Furthermore, private companies are developing applications for smartphones and they are able to transfer GPS/GNSS data to the 112 PSAPs. How this information should be delivered to emergency services has to be urgently standardised.

Many stakeholders should be involved in the provision of location information to emergency services. The following table contains recommendations about the role to be played by stakeholders.

Stakeholder	Action
European Authorities	Directive mandating the availability of caller location to emergency services • in a standard format • available automatically with the call as soon as the call reaches the PSAP • with accuracy requirements • free of charge to the authority handling emergency calls Establish a target schedule for the implementation of the accurate emergency call positioning service covering 100% of EU mobile phone users and geographical area Establish a network of experts to provide the sharing of experiences

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	and the exchange of best practices Mandate the availability of GNSS in all phones sold in Europe by 2018 Standardise the method to access smartphone location data for emergency services by end 2015 and mandate its implementation by end 2016 Verify the correct implementation with adhoc audits carried out by third parties to ensure the calls are being located
National / Regional Authorities	Law transposing directives, mandating operators to make caller location available to emergency services Establish a financial plan for setting up the required solution for providing accurate caller location for PSAPs Establish national implementation schedule no longer than the EU requirement.
National Telecommunications Regulatory Authorities (NTRA)	Check that telecommunication operators comply with legal requirements for the provision of location information to the PSAPs (also for roaming) Establish national accuracy requirements as least as accurate as EU requirements
Authorities Competent for Emergency Services	Make sure that emergency services have the necessary means (including budget) to adapt their systems to caller location Standardise the way emergency services have access to smartphones' positioning data, which includes GNSS latitude and longitude but also the mobile network cell and the approximate Wi-Fi position (or the Wi-Fi hotspot IDs).
Telecommunications operators	Provide the location information to the PSAP (also for roaming cases) in conformance with the technical requirements (accuracy, latency, etc.)
Emergency services	Integrate location information into their systems Verify that location information is correctly received

6.8 EENA Requirements

Analysing the different positioning methods and technologies for emergency services, many aspects have to be taken into account. Some of the major ones are summarised as follows:

- The selection of any location method should take into account the balance between the benefits and the complexity of implementing and operating the technology in the telecommunications network, the impact in the user's device, and in the PSAP operations centre.

- The cost and complexity of location technologies might have significant impact in the operator's network so handset-based location data should be used as and when possible.

- Preferred location methods should fully support standards and the evolution of telecom networks, i.e. UMTS, LTE, and beyond. Medium term investments in LTE networks will provide a new generation of readily available network-based location means.

- The location method should also take into account how many wireless subscribers will have access to the high performance location technologies. Additionally, the combination of the different location methods used should function in the areas where the majority of 112 calls are made.

EENA members have concluded that the following features are required:

Requirements	
Integration with GIS	Available
Possibility to additionally obtain the registered address of the subscription	Yes
Availability of caller location in case of users of international roaming	Yes
Possibility to update the caller position (caller on the move)	Yes
Accuracy:	Success rate: % of calls 67% 95% 1. First estimate location Urban accuracy <50m <100m Rural accuracy <500m <1000m Latency time <5sec <10sec 2. Accurate location Urban accuracy <30m <100m Rural accuracy <30m <50m Latency time <10sec <20sec
Accurate location information received by PSAP should include:	Latitude, Longitude, Altitude (optional), Street address (optional), Accuracy estimate (RMS), Speed, Direction, Timestamp,
Data security	Encryption, secured connections

We have proposed stronger requirement for location accuracy and latency. This is based on the fact that it is now possible to use different technologies. Member states should be responsible for this to happen, it could also be implemented through a European approach with a mandate directed to the handset makers.

7 SMS Location

In some countries the access to emergency services using SMS is possible but it is restricted to people with disabilities; in some others it is available to all citizens. In the countries where SMS is being used, the need for location data is exactly the same as for voice calls.

The main difficulty associated with SMS location is that it is a "store and forward" and a "non guaranteed delivery" mechanism. SMS is stored and forwarded between two phones, not necessarily between phone and a host. The delivery of SMS to the destination can also be acknowledged. Anyone who sends an SMS cannot know whether it has been received or how long it will take to be received. There are no standards that describe how location could be automatically delivered with an SMS.

