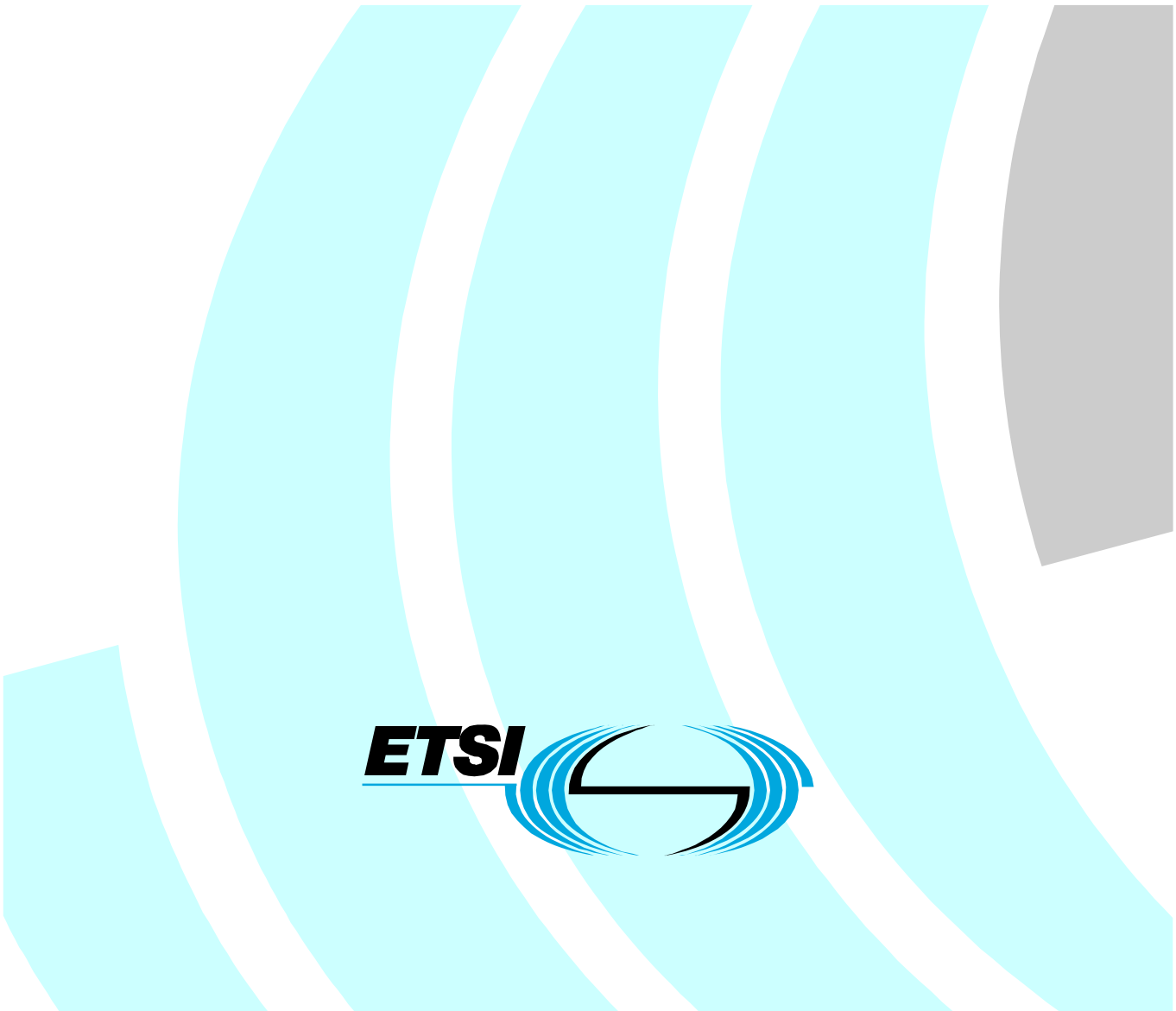
ETSI TS 102 660 V1.1.1 (2008-07)

Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Signalling Requirements and Signalling Architecture for supporting the various location information protocols for Emergency Service on a NGN



Reference
DTS/TISPAN-03049-EMTEL

Keywords
Emergency, location, service

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Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Introduction

The present document has been produced by an ETSI STF co-funded by EC/EFTA to examine the work of various Standards Development Organizations worldwide in developing and implementing protocols for the transmission of location information over telecommunications networks for use in establishing the location of users of the emergency calling facilities. In order to effectively deliver emergency services to the location of a reported incident, it is essential for the emergency responders to have timely and accurate information that enables them to correctly identify the location of the incident.

