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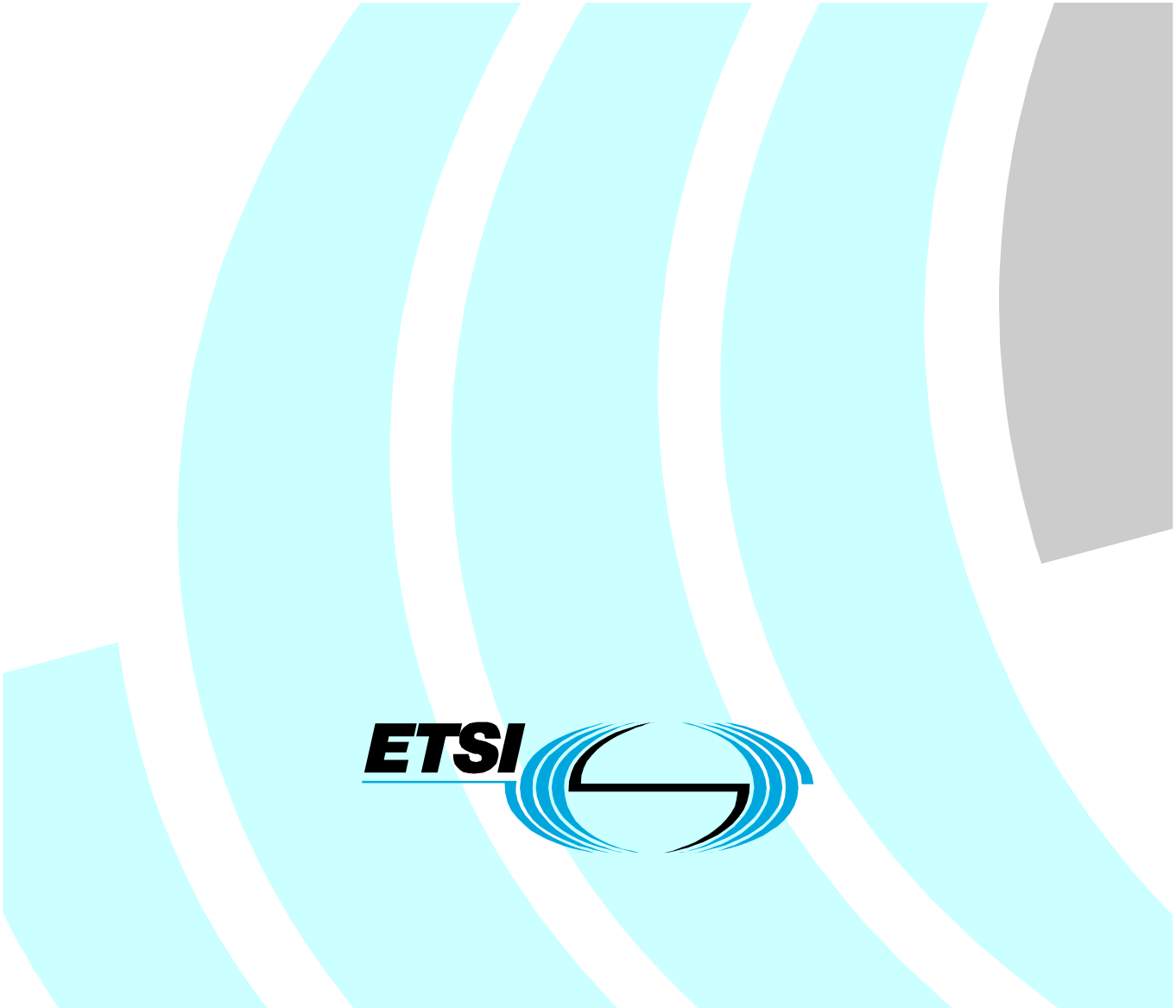
Technical Report

Emergency Communications (EMTEL); Emergency calls and VoIP: possible short and long term solutions and standardisation activities



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1 Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Special Committee Emergency Communications (EMTEL).

1 Scope

The present document is applicable to ETSI technical bodies for the defining of services and specifying technical solutions.

VoIP is growing quickly, especially in countries with a high broadband penetration. Therefore the use of this technology for the provision of emergency communication services will be considered. For this, specific features must be introduced such as location and routing. This document covers the interfaces between the communication network and the PSAPs and gives an overview of activities dealing with these issues in other standardisation bodies and summarises different methods for VoIP providers to deliver emergency communication services.

2 References

For the purposes of this Technical Report (TR), the following references apply:

[1] Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive).

NOTE: See Article 19.

[2] Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive).

[3] Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications).