8 Smartphone Apps-based location

Obtaining and sending location using smartphone applications could be an intermediate way to manage 112 callers location. EENA published the 112 Apps EENA Operations Document[9] with a recommended pan-European architecture and data format.

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[9] http://www.eena.org/uploads/gallery/files/operations_documents/2014_02_25_112smartphoneapps.pdf

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- Such an architecture would avoid the risk of multiple national applications that are not compatible and not tested to work in other EU countries.
- A pan-European standardised way to access 112 through Apps would also put PSAPs more in control and avoid them having to rely on propriety technology
- Handset-based additional data will be available to emergency services; more accurate location being the most important one.
- Also, with one standard to connect to 112 via smartphone application, callers will be able to use the service in their own language while being abroad and connecting to the local PSAP in that country.
- For people with disability using the SMS location seen above, the app should send the SMS and should send the GNSS location to the PSAP using SMS or other channel.

9 IP based communications

9.1 Current situation

9.1.1 Service categories

The European Regulators Group (ERG) - now replaced by the Body of European Regulators for Electronic Communications (BEREC) - has differentiated four categories of VoIP services[10]:

1. A service where international public telecommunication numbering plan numbers – E.164 numbers - are not provided and from which there is no access to or from the public switched telephone network - PSTN. This case however covers different implementations: from pure *peer-to-peer*, based on VoIP software which uses users' computers as nodes of the connection to more centralized architectures based on call management servers, data bases and routers provided by the VoIP operator.
2. **Outbound voice**: a service where there is outgoing access to the PSTN only and E.164 numbers are not provided.
3. **Inbound voice**: a service where there is incoming access from the PSTN, mobile networks or via IP and E.164 numbers are provided. A service belonging to this category does not provide outbound calls (whether to the PSTN, mobile or otherwise).
4. **Voice telephony**: a service where there is incoming and outgoing access to the PSTN, mobile network, and E.164 numbers are provided. This category includes traditional publicly available telephone services - PATS, other services which can generally be regarded as a substitute for PATS (like most VoB offers) and ECS VoIP services.

For voice telephony, the PSAP receive the information from their database of IP location that can prove useful. Yet in case of private networks installed in large buildings or campuses, one IP means one generic location for all buildings inside the campus.

If we suggest E112 is after 100% quality of location, then IP location available from VOIP calls will not work. However, if the expectation is 90% then IP location for VOIP calls made on phone lines is accurate to the city or better. This might not be enough to locate the caller but will be useful to identify the most relevant PSAP.

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[10] ERG (07) 56rev2 "ERG common position on VoIP", December 2007
ERG (09) 19 "VoIP – Action plan to achieve conformity with ERG common positioning", June 2009

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A standardisation group as part of ETSI is working on an EC mandate to create a standard specifically for IP based communications. Started in 2012, they are focussing on insuring better accuracy and reliability from IP calls available location data and making it hack-proof.

International standardisation groups have previously developed standards to obtain the location of the caller. The exhaustive study of this technology is out of the scope of this document. This work is done in the framework the EENA NG112 Technical Committee. The standards are listed for information purposes.

The Internet Engineering Task Force (IETF) has developed standards and technological emergency services architectures. Here is the list of applicable standards:

- Location Retrieval: Various protocols standardised for different environments:
  - HTTP-Enabled Location Delivery (HELD): RFC 5989 http://tools.ietf.org/html/rfc5985
  - DHCP Civic Location: RFC 4676 http://datatracker.ietf.org/doc/rfc4676/
  - DHCP Geodetic Location: http://datatracker.ietf.org/doc/rfc3825/
  - With a number of extensions, see http://datatracker.ietf.org/wg/geopriv/.
- Emergency Call Routing:
  - Requirements: RFC 5012 http://datatracker.ietf.org/doc/rfc5012/
  - Security Threat Analysis: RFC 5069 http://datatracker.ietf.org/doc/rfc5069/
  - RFC 5222 (LoST) http://tools.ietf.org/html//rfc5222
  - Architecture: RFC 5582http://datatracker.ietf.org/doc/rfc5582/
  - Discovery of LoST Servers: http://datatracker.ietf.org/doc/rfc5223/
  - Support for Holes in Service Boundaries: http://datatracker.ietf.org/doc/rfc5964/
- Considerations for Trustworthy Location Information:
  - http://datatracker.ietf.org/doc/draft-ietf-ecrit-trustworthy-location/
- Considerations for Dealing with Imprecise Location:
  - http://datatracker.ietf.org/doc/draft-ietf-ecrit-location-hiding-req/
  - http://tools.ietf.org/html/draft-ietf-ecrit-rough-loc-03