The ability to initiate an emergency communication to summon help when needed is a right of all citizens, and this ability should ideally be independent of the network and access technologies deployed or the physical abilities of the citizen.

The rights of individual users to privacy shall be adhered to according the European regulation and it is therefore essential that all information derived from emergency calls shall only be used for management of the related incident. If applied to non-emergency calls, the use of caller location information for commercial purposes may also be subject to European or national regulation. In many circumstances, citizens reporting an incident requiring urgent assistance are unable to provide the emergency service with accurate information about the location of the emergency. This may be due either due to the nature of the emergency, the callers' lack of local knowledge, their disabilities or lack of linguistic ability, etc. Young children or cognitively impaired people may not have the language skills to explain their location, speech and/or hearing impaired users may not be able to use voice terminals, visually impaired or otherwise disabled people may not be able to use text terminals, elderly or confused people may not be able to use any form of terminal, etc. For these significantly large categories of users the successful outcome of an emergency call could make the difference between life and death. It is therefore essential for the emergency responders to be provided with accurate location information via an automated process based on the communications network being used by the caller.

Implementation of caller location systems is also likely to result in a welcome positive impact on the reduction of malicious calls made by criminal or anti-social persons when they realize that the automatic provision of their location information to the emergency services could enable their almost instant apprehension.

The present document should be read in conjunction with TS 102 650 [1] which reports on an Analysis of Location Information Standards Produced by Various Standards Development Organizations (SDOs). The object of this analysis was to determine what, if any, standards existed and had been adopted for the determination of caller location, in order to assist in the response to emergency calls.

The above text is intended to set the scene in which this work was undertaken and therefore concentrates on the background information and on the ongoing activities by the various standards bodies in different regions. It should be borne in mind that the document is intended to be focussed on what EC/EFTA wanted from their contract, essentially to understand what the work is and what needs to be done. It is for TISPAN to do the in depth analysis and produce the detailed technical recommendations.

NOTE: In the present document all references implying that 911 is the common emergency calling number are used only to identify pre-existing work and as part of the titles of other documents. The mandated common European emergency number is 112 with many countries also operating national numbers in parallel.

1 Scope

The present document makes recommendations on the standards to be used for the acquisition and conveyance of location information associated with emergency calls. These are largely derived from the analysis of the outputs of various ETSI work groups and other worldwide standards bodies documented in TS 102 650[1]. The recommendations are produced for TISPAN WG3 so that interworking and integration between various networks can be accomplished for the support of Emergency Communications on a NGN.

The document makes recommendations for the development of standards based on existing solutions but with substantial additions to reflect the needs of a user-base having a wider geographical profile than that of the base standard.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 102 650: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Analysis of Location Information Standards produced by various SDOs".

[2] ETSI TS 123 167: "Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS) emergency sessions (3GPP TS 23.167)".

[3] NENA (i2): "Interim VoIP Architecture for Enhanced 9-1-1 Services (i2)" which may be downloaded from http://www.nena.org/media/File/NENA-08-001-V1-12-06-05-1.pdf .

[4] NENA (i3): "Functional and Interface 3 Standards for 4 Next Generation 9-1-1 Version 1.0 (i3)" which may be downloaded from http://www.nena.org/media/File/08-751-20060928.pdf .

