Emergency Call (eCall) Services Based on Approved E-112 Regulations and Infrastructures: A solution to improve security and release of road help

Location information is of vital interest for emergency services throughout Europe. Among the recent priorities of the European Union is to promote appropriate electronic communication technologies (like mobile cellular networks and satellite location systems), in order to improve road safety, to speed up rescue times and to provide an efficient ‘harmonised’ European emergency call (eCall) service, especially based on current E-112 regulations and infrastructures. Such an option implies significant potential, as well as a variety of commercial, socioeconomic and other benefits for a great variety of the market players involved. The eCall is a highly efficient solution that can serve the majority of road users. Moreover, it affects network operators, service providers and national authorities, to suitably coordinate their activities towards designing, developing and exploiting appropriate solutions (and new business partnerships) through an effective/converged use of all underlying infrastructures, for a common location-provisioning mechanism, timely implemented, accessed and effectively used by the E-112 community and emergency-service operators, to create interoperable solutions and to decrease implementation costs.

The Challenge of Developing Emergency Call (eCall) Solutions for Road Safety

Among the current priorities of the European Union (EU) is to promote appropriate electronic communication technologies, in order to improve road safety, to reduce the number of serious accidents (causing fatalities, injuries and material damages), to speed up rescue times and to provide an efficient ‘harmonised’ European emergency service, for various uses regarding converged fixed, mobile and vehicular applications.

The total cost of accidents to society has been estimated at more than €160 billion a year, which represents almost 2% of the EU GNP (gross national product); this is a very expensive price to pay, given that relatively straightforward solutions which would be acceptable to the public are not, yet, widely used.

Advanced information and communication technologies (ICT) can have a great potential to improve road safety in Europe and to strengthen the broader public health aspects. Suitable activities can support (and supplement) policies to reduce the loss of human life, injuries, material damage, economic and environmental damage, thus making the objectives of social cohesion and solidarity more tangible. Roads and vehicles throughout the EU need to be equipped with the beneficial use of new technologies and of innovative electronic facilities.

According to the commonly applied European practices and regulation, an ‘emergency service’ is recognised as the specific one ‘that provides immediate and rapid assistance in situations where there is a direct risk to life or limb, individual or public health or safety, to private or public..."
property, or the environment but not necessarily limited to these situations'. Within such a context, eCall is an area where EU-wide consensus can help remove technological and commercial barriers to the take-up of life-saving road safety systems. Without any doubt, rapid delivery of the appropriate emergency services and ‘post-impact’ care can be the difference between life and death for a road accident victim.

In the event of a crash (or an accident), an emergency call can be initiated automatically (based for example on airbag release or deceleration information), or manually. The call is then routed to a physical location known as public service answering point (PSAP), under the responsibility of a public authority or a telecommunications operator. Accurate location information can drastically ‘cut’ emergency response time, thus saving lives and reducing the severity of the injuries. Quicker treatment can save lives of citizens and reduce the consequences of such an event having a long-term impact on their quality of life. The possibility of having automated provision of an accurate location will also be very useful if a person is no longer able to speak. Furthermore, such information has the potential to allow correct response and immediate aftercare in case of accidents involving hazardous goods. Recent studies suggest that, if fully deployed, the eCall could save up to at least 2000 lives in Europe per year.

A prerequisite for the effective deployment and the full introduction of the eCall in vehicles is the establishment of proper location-enhanced emergency services. To this aim, the European Commission has supported measures for the ‘structuring’ of the in-vehicle eCall application on the existing public-sector E-112 infrastructures and standards, in order to provide opportunities to give more accurate location information and additional relevant data. In fact, ‘E-112’ means an emergency communications service using the single European emergency call number, 112, which is enhanced with location information of the calling user.

European authorities have a multifaceted role to play in this field, including facilitating a wide consensus on priorities and activities, supporting the relevant research and development, ensuring that telecommunications regulations support road traffic safety and helping to remove any relevant obstacles, for example by means of appropriate standardisation.

The handling and use of location information associated to E-112 emergency calls by PSAPs and emergency services is also associated to recent initiatives, measures, policies and actions contributing to the integration of civil protection objectives.