The National Emergency Number Association (NENA) has made big progress in the field of definition and description of standards for the reception in the PSAPs of 9-1-1 calls over IP.

08-002 v1	Functional & Interface Standards for NG9-1-1 (i3)
08-003 (Draft)	NENA i3 Solution NOTE: NENA 08-003, Version 1, is in the NENA review process. The public review comments are being addressed by the LTD WG.
08-501 v1	Network Interface to IP Capable PSAP
08-502 v1	E9-1-1 Requirements
08-503 v1	VoIP Characteristics
08-504 v1	VoIP Standards Development Organizations (SDOs)
08-505 v1	Location Determination: IP-Based Emergency Services
08-751 v1	i3 Requirements (Long Term Definition)
08-752 v1	Location Information to Support IP-Based Emergency Services
08-DRAFT	Emergency Services IP Network Design for NG9-1-1 NOTE: NENA 08-XXX, Version 1, is continuing to be developed by the ESIND WG.

NOTE Please check regularly for standardisation updates.

9.1.2 Existing Implementations

In the United Kingdom, 112 calls can be initiated using Skype, a well known software application that allows users to make voice calls over the Internet. Skype checks whether the user's IP address is in the United Kingdom using Geo IP. Detailed location information is not available and calling back is not possible.

In Slovenia the system described under Category 4 of VoIP services is used.

In Denmark it is possible to access 112 using VoIP. These calls are flagged; this way the emergency centre knows that the accuracy of the address information is not entirely reliable.

9.1.3 Recommendation to stakeholders

In many of the Member States, the national law is an obstacle to conformity with the Common Position of ERG. This should be covered by new legislation implementing the results of the Framework Review.

Stakeholder	Action
European Authorities	Directives mandating the availability of caller location to emergency services • in a standard format • available automatically with the call as soon as the call reaches the PSAP • with accuracy requirements • free of charge to the authority handling emergency calls Establish a network of experts to provide the sharing of experiences and the exchange of best practices
National Governments	Law transposing European directives, mandating operators to make caller location available to emergency services
National Telecommunications regulatory authority (NTRA)	Check that telecommunication operators comply with legal requirements for the provision of location information to the PSAPs
Authorities Competent for Emergency Services	Make sure that emergency services have the necessary means (including budget) to adapt their systems to caller location
Telecommunications operators	Provide the location information to the PSAP in conformance with legal requirements
Emergency services	Integrate location information into their systems Verify that location information is correctly received

9.2 EENA Requirements

EENA members have concluded that the following features are required:

Requirement	
Integration with GIS	Available
Latency: time to caller location provision	≤ 5 sec average, ≤10 sec 90% all
Possibility to additionally obtain the registered address of the subscription	Yes
Availability of caller location in case of users of international roaming	Yes
Possibility to update the caller position (caller on the move)	Yes
Accuracy	≤100 m
Data security	Encryption, secured connections
Availability	99,95%

9.3 Target future state

Citizens expect to be able to contact emergency services with technologies they use to communicate every day. This includes text-messaging, video and other means of communication that have become commonplace. EENA's Next Generation Committee is dealing with these issues. In the future:

- Citizens should be able to reach emergency services by calls using all types of VoIP, text messaging, instant messaging, pictures and videos.
- Contact should be established without additional delays, which could have potentially disastrous consequences.
- The location of citizens should be available to emergency services independently of the technology used.