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

access network: portion of the Telecommunications Network that provides access to the switching function and terminates the User Access signalling

emergency: urgent need for assistance or relief

emergency call: call from a user to an emergency call centre, PSAP or similar agency charged with routing calls to the relevant emergency response organization

emergency call facilities: mechanisms provided by public or private communications networks, emergency telephone stanchions/boxes, fire alarms, etc. the use of which enables emergency calls to be made

emergency call service: mechanism by which a caller is given a fast and easy means of giving information about an emergency situation to the appropriate emergency organization

emergency caller: user who calls an emergency service by making an emergency call

emergency control centre: facilities used by emergency organizations used to accept and handle emergency calls

NOTE: A PSAP forwards emergency calls to the emergency control centres.

emergency number: special short code or number which is used to provide callers with immediate access to the PSAP to request assistance from the emergency services

emergency response organization: police, fire, emergency medical and similar services

emergency service: service 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

emergency situation: abnormal situation of serious nature that develops suddenly and unexpectedly, of which the evolution is uncertain and which may turn into a crisis or cause damage and casualties

enhanced 112 (E112): emergency communications service using the single European emergency call number, 112, which is enhanced with location information of the calling user

health hazard: sudden outbreak of infectious disease, such as an epidemic or pandemic, or other event posing a significant threat to human life or health, which has the potential for triggering a disaster

location information:

1) in a public mobile telecommunications network, the data processed indicating the geographic position of a user's mobile terminal, and

2) in a public fixed network, data defining the physical address of the termination point.

natural hazard: event or process, such as an earthquake, fire, flood, wind, landslide, avalanche, cyclone, tsunami, insect infestation, drought or volcanic eruption, which has the potential for triggering a disaster

next generation network: public, broadband, diverse and scalable packet-based network evolving from the public switched telephone network, intelligent network and Internet, characterized by a core fabric enabling network connectivity and transport with periphery-based service intelligence

originating network: access network from which the emergency call was originated

priority call: call that has been assigned some higher level of priority for processing by a telecommunications network such that it may achieve precedence over other traffic

priority service: provides for preferential treatment in the order of path selection in the network to calls originating from and/or addressed to certain numbers

public safety answering point: physical location where emergency calls are received under the responsibility of a public authority

relief operations: activities designed to reduce loss of life, human suffering and damage to property and/or the environment caused by a disaster

telecommunication assistance: provision of telecommunications or other resources or support intended to facilitate the use of telecommunication resources

telecommunication resources: personnel, equipment, materials, information, training, radio-frequency spectrum, network or transmission capacity or other resources necessary for the reliable operation of telecommunications networks

telecommunications: any transmission, emission, or reception of signs, signals, writing, images, sounds or intelligence of any nature, by wire, radio, optical fibre or other electromagnetic system

user access: any point of access to a telecommunications network from which a call can be requested.

NOTE: This includes public telephones and specialised "emergency call facilities" such as dedidicated roadside call points.

widespread outage: sustained interruption of telecommunications services over a considerable area, that will have strategic significance to government, industry and the general public

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	3rd Generation Partnership Project
ATIS	Alliance for Telecommunications Industry Solutions
CLI	Calling Line Identity, or Calling Line Identification
CSCF	Call Session Control Function
IETF	Internet Engineering Task Force
IMS	IP Multimedia Subsystem
NENA	(US) National Emergency Number Association
NGN	Next Generation Network
OMA	Open Mobile Association
P-CSCF	Proxy CSCF
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
VoIP	Voice over Internet Protocol

4 Requirements for Europe

It is expected that whatever existing solution is adopted as the basis for Signalling Requirements and Signalling Architecture for supporting Location Information Protocols for Emergency Services on the NGN, that it will require additional functionality to suit European networks and operational processes. Some details of the issues identified will be outlined in the following clauses.

4.1 Information Content

1) Address formatting - TS 102 650[1] has identified issues concerning addressing formats and work is currently underway to categorize the issues and the likely minimum required address fields. This issue will require substantial study in order to identify a sufficient data set for unambiguous addressing whilst still accommodating differing national formats and practices.

2) Network operator - The situation arises in Europe (and elsewhere) where it is necessary to identify the network operator on whose network an emergency call originates. This information is required in order to query the appropriate subscriber information files, and for inter-operator billing functions. This topic will require further study.