The eCall action plan will be implemented as part of the EU’s eSafety initiative, a pan-European joint public/private partnership that promotes road safety and enables sophisticated systems that improve road users’ chances of avoiding and surviving accidents. After the initial successful introduction of 28 recommendations to accelerate the research, large-scale deployment and use of appropriate ICT for safety systems, its current priorities now target the end of 2005 for agreeing on eCall standardisation and specifications, 2006 for full-scale field tests and 2009 as the year for introducing automatic eCall technology in all new vehicles. This technology will necessarily use the location-enhanced single European Emergency Number (E-112). To enable a ‘proper’ functioning, emergency services in the EU Member States will need to equip and/or upgrade their PSAPs to process eCall location reports at the latest in 2007. The actual work currently focuses on three main topics:

- definition of the minimum standards on location accuracy and of an accurate location mechanism;
- description of requirements for networks, databases and PSAPs widely used; and
- possible financing and cost analysis for market deployment.

A Memorandum of Understanding (MoU) on arrangements for implementing the plan, which sets out measures to be taken by the European Commission, Member States, system suppliers and the automotive, telecommunications, navigation and insurance industries, has already been signed by the relevant market players. The key aim of the MoU is to ensure that eCall technology will work in any European country.

In present cases, both infrastructure operators and authorities currently depend on notification of accidents (and incidents) through telephone calls (fixed, and increasingly mobile), or through data provided by video, radar or other sensing equipment. The provision of immediate and accurate location information can be crucial to increase survivability, by improvements in the response time; so it is quite obvious that emergency calls deal with a very serious situation, with significant potential socio-economic benefits.

### Enhanced Security Through the Location-Enhanced Single European Emergency Number (112)

Location-enhanced emergency calls, like the in-vehicle eCall, offer their primary benefit to society of saving lives and providing an increased sense of security. This is practically achieved by ‘enhanced’ call routing, obtaining faster and improved information for dispatching relevant resources, and, most importantly, improved information to locate the caller as soon as possible when necessary.

The eCall is a highly efficient solution that can serve the majority of the road users in Europe, including those citizens travelling abroad. Under appropriate terms and conditions, it can provide significant opportunities to develop innovative responses, within the wider context of the expected convergence, both in terms of technology and market.

The initiative provides an excellent opportunity for a great variety of market players (for example, telecommunications industry, national authorities, service providers, automotive industry, equipment suppliers, users, etc.) to develop sustainable business models and exploit feasible commercial cases to accelerate implementation (for example, to ensure common specifications and reference design, shared costs and benefits, targeted finance and investments, incentives, etc.).

Of particular importance will be the role of:

- the automotive industry (to promote call initiation capability through implemented in-vehicle equipment of reasonable cost);
- network operators (to ensure call transport);
- service providers to assure the necessary assistance and/or other optional telematics services; and
- PSAPs and (national) emergency authorities (EAs) to develop call listening and emergency operation capabilities.

In fact, the eCall constitutes a good example of what the public and private industry can achieve by working together, in a fully ‘synchronised’ way, to promote their strategy, tactical and operational goals. Furthermore, the eCall is a remarkable case of what can be achieved by combining regulation and voluntary measures within an ‘open’, fully liberalised and competitive market.

Emergency communications necessitate information transfer across both private and public sector boundaries and, consequently, each sector will need to work to support the...
other. The relevant initiative offers opportunities for high-synergy potential in probable public-private partnerships, also requiring appropriate investments (both in infrastructures and in taking measures to allow the market introduction of new applications). However, all stakeholders have to agree on the applicability of the suggested final solutions and to decide on their specific roles and responsibilities. In any case, to realise the expected benefits, the new systems have to be widely deployed in the marketplace, while agreements have to be made on possible best practices, on economic (business/revenue) models and on the corresponding financial mechanisms.

Such a perspective can lead to a new ‘optimised’ emergency networked infrastructure with defined interrelationships, lowest possible investments, suitable co-funding schemes, highest productivity, tailored pricing scheme dependent on the nature of application/service (for example, ‘free of charge’ for safety warning information and emergency calls and ‘pay-per-use’ for personalised, location-based services) and a shorter timeframe for implementation.

Furthermore, any effort for awareness of the new applications available for consumers, together with clear explanations of the expected benefits, will be a key issue, determining to a large degree the rate of expected uptake.

The recent eCall initiative is based on existing approved E-112 regulations and infrastructure, so it can become – under suitable conditions – a standardised solution with pan-European roaming and interoperability.