ANNEX A - Caller location situation in 2014

Source: COMMUNICATIONS COMMITTEE document
"Implementation of the European emergency number 112 – Results of the seventh data-gathering round" published 11 February 2014

Country	6 Caller location accuracy and reliability 6.1 Fixed networks 6.2 Mobile networks	7. Average time needed for receiving the caller location by the 112 operator	8.1 Availability of EU roaming call to 112 8.2 Availability of caller location of EU roaming calls
Austria	6.1: residential address, see http://www.rtr.at/en/tk/TKG 2003 6.2: Cell/ID (base station number) or location of base station (geographic data). If technically available some mobile operators offer sector information additionally	7.1: N/A	8.1: Yes 8.2: Yes
Belgium	6.1: registered installation address by the operator reliability fluctuates due to irregular update of changed data by operators. 6.2: Cell ID together with installation address of antenna of operator; reliability is high. Nomadic services remain problematic location data are rarely provided and reliability is highly questionable.	7.1: Fixed: real time if emergency services have access to installation database ; mobile: near real time. (automated pull system)	8.1: Yes 8.2: No
Bulgaria	6.1: address of the calling party, based on calling party number 6.2: coverage of the Cell	7.1: Push method (instant)	8.1: Yes 8.2: Yes
Croatia	6.1: public address book. 6.2: Cell Id and angle of coverage	7.1: 10-50 s on a GIS map - not statistically measured.	8.1: Yes 8.2: Yes
Cyprus	6.1: address 6.2: around 30m	7.1: 20 sec. Longest 30 sec. Quickest 11sec.	8.1: Yes (95%) 8.2: Yes
Czech Republic	N/A	7.1: N/A	8: N/A
Denmark	6.1: N/A 6.2: Cell ID: 75% within a range depending on the mobile network infrastructure from 500 m to 5000 m. 112 app is accuracy: 10-60m.	7.1: Instantly. 112 App – up to 20-40 sec depending on the phone and network.	8: N/A
Estonia	6.1: N/A 6.2: N/A	7.1: 2 s	8.1: Yes 8.2: Yes
Finland	6.1: street address information from the commercial directory services database 6.2: Cell ID/Sector ID and more accurate information based on the best available calculation method (depends on the operator)	7.1: 6 s	8.1: Yes 8.2: Yes

France	6.1: Mailing Address 6.2:Cell ID	7.1: several minutes (estimated)	8: N/A
Germany	6.1: For calls from fixed networks, the technical specifications state that an exact address must be given as the location. This requirement should have largely been implemented by the end of 2014 (including nomadic use of the telephone service provided by the network operator); the only exemptions from the implementation requirement are: a) telephone connections to exchanges using ISDN technology (in view of the foreseeable end of the service life of that technology) and b) mixed types of nomadic uses for which solutions at EU level are to be standardised. 6.2: Cell ID	7.1: a) mobile networks 0 seconds (100% 'push' system) b) fixed networks: 0 seconds in the case of emergency calls from networks in which the 'push' system is already being used; in cases where the 'push' system has not yet been introduced: approx. 70 seconds with the 'pull' system which based on the telephone number is still being used until the 'push' system is introduced; trend: the time needed is decreasing.	8.1: Yes 8.2: Yes
Greece	6.1: physical address for fixed telephone connection; in case of Nomadic VoIP systems, the registered subscriber address 6.2: Cell ID, depending on the network: Cell Area, Cell Set, Cell ID, Base station Address, Azimuth, and maximum coverage distance	7.1: 38min and 48sec	8.1: Yes 8.2: Yes
Hungary	N/A	N/A	N/A
Ireland	6.1: 99.14% of fixed lines have location information. This is broken down as follows: Installation Address Co-ordinates - 21.38% STD Code match - 7.12% County only match - 36.89% Townland & County match - 33.74% 6.2: Cell ID	7.1: Instant	8.1: Yes 8.2: Yes
Italy	6.1: 80 % 6.2: 23%	7.1: 3-5 s	8.1: Yes 8.2: Yes
Latvia	6.1: address provided by network operator. 6.2: Cell ID	N/A	8.1: Yes 8.2: Yes
Lithuania	6.1: Subscriber's billing address, database renewal – every two months 6.2: Cell ID, 95% of mobile location data must be provided within 20 seconds from call set-up moment.	7.1: 1-2 s	8.1: Yes 8.2: Yes
Luxembourg	6.1 Administration des services de secours : High accuracy High reliability No data for VoIP caller 6.2 Administration des services de secours : Cell ID High reliability	7.1 Administration des services de secours : < 1 seconds for fixed and mobile caller Police : N/A	8.1: Yes 8.2: Yes
Malta	6.1: Address of Registered Line as available in the Service Provider database 6.2: Cell ID	7.1: 5-10 minutes	8.1: Yes 8.2: Yes