3) Country code - Due to international boundary and wireless coverage issues it is necessary to identify the country in which an emergency call originates. This may not be the country in which the network operator carrying the call is based, resulting in the possibility of a call being delivered to a PSAP in the wrong country. This is will require further study.

4.2 Information Format

The solution which is ultimately adopted for the Signalling Requirements and Signalling Architecture for supporting Location Information Protocols for Emergency Services on the NGN must support all necessary standard information formats and must not preclude future development of additional facilities and features.

4.3 Protocol Support

The solution which is ultimately adopted for the Signalling Requirements and Signalling Architecture for supporting Location Information Protocols for Emergency Services on the NGN must support all relevant protocols of the NGN and must not preclude future development of additional facilities and features, including those required for national implementations.

4.4 Additional Features

1) Further work will be needed to combine /integrate the existing IETF/ATIS/NENA and 3GPP standards work (and possibly that of OMA) and to rationalize their differences bearing in mind that VoIP and NGN must co-exist, both in the fixed and mobile environments.

2) There do not appear to be any recognized standards for the storage of and access to location information within private (voice and data) networks. With the ever-increasing application of large scale, private and corporate networks it is critical that these networks should be included, to ensure that emergency caller location will work universally. It is not sufficient to only on gateway identification and unreliable internal location processes in private networks.

3) There are varying PSAP architectures and technologies within Europe and it is clearly not practicable or cost-effective to update these, even assuming it was possible to decide which is the 'right' solution. It must be ensured therefore that the location information delivery solution should be independent of current PSAP technology.

4) The solution must be critically examined to ensure that it is both efficient and cost-effective otherwise it may not be implemented. Hence all essential features need to be included without adding cost in the form of 'nice-to-haves' that will rarely be used.

5) The provision of caller location information potentially poses a serious privacy issue. Work will be required to ensure that the subscriber is fully informed about the location facilities and empowered to control the use of the information by network operators and others, without jeopardizing the use of the information in emergencies.

6) In order to accommodate differing delivery architectures for emergency calls, according to differing national practices, it will be necessary to devise mechanisms which are not dependent on the existence of a separate emergency services network.

4.5 TISPAN Architecture

It has been pointed out that the TISPAN architecture for Emergency Calling should:

1) Support the migration to a full 3GPP IMS model [2] (with a P-CSCF in the visited network) in the future.

2) Enable the EU countries to provide VoIP Emergency Calling in the context of their existing organizations and billing models and by upgrading their exiting infrastructure in steps. In particular, Emergency Calling must not assume the existence of a dedicated national Emergency Services Provider, otherwise the TISPAN architecture will probably not be adopted in some countries.

3) Enable VoIP Emergency Calling for older end- and intermediary-devices.

4) Enable the full compliance with the regulatory requirements of all EU countries.

5) Support Emergency Calling for IMS implementations where the P-CSCF is located in the Home Network.

6) Support Emergency Calling for nomadic users on private networks which use a public VoIP service.

NOTE: Many of these requirements are already covered in the 3GPP architecture [2].

5 Recommendations

It was initially considered that the base Signalling Requirements and Signalling Architecture for Supporting Location Information Protocols for Emergency Services on a NGN could be modelled on the emerging NENA standard as it matured. Further work would have been necessary to ensure compatibility with all NGN network types, together with work to ensure that specific national, European and worldwide functionality needs were capable of being supported, and that future developments were not precluded.

It is therefore concluded that the solution must be based on existing TISPAN NGN and 3GPP work, with the possibility of its further development in the future.

5.1 Recommended Solution

Signalling Requirements and Signalling Architecture for Supporting Location Information Protocols for Emergency Services on a NGN could be modelled on the existing 3GPP and IMS standards [2].