[4] ETSI SR 002 180: "Requirements for communication of citizens with authorities/organizations in case of distress (emergency call handling)".

[5] ETSI TS 102 424 “Requirements on the NGN network to support Emergency Communication from Citizen to Authority”

[6] 3GPP TR 23.167 “IP Multimedia Subsystem (IMS) emergency sessions (Release 7)”

[7] IETF-ECRIT Requirements-11 “Requirements for Emergency Context Resolution with Internet Technologies”

[8] EGEA 06-10 “High Level Operational Requirementsa for Access to Emergency Services”

3 Definitions and abbreviations

3.1 Definitions

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

IP network: packet transport network comprising one or more transport domains each employing the IP protocol

IP telephony: any telephony related service that is supported on a managed IP Network

3.2 Abbreviations

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

3GPP	Third Generation partnership Project
EGEA	Expert Group on Emergency Access
ETSI	European Telecommunications Standards Institute
IETF	Internet Engineering Task Force
IRIS	
PIDF-LO	Precence Information Data Format – Location Object
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
RPC	Remote Procedure Call
SS7	Signalling System Number 7
VoIP	Voice over Internet Protocol
URI	Uniform Resource Identifier

4 Purpose of this document

4.1 The network evolution

New communications networks are IP-based. The number of broadband telephones is increasing quickly and more and more calls no longer reaches a circuit switched network.

Emergency calls traditionally reach the PSAP through the PSTN. New public communications operators without a PSTN network, e.g. municipality networks, need to transfer emergency calls thorugh a circuit switched network, typically the old PTT to reach a PSAP.. Since IP allows for transfer of more information related to the call and the caller it could be beneficial to allow for direct IP-interconnect to PSAPs. It is also foreseeable that the days of the circuit switched networks are coming to an end. That means that the requirements for IP-interconnections of PSAPs must be defined. It can also be argued why new IP-based public communications operators would not have the possibility to connect directly to PSAPs over IP.

Apart from the above mentioned reasons for starting work on IP-interconnection of PSAPs it is likely to be an advantage to try and define PSAP IP interface. It could lead to easier reaching common functionality meeting requirements from Emergency Services. This could for example lead to a possibility to utilize common platforms , easier exchange of experiences.and a harmonized service across borders.

4.1.1 Summary

- The circuit switched network era will end
- The conversion from IP into PSTN for eraching PSAPs is unnecessary
- A pure IP-interface for PSAPs must be defined
- More information can be transferred through IP into the PSAPs compared to todays SS7 or PABX-signalling based interfaces.
- Common requirements is beneficial for meeing requirements on Emergency Services concerning harmonisation across borders, cost for systems and exchange of experiences

4.2 Broadband subscribers

The increasing penetration of broadband has opened the market for broadband telephony. From being a complement to to PSTN is is becoming a replacement. Driving factors are the possibility to reduce subscription and call costs and also other services, e.g. the possibility to log into the network and thus receive calls to your actual location.

When becoming a replacement subscribers would expect that the behaviour of of the telephony service concerning Emergency Calls is the same as in the PSTN. Due to technical reasons this is not possible to guarantee when a call is set up from Internet.

This problem is addressed in many international working groups in e.g. IETF, 3GPP, and ETSI. There is a need to coordinate the VoIP Emergency Call standardisation activities and also to define the requirements on the PSAP IP interface.

This document provides descriptions of, and references to, short and long term requirements for Emergency Calls from broadband connections with the aim to facilitate a harmonised European approach. The individual subscriber should not be forced to know technical details of the network he is connected to for making Emergency Calls.

4.2.1 Summary

- Broadband telephony (VoIP) is going from being a complement to PSTN into becoming a replacement
- The subscriber expects Emergency Calls to work “as usual”
- It is desirable to have a harmonised approach in Europe since the VoIP service is borderless
- There are a lot of standardisation activities going on in different groups.
- EMTEL need to define the functional requirements concerning Emergency Calls over IP
- This must be done in a short and long term perspective
- Specific consideration of IP Security toward PSAPs must be carried out
- It is natural for EMTEL to give an overview of standardisation activities in other bodies