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Netherlands	6.1: N/A 6.2: N/A	7.1: 1 s for MNO's. 3 s for fixed	8.1: Yes 8.2: Yes
Poland	6.1: detailed address of a network termination point installation Fixed caller location information is obtained from the relevant operator and a centralised location information database. 6.2: Cell Id/Sector ID/timing Advance: 100m - 1 km. Geographic location of publicly available telecommunications services user's terminal. Specific requirements laid down by NRA are under consideration – NRA is authorised to settle specific requirements in decision for an operator.	7.1: 73 s (estimated)	8.1: Yes 8.2: Yes
Portugal	6.1: N/A 6.2: N/A	7.1 N/A	8: N/A
Romania	6.1: 98.35% from fixed networks receive address information with accuracy (updating databases monthly) 6.2: 98.86 % from calls have a valid network cell ID and sector ID	7.1 Average time: 10 (sec)	8.1: Yes 8.2: Yes
Slovakia	6.1: N/A 6.2: N/A	7.1: N/A	8.1: Yes 8.2: Yes
Slovenia	6.1. Address 6.2. Cell ID	7.1: 4s	8.1: Yes 8.2: Yes
Spain	6.1: Subscriber's address. 6.2: POSIC112 provides the physical location of the base station corresponding to the cell where the caller is located, as well as the sector or sectors of most probable location (Cell ID, Sector ID).	7.1: 1.26s	8.1: Yes 8.2: Yes
Sweden	6.1: N/A 6.2: N/A	7.1: 0,9 s	8.1: Yes 8.2: Yes
United Kingdom	6.1: N/A 6.2: N/A	7.1: <2 s	8.1: Yes 8.2: Only for some networks.
Iceland	6.1: Correct location in 99,9% of calls. 6.2: Cell ID is generally provided reliably in probably 90% of all mobile calls	7.1: 10 s	8.1: Yes 8.2: Yes

ANNEX B – Mobile caller location situation in 2010

Some examples of the type of mobile calls location information received by emergency services in European countries are shown in this section of the document. Data based on the Electronic Communications Committee (ECC) Report 143 "Practical improvements in handling 112 emergency calls: caller location information" (April 2010) and information given by EENA members:

Country	Type of caller location information
Austria	Cell ID/ Sector ID
Belgium	Cell ID/Sector ID

Country	Type of caller location information
Latvia	Cell ID/ Sector ID
Lithuania	Cell ID

Bulgaria	Cell ID
Cyprus	Cell ID/ Sector ID
Czech Republic	Depending on the network operator, the caller location provided is area with radius from 1 km/70% to 5 km/70% or the Best Server Base Transceiver Station
Denmark	Cell ID. Caller is asked to give the GPS/GNSS coordinates, if available.
Estonia	Coordinates
Finland	Cell ID/ Sector ID and also more accurate information based on the best available calculation method depending on the operator
France	Postal code of the local community of the relevant cell base Transceiver Station (BTS). This provides for accuracy of a few km.
Germany	Cell ID/Sector ID
Greece	Cell ID
Hungary	Cell ID/Sector ID
Ireland	Cell ID
Italy	Cell ID

Luxembourg	Cell ID
Hungary	Cell ID / Sector ID
Netherlands	Cell ID
Poland	Cell ID/ Sector ID Timing advance technology with accuracy of 100 m to 1 km
Portugal	Cell ID
Romania	Cell ID/ Sector ID
Slovenia	RF pattern with three levels of probability
Slovakia	Cell ID/ Sector ID
Spain	Cell ID /Sector ID
Sweden	Cell ID, with or without timing advance
Switzerland	Time and ellipse plus optional information
United Kingdom	Cell ID, with or without timing advance

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