The TISPAN and 3GPP standards currently appear to be the most mature standards available to enable an emergency caller's location information to be obtained and transmitted over NGN and traditional access technologies. It is recognized that to completely achieve the full required functionality, it may be necessary for further development of the existing standards. The recommendation is that the NENA solutions [3] and [4] currently based on North American practices and network architecture are harmonized to coexist with the 3GPP approach [2]. It is likely that further work on the NENA solutions would be necessary to ensure that specific national, European and worldwide functionality needs can be incorporated.

5.2 For and against the recommended solution

5.2.1 Introduction to the solution

This clause will briefly justify the reasoning for the recommendation, with details for and against the decision, and note the consideration of alternative solutions. The recommendation must recognize that the solution should have worldwide inter-operability so as to ensure that adequate facilities exist for the ever increasing expectations of mobile and nomadic users and their need for universal emergency service. Such interoperability is regarded as being of paramount importance, although it is unlikely that nomadic users will be able to experience the ideal of precisely the same functionality wherever they may be, due to the inherent limitations imposed by the many differing network technologies and their implementations.

Since the majority of users will have little or no previous experience of making emergency calls, they will thus have few expectations. What all callers must have is the basic ability to make an emergency call and for their location to be adequately determined from network based information. Nomadic users needing urgent assistance whilst away from their subscribed network will expect to be able to directly contact the emergency services serving their present locale, not those in their home town, though ideally by using the emergency number with which they are familiar at home.

5.2.2 In Favour of the recommended solution

The 3GPP standards [2] will allow, in principle, the establishment of the location information relating to any call, not only emergency calls. Some networks may require the introduction of new protocols but this is seen as an inevitable consequence of the introduction of new functionality in the network. Establishing of the caller's location will be a network responsibility. Legacy terminals must be able to continue to be used, although possibly with reduced functionality when compared with newer terminals.

From a network operator's perspective, the ability to establish the location of any caller has the potential to support the introduction of a variety of new location-based services, thus the possibility exists of operators being able to recoup some of the investment necessary to support the emergency service. Clearly, such services would have to be subject to an informed opt-out provision in much the same way as a PSTN user can suppress the CLI where trusted network operators agree to obey the user's indication.

The proposal has a clear advantage in that it does not dictate the introduction of new subscriber terminals for its successful implementation though it is accepted that additional functionality will eventually be achieved only when using later generation terminals.

5.2.3 Against the recommended solution

In making this recommendation, it is recognized that the 3GPP solution and the NENA solution [3] and [4] which is specifically based on current North American practices and network architectures may exclude compatibility with some existing VoIP services. Further work will be necessary to ensure that specific national, European and worldwide functionality needs are incorporated. Nevertheless, the value of the existing work is considered to be greater than the likely costs of developing a completely new standard which in any case would be likely to have compatibility issues and which would have to be interoperable with the *de facto* standards which are likely to be well entrenched before the development of such a new standard could be completed.

5.2.4 Consideration of Alternatives

No viable, pre-existing alternative solutions were identified that were likely to be effective as a basis for the support of signalling of emergency caller location information across a broad spectrum of access technologies.

The only possibility was therefore to consider the drafting of an entirely new set of standards and protocols. This did not seem to be a reasonable course of action, not least due to the likely costs, timescale and efforts involved. It is specifically noted here that the Australian telecommunications industry (and probably others) have specifically stated that they will await the expected convergence of the NENA, IETF, TISPAN and 3GPP standards before committing to a particular solution.

The costs of implementing this recommendation have not been considered *per se*. Nevertheless, it has been borne in mind that in most jurisdictions, network operators are mandated to provide an emergency calls service at no cost to the caller. Both the capital and revenue costs are therefore borne by the network operator and ultimately fall upon the subscriber community at large by way of increased costs for other services. The need to minimize the cost of providing an emergency call service has therefore been kept in mind but whatever solution is chosen will inevitably require substantial investment by network operators.

5.2.5 Comparison

A comparison between the 3GPP and NENA solutions is contained in clause 9 of TS 102 650 [1]; also the areas of enhancement to NENA (i2) [3] for defining NENA (i3) [4] are indicated in the same clause.

History

Document history		
V1.1.1	July 2008	Publication