The full effort aims to promote the growth of suitable open platforms, open systems’ architecture and standard software, communications, service and human-machine interfaces to speed up the development, deployment and use of integrated road safety systems.

### Proposed Technological Solutions – Scenarios for Realising the Target

Technologies for realising eCalls are being developed in various sectors. Users should be able to make a basic telephone call to an emergency service on any compatible terminal (properly designed for such a purpose). However, vehicle emergency calls differ from the general emergency calls, especially when referred to input, handling and output of data.

Telecommunications operators can promote and apply suitable technical requirements to realise call transport (voice and data) and routing, as well as the corresponding protocol handling. In any case, different functional architectures have to be compared and classified under relevant criteria.

For the European market, such activities are to be built on the ‘harmonised’ E-112 emergency services being implemented in the Member States both for fixed and mobile operators, on the basis of deliberations in the joint industry-public sector CGALIES† (Coordination Group on Access to Location Information by Emergency Services) context, and will also include provisions for more accurate location information and additional safety information.

Regarding the successful implementation of E-112 services in the EU, several issues must be addressed and timescales have to be considered for the coordinated introduction of the new systems, by defining potential business models with the ‘identification’ of benefits for all stakeholders. Many European countries already offer enhanced emergency call services by providing fixed caller location information to EAs, based upon the installation address in the current database system of the fixed operators. Nevertheless, EAs (and other relevant public bodies) must ensure that they do not fail to exploit the capabilities of this new technology for the public benefit.

A schematic illustration of the general functional architecture for in-vehicle emergency calls is shown in Figure 1 and it is explained in the following paragraphs.

An eCall-equipped vehicle can either have a terminal with satellite positioning or mobile (or wireless) communications and/or sensors for detecting crash, rollover and fire. The general process is as follows: The in-vehicle system (IVS) generates an emergency call and sends it to the PSAP through the mobile network (GSM/GPRS/UMTS) and/or the fixed network. This call consists of voice (112 call) and of data over voice (the latter is called a minimum set of incident data (MSD), and will be discussed, in more detail, in a following section of this paper). The coding of MSD at IVS for vehicle-to-PSAP communication is performed using existing communications technologies (for example, User-to-User Signalling (UUS1)).

The PSAP operator, firstly transmits ‘acknowledgement’ of data received to the IVS and attempts to establish a communication with the vehicle occupants. Simultaneously, it decodes and visualises the MSD. After processing the received data, the PSAP operator dispatches the emergency details to the appropriate rescue dispatch centre(s) (for example, fire department, police department, medical services, etc.). If the user is a subscriber of a private service provider (SP), then:

- As for voice communication between the vehicle and the PSAP operator, it should

† The CGALIES group has been established by the European Commission in May 2000 as a ‘partnership’ of public service and private sector players. It has allowed representatives of different sectors to discuss and find agreement on the principles for harmonised and timely implementation of location information by emergency services (http://www.telematice.de/cgalies/).
be noted that, in case translation from a foreign language is needed, the PSAP can use a ‘roll free’ number, provided in the MSD, to contact the original SP who then starts a conference call with the driver.

- The IVS can send a larger set of data (called a full set of data (FSD)) to the SP, after receiving acknowledgement from the PSAP operator. The SP then receives the FSD, sends to the IVS an acknowledgement of data received and starts several handling procedures, adding the additional eCall data into its database.

The PSAP can access the SP’s ‘eCall specific database’ in order to obtain directly any additional data. It is also recommended that the PSAP operator communicates to the SP the involved rescue centres, in order to allow the latter to be able to provide additional post-accident services. Such a communication can be realised via fixed-line networks (for example, as a simple phone call between the operators involved) or via the Internet.

More generally, an eCall can be transferred by using many different ways and network infrastructures. Each originating network should be able to ‘recognise’ emergency calls by means of the eCall number ‘112’ in addition to the local national emergency numbers valid in the originating network; the latter should then generate the following emergency call-related information and transmit it to the emergency control centre (or the PSAP). The information may either arrive there at the same time as the eCall or be available for retrieval on demand from the relevant emergency control centre, during the call. The generation and transmission of the information should not delay the expected answer of the call. Transit networks over which an eCall is routed to the interconnected control centre should forward this information in a transparent mode.