5 General on Access to Emergency Services

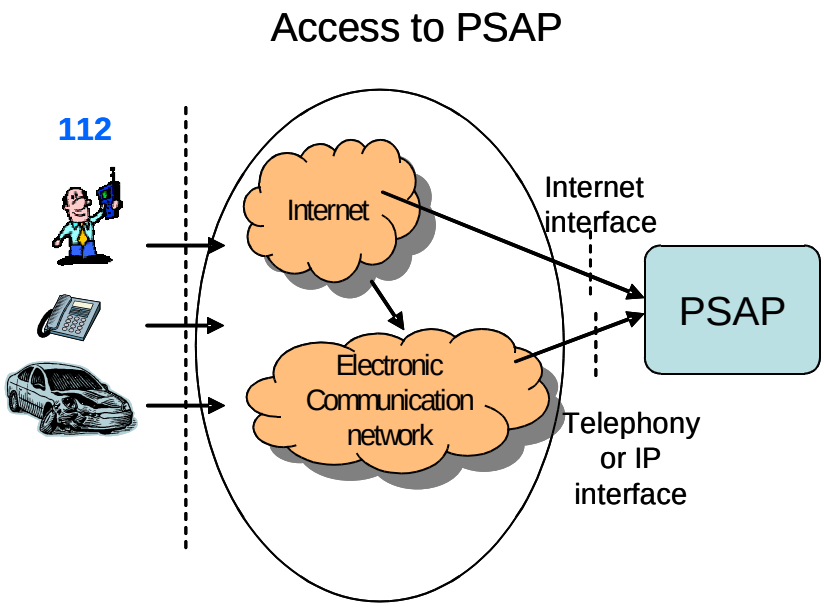
The efficient operation of Emergency Services requires fulfilment of the following basic functions.

1. Priority Routing to the appropriate PSAP
2. Identification of the caller
3. Location of the caller

Note: in all cases reliability of IP based PSAPs and IP connectivity

<Editor’s note the requirements of QoS and reduced grade of service of multimedia traffic need clarification.>

These three basic functional requirements are valid independent of what service type the Emergency Call is set up from and which interface is used between the telecommunications network and the PSAP. See figure below.



5.1 Service Types

All Emergency Calls must originate over a Service Type. Below a list of possible Service Types are given

Voice Services

1. POTS (Plain Old Telephone Service)
2. Mobile telephony
3. Satellite telephony
4. Voice over IP
   - Fixed (The subscriber cannot move the service to antother Network Access Point)
   - Nomadic (The subscriber can move the service to another Network Access Point)
5. Internet telephony

Multimedia Services

6. Video calls (E.g. from 3G-telephone)
7. Data calls (E.g. alarm from a device)
8. E-mail
9. Attached files (E.g E-mail or MMS only containing the attachment)
10. SMS (Short Message Service)
11. MMS (Multimedia Message Service)
12. Real-time Instant-Messaging & Chat

This document deals with the Service Types for Voice over IP and Internet telephony, categories 4 and 5.

5.2 The PSAP interface

The interface between the Communications Network (telecom or Internet) and the PSAP can be of two main types.

1. PSTN-based

2. IP-based
    a. Voice or data session IP
    b. Internet VoIP

Other data can be communicated between the Network and PSAP related to the Emergency communication, including location; this is not User Interface

5.3 Network capabilities

Independent of what interfaces are implemented, the functional requirements are the same. Therefore, information conveyed over any interface should be able to identify and locate the caller. Furthermore the Communications Network should be able to route the Emergency Call to the appropriate PSAP.

This document does not specify the actual protocols used for the interfaces between the Internet or Communications Network and the PSAP.

6 Emergency Calls and VoIP

In order to address problems associated with the implementation of VoIP emergency calls, various scenarios and the corresponding options for handling emergency calls are discussed.

6.1 Description of VoIP scenarios

Voice over IP can be subdivided in a number of scenarios depending on how the telephony service is offered technically. The following have been identified.

6.1.1 IP-based telephony from fixed terminal

An IP-telephony service offered and controlled by the network operator.

- The subscription is associated with a specific fixed network termination point
- The subscription cannot be moved to another Network Termination Point by the subscriber
- A telephone number from E.164 is assigned

Examples

Cable-TV-networks offering telephony, separate fibre network and classical cupperbased broadband networks where the service provider/network operator for some reason only offers non-nomadic services..

6.1.2 Internet telephony from fixed terminal

A telephony service offered over an Internet access, not with the E.164 numbering plan

- The subscription is associated with a specific fixed network termination point
- The subscription can be moved to another Network Termination Point by the subscriber
- A telephone number from E.164 is not assigned to the terminal and hence the E112 service is not guaranteed.

Examples

Any Internet connection.

6.1.3 IP-based telephony from nomadic terminal

An IP-telephony service offered by a service provider over a network operator's network.

– The subscription can be moved to another Network Termination Point by the subscriber

– A telephone number from E.164 or the SIP URI from the operator's addressing plan, is assigned

Examples

Any broadband network that hasn't barred access to VoIP-servers (SIP-servers).

6.1.4 Internet telephony from nomadic terminal

A telephony service offered over an Internet access, not associated with the E.164 numbering plan

– The subscriber