The originating network should transmit the calling line number of the access (calling line identification (CLI)) at which the emergency call is made, to the PSAP together with the eCall, in a standardised way. So, the aim is to establish specifications and call routing and handling procedures that would allow for pan-European interoperability. The emergency control centre should be able to return a call to the number in the CLI. Each eCall should be accompanied with information enabling the centre to determine the caller’s location at the time of calling. Such data may be a geographical address or a set of ‘appropriate’ geographical coordinates. After the initial contact is made, the information should be accessible via a standardised interface either by the PSAPs or the emergency response vehicles (for example, ambulances, fire trucks, etc.). Both must be equipped with equivalent map databases with graphical user interfaces to handle the eCall location. Furthermore, location information should be accessible for as long as the emergency lasts.

The main requirements for such an interface could be considered as follows:

- automatic terminal/network initiated real-time location ‘push’ to PSAP when the E-112 emergency call is made,
- possibility for location ‘pull’/information ‘pull’ by PSAP/emergency service (for example, of street address from the operators’ active database);
- adequate level of privacy protection (override of user privacy by authorised emergency authorities only and for as long as the emergency lasts);
- flexibility for upgrade/ability to include future (not yet fully specified) requirements (for example, those from roadside telematics applications as they may emerge);
- build-in assurance that commonality at ‘information passing level’ is perpetual;
- no reliance on the original (‘home’) network when roaming internationally and in cases where national roaming is possible; and
- based on future-proof technology (for example, Internet TCP/IP/XML) for connecting to standard PC-based product at PSAP level).

Recent European studies have demonstrated that during the introductory phase of E-112 services, application of the ‘best efforts principle’ might be preferable to mandating specific performance characteristics for location determination. However, as PSAPs and emergency services gain practical experiences with location information, their requirements will become more defined. Likewise, location technology will continue to evolve, both within mobile cellular networks and satellite location systems. Therefore, the best-effort approach will need to be reviewed after the initial phase.

In the following sections, we investigate possible solutions, in particular by considering interoperability and interactivity options between third-generation (3G) mobile-based applications, satellite-based location positioning and navigation systems and public emergency services.

The mobile telecommunications industry is evolving from being primarily voice telephony service providers (with extra features like short message services (SMS)) to delivering mobile data and multimedia services. Third-generation mobile infrastructures broaden the availability of technology on the basis of which competitive service provision provides access to enhanced electronic communications. Furthermore, a coherent policy on wireless communications is also pursued across the EU. With general packet radio service (GPRS) and universal mobile telecommunication systems (UMTS) advancing in the automotive markets, the viewpoint for mobile, location-related services is brightening up significantly, while options for higher bandwidths and permanent online connectivity extend the range of the services offered. Furthermore, currently available network-based solutions can satisfy a significant proportion of user requirements and can be compatible with a great variety of terminal handsets.

Location information, together with mobile communications, enables a large number of telematics services, including the location-enhanced eCall. Caller location systems in mobile communication networks are expected to become widespread in the coming years. The huge prospect for commercial services is expected to drive the location-based services (LBS) market forward. This market will develop rapidly due to favourable return on the related investment and competitive incentives.

Currently available solutions based upon the precise location of the cell or ‘cell ID’, mainly referred to as cell global identity (CGI) (also including timing advance (TA)) and enhanced cell global identity (E-CGI) can utilise legacy handsets and satisfy a variety of user requirements.

CGI is based on the cell ID that is the identity number associated with a circular cell, which is designated by the network operator to a base station (BS). This information is used in the network during normal operation in order to register a mobile station (MS) and to identify the connection point of the handset to the network. However across networks, cell sizes can vary from 150 m in an urban area up to 30 000 m in a rural area, so the accuracy of the method is not satisfactory in some cases.

CGI-TA improves the accuracy by using the timing advance, a parameter that measures the delay for a signal sent by the BS to arrive at the MS and therefore the distance between the MS and the BS, thus ‘narrowing’ the circle around the BS. In fact, this is a ‘measure’ of the range of the connected mobile from the cell site.

E-CGI is an improvement of the previous CGI-TA method, based on performing measurement reports of the fieldstrength data. In this case the MS continues to make measurements of neighbouring cells’ power and report them to the BS routinely. So, the signal power can be used to calculate the distance between the MS and the BS.

Technologies already available but not yet widely deployed (for example, assisted global positioning system (A-GPS)) and
enhanced observed time difference (E-OTD) are expected to deliver more accurate location data and should satisfy a large proportion of the corresponding requirements.

E-OTD is a positioning technology based upon ‘triangulation’. The MS measures the arrival time of signals from three or more cell sites in a network, while the network measures the transmission time of those signals from the relevant cell sites. The combination of such distinct information permits location estimation. However, a restraint of this specific technology is due to the fact that it relies upon ‘visibility’ to at least three cell sites, which can be an advantage in areas of high-cell density (urban) but a serious disadvantage in rural areas, where separation is large.

The standardised positioning technology A-GPS is an enhancement of the ‘conventional’ GPS (global positioning system) navigation, that utilises transmissions from a constellation of US government satellites. It uses a ‘reference network’ with receivers located at known positions, dealing with problems such as relatively long start-up time (from 30 sec up to a few minutes), due to long acquisition time of navigation information from the satellites, poor visibility, difficulties in obtaining the position indoors due to very low transmission power from the satellites resulting in easy distortion and demotion of the accuracy, and high power consumption.

However, the business rationalisation for the corresponding investment both in infrastructure and handsets has yet to be demonstrated in an ‘untested’ EU market. Existing solutions based upon cell ID and E-CGI can cater for legacy handsets and could therefore provide a baseline capability for full user roaming across Europe. Roaming at higher levels of service (for instance those based on technologies such as A-GPS and E-OTD) will rely upon the development of common handset solutions. Whilst this is unlikely to occur in the short term, it is likely that consolidation within the mobile industry will eventually lead to a limited number of interoperable handset solutions.

The European satellite navigation infrastructure Galileo15 can provide a set of navigation and positioning services that allow a wide range of innovative applications to be developed, together with high-level performances. Galileo will provide a worldwide (global) radio-electrical service allowing users equipped with a dedicated receiver to get their continuous and accurate real-time 3D position and velocity information. The system, together with the advent of new regulations in the mobile phone domain (E-112 legislation), in the road sector, will create new business opportunities and open doors for new applications.

Furthermore, it can be used with appropriate geographic information systems (GIS) related to emergency management10, in order to ensure assessment and evaluation, mitigation and prevention, preparedness, response and recovery.

The use of different underlying infrastructures implies both opportunities and challenges for realising an accurate exchange of various forms of data; however a minimum set of incident data (MSD) has to be defined as ‘essential’ to speed-up and improve the expected response from a PSAP. The MSD should be transmitted from vehicles to PSAP as a data stream in ‘open voice’ channel. This MSD could include, among others, the ‘location-positioning’ of the vehicle (probably through the consideration of a global positioning service in terms of latitude and longitude), the direction of travel and ‘map matching’ to define the exact highway the vehicle is on, time of incident to define when the call was generated, vehicle and/or service provider identification to enable the emergency operator to identify the vehicle as well as to find additional data about the event, eCall qualifier giving the severity of the incident (currently automatic or manual).

Additional data may include the number of passengers, the type of load of dangerous goods, number of sensors activated and the source of the eCall (for example, airbag, rollover, front crash, side crash, fire, etc.). The intention is to provide enough information to the PSAP operator so that he/she can offer a faster and more effective emergency response.

However, the value of all data is very strongly linked to its accuracy, in order to accelerate the assistance that will be provided by the relevant EA. The prescribed action can be realised through a variety of properly designed verification and validation processes (for example, prevention of false alarms, minimisation of spurious and malicious calls and avoidance of any ‘confusion’ due to inaccurate information).

Other additional data, for example, offered via a certain service provider or transferred by existing databases (such as insurance details, driving licence, contact details for vehicle owner/driver, etc.) may provide information to deal with resolving problems and to assist in any relevant investigation.

In any case, the minimum set of data has to meet specific requirements in line with the objectives and operator’s capacity, so as to reach economies of scale and to drive effective adoption rates. It is evident that the ‘full’ adoption of an appropriate common data transfer protocol for passing data to PSAPs can avoid (or even minimise) any probable risks due to technical confusion or to ‘erroneous’ interpretations. To this aim, the global telematics protocol (GTP) currently seems to be a suitable solution.

It should be noted that the emergency control centres can be either integrated within the PSAP (that is, into the same physical entity) or distributed; in the latter case, the PSAP is separated through a specific dedicated priority network. Figure 2 provides an illustration of the relevant suggested architecture.
Promotion of Commonly Accepted Standardised Solutions

Building on the provision of the E-112 legislation, which is contained in the new Electronic Communications Directive\(^2\), the EU has proposed\(^3\) an integrated and compact strategy for pan-European emergency services.

The suggested policies aim to support emergency operators with better location data and higher-quality information, to avoid the current diversity of legal and operational conditions of the public emergency services across Europe.

A commonly accepted infrastructure (and the relevant architecture as well), especially of ‘neutral’, open and highly flexible character, would solve cross-border emergency issues and set the ‘standard’ (that is, technical solutions and practices) for enhanced quality services. In any case, standardisation should remain primarily a market-driven process.

The successful coexistence of commercial service centres (managed by private stakeholders) and publicly operated PSAPs requires defining an ‘open interface’ standard between them and solving the related liability and responsibility issues, under objective, transparent and non-discriminatory terms. Moreover, such an ‘appropriate’ interface can constitute the technical basis where additional eCall data might be transmitted.

The relevant market players should encourage the use of proper standards (and/or technical specifications), for the provision either of services, technical interfaces and/or other network functions, to the extent necessary, in order to promote (and to support) interoperability and to improve freedom of choice for users.

To achieve a harmonised eCall system, where all European citizens can confide in a proper service standard and an optimum level of security and accessibility, the different national systems and structures need to grow together to become fully interoperable, while preserving their liberalisation, openness and competitiveness features.

A commonly accepted solution across Europe would serve interoperability for sophisticated safety applications, with major impacts upon businesses and investments. The elaboration and development of ‘common’ technical initiatives through the ‘efficient’ supervision of the European standardisation organisations\(^4\) (ESOs) can create effective interoperable solutions and decrease the relevant implementation costs\(^5\) and risks.

Work is in progress and it is practically realised through the activities of ETSI (European Telecommunications Standards Institute)/EMTEL (Emergency Telecommu-

ninations)\(^6\), aiming to integrate specific standardised solutions into officially recognised telecommunications standards.

In particular, the concept of EMTEL addresses a broad spectrum of aspects related to the provisioning of telecommunications services in emergency situations. It covers the telecommunications needs of society’s dedicated resources for ensuring public safety; including police forces, firefighting units, ambulance services and other health and medical services, as well as civil defence services. In fact, telecommunications needs of such services have until now been satisfied by dedicated networks and equipment, often different for distinct services; however, with modern technology it is possible to increasingly integrate all of them with the ‘public telecommunications services’ (as these services are currently considered under the EU Law).

Legal Challenges and Other Fundamental Issues

The rapid evolution of the market in Europe, the important technical developments in multiple domains, the new decentralised structures for the management of communications networks and services are all associated to a ‘revision’ of the regulatory conditions\(^7\) applicable in the wider communications sector in the EU.

In fact, transmission lines over which emergency telephone services are connected should be available without restriction. Early regulatory measures\(^8\) have required EU Member States to ensure that the number ‘112’ should have been properly introduced in the public telephone networks, as the ‘single European emergency call’ number (under appropriate terms and conditions).

Transporting the eCall data and voice signals from a vehicle to the emergency services (and/or authorities) requires full interoperability and interworking of the three fundamental technical ‘platforms’ involved (that is, in-vehicle equipment, telecommunications networks, emergency operation rooms). Therefore, interoperability and interfacing of services and systems are of paramount importance in emergency telecommunications.

Although the recent European regulation provides a generic framework\(^9\) for such interoperability, significant standardisation work still needs to be performed to adapt the relevant terms to the specificities of an automated call, within the scope of current and expected changes in markets, services and technologies.

According to the current EU Law, in the case of emergency calls, public telephone network operators should forward (‘push’), from their own networks to the existing PSAPs, the best information available relevant to the location of the caller, to the extent technically feasible. In any case, aspects like the evolution and availability of technological capabilities for location determination should always be taken into account, to offer the best possible solution. Location information should be provided under ‘proportionate’ terms regarding all potential users, without any ‘discrimination’ as for the quality (or the ‘kind’) of the service offered. In addition, such data should be accompanied by a proper ‘identification’ of the network (either fixed or mobile) on which the call originates, while accurate and up-to-date sources should be kept.

Moreover, there is a strict obligation for fixed public network operators to make available the installation address of the line from which an emergency call has been made.

For the successful implementation of enhanced E-112 services in Europe, a large number of issues need to be clarified and the timescales for the introduction of new systems need to be coordinated as well. This implies the necessity of a ‘consensus’ between all players as for the relevant implementation details, in order to guaran-
tee a ‘harmonised’ introduction and exploit investments in new systems.

In parallel, further activity is necessary to overcome probable legal obstacle issues: The increased level of safety and security, which is now possible by the evolution of modern technology, must not compromise the principles of privacy.

The information given in the context of E-112 (that is, the voice call accompanied by location information), which constitutes an element of the ‘emergency call chain’, is not within the generalised ‘data protection’ restrictions under the European law (considering that privacy and data protection rights of the individuals should be fully respected). This implicates that such information may be freely used by the EAs for the sole purpose of providing assistance.

In general, the initial and fundamental thematic context of the European Data Protection Directive\(^10\) requires that personal data may be processed where necessary, in order to protect the imperative interest of the data subject.

Additionally, the latest Directive on Privacy and Electronic Communications\(^11\) can also be taken into account by emergency services for the purpose of providing assistance, as it claims that providers of public communications networks and services may ‘override’ the elimination of the presentation of calling line identification and the temporary denial or absence of consent of a subscriber (or user) for the processing of location data, on a per-line
basis, for entities/organisations dealing with emergency calls (and recognised as such by a Member State); these include law enforcement agencies, ambulance services, fire brigades, civil defence and technical disaster teams, for the purpose of responding to such calls. As a result, in the case of emergency calls, rights for life and health protection take precedence over privacy rights.

In the same context, it should be necessary to establish a kind of proper legal ‘agreement’ between the person-entity from whom various data is generated, and the service provider who stores it in relevant databases, also predicting possible circumstances where it may be released.

Furthermore, any service provider should be strictly obliged to guarantee that accuracy, integrity and continuity of communications to and from PSAPs and EAs would be preserved at the highest possible level, for network security and recovery reasons (to ensure the availability, answering, inter-network forwarding and termination of the relevant eCall). Additionally, particular ‘priority treatment’ should be offered over normal traffic in order to overpass probable network congestion situations, while extra capabilities should be offered to renew the location information through a call-back functionality (‘pulling’) for the purpose of ‘handling’ the emergency. Simultaneously, the speech quality of emergency calls should not be worse than that of a basic telephone service.

Furthermore, the recent Universal Service Directive requires operators to make caller location information available to authorities handling emergencies, to the extent technically feasible, for all calls made to the single European emergency call number 112, free of charge. In addition, adequate information should be provided to the citizens about the existence, use, and benefits of E-112 services, including details about the way in which their location data will be forwarded to certain PSAPs around the EU territory and how the fair processing of their personal data should be preserved.

Network operators should maintain reserved capacity to ensure termination of emergency calls to PSAPs (and emergency control centres), including situations where the standard capacity is fully utilised, subject to nationally agreed service level agreements (SLAs).

Apart from privacy and security requirements, other key points may refer to the liability of various players involved. If an operator makes a commitment or is obliged by law to provide an estimation of a user’s position with a specified performance, then it will be possible to consider this operator as entirely ‘responsible’ for achieving the expected performance. Consequently, there is a ‘risk’ that operators will face liability implications as a direct result of providing location information, due to the fact that current location technologies may have a ‘limited’ level of performance, probably outside the PSAPs’ or EAs’ control. Following practices already applied in the US, it might be beneficial to establish new regulations on liability and protection, in order to provide the required reassurances to all operators involved, in a way to protect the expected progress of E-112.

In the same context, it should be expected that the EU Member States would draw up specific and detailed rules (for example, through the use of a common ‘open interface’ standard and/or of a common data transfer protocol) for the effective handling of emergencies.

Conclusions

The provision of emergency telecommunication services can be considered as one of the most important duties of a public authority towards its citizens. Therefore, citizens, authorities and emergency response teams have a need for dedicated, reliable and high-quality communication systems, able to operate at all times and for a diversity of probable incidents or circumstances. In fact, this constitutes a fundamental target of current European policies aiming to improve road safety and to support aid assistance in a variety of emergency situations.

In modern deregulated and liberalised telecommunications markets, like those of the EU, certain operators of public telephone networks have the obligation to provide public emergency services under their licences’ regime, both on a European and national basis. To this aim, recent policies and measures have promoted a harmonised end-to-end system and proper service architecture, for the entire European environment.

In particular, emergency telecommunication services have been enhanced by the provision of caller location information for the purpose of eCall services based on the use of the European emergency call number (E-112). Perspectives from the above issues are not limited only to networks and services designed for this type of communication, but are also relevant:

- to critical network infrastructures (such as the existing public telephone systems);
- to sophisticated multimedia and broadcasting networks; and
- to any form of existing physical backbones that enable both telephone and data networks.

The eCall benefits are mostly expected to reduce fatality and injury level, with a strong impact in health, insurance and emergency services’ costs.

Public safety communications’ users can encompass a great variety of applicable sectors such as security, emergency and medical services, law enforcement, advanced firefighting and rescue, civil defence and disaster response. Their specific needs can include ‘shared’ resources for reduced network congestion during emergency situations, subscriber authentication/identification, emergency interworking across different types of networks, ‘priority’ treatment over normal traffic, network security and recovery, resiliency, ability to improvise, user friendliness/usefulness with regards to the equipment functionality, and financial availability of such equipment and network elements.

Low-cost devices (also including standardised hardware components, software and proper interfaces) should be developed, allowing accurate location/direction information, and vehicle sensor data to be routed to focus possible emergency support. To this aim, the development of ‘commonly accepted’ standardised technical solutions and of a common European implementation plan, guided by continued liaison and cooperation among all players involved, will be crucial. Likewise, appropriate European regulatory measures can eventually provide significant assistance (for example, by specifying ‘concrete’ performance parameters), especially if implementation and market deployment delay (or even if they partially fail) to meet the already ‘stated’ EU policy objectives.

Investment in ‘location enhanced 112’ can gradually become a priority issue, especially if considered in parallel with probable financial (or fiscal) incentives, to support positive business cases, benefits and savings for each stakeholder. Whatever the case may be, any relevant implementation policy must effectively strike a sort of ‘balance’ between benefits, cost and an ‘acceptable’ return on investment.

Moving forward with implementation of in-vehicle eCall requires parallel commitment and joint effort to work on common, coordinated implementation and supporting business plans from all parties constituting the basic eCall ‘service and value chain’. High-synergy potential in public/private partnerships has to be developed and strengthened, further, leading to new business schemes, with clear roles, benefits and responsibilities.

Recent EU approaches indicate that significant benefits may be achieved from location-enhanced E-112 services; that is, for society, users, authorities and the wider industry sector. The common European framework based on the E-112 infrastructures and services can be a suitable solution for optimal implementation, in order to
guarantee immediate and efficient performance, convergence features, interoperability, interworking, and highest productivity with the lowest possible investments.

References


6. European Information Society Technology IST-1999-14093 LOCUS (Location of Cellular Users for Emergency Services) Project (http://www.telematic.eueu/locus). (LOCUS, a 14 month project which started on 27 June 2000, was an accompanying measure of the IST programme of the 5th Research Framework Programme of the European Community.)


24. Implementation status for E112 in EU-25 & Incremental costs of eCall on top of E112, draft Version 0.3. Published by the RESCUE

(GST initiative and related activities present opportunities for improving the information flow and operation of the rescue chain. The focus of the RESCUE sub-project is to accurately assess the type of emergency and resources required to provide the appropriate response to a critical incident. To this aim, RESCUE ensures that information about the incident will be available in the emergency vehicles and that they are able to quickly and safely reach the incident scene.)

http://www.emtel.etsi.org/.


Biographies

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Mrs. Anastasia Spiliopoulou-Chochliourou is a Lawyer, LL.M., Member of the Athens Bar Association. She has gained extended experience as a lawyer, while she has been involved in various national and international affairs. Her LL.M.’s post-graduated degree, from the Athens University Law School, has focused on the investigation of multiple regulatory aspects related to the Internet (infrastructure, services, software, content). During recent years, she has had a major participation in matters related to telecommunications and broadcasting policy, in Greece and abroad, within the framework of the Information Society. She has been involved in current research and business activities, as a specialist for e-commerce and e-business, electronic signatures, e-contracts and e-procurement, e-security and other modern and innovative applications. She has published numerous articles and papers, with specific emphasis given on regulatory, legal, business, commercial, social and technical aspects. She currently works as an OTE (Hellenic Telecoms S.A.) lawyer-partner for the Division of Procurement and Services’ Contracts of the Legal Department of the OTE Group of companies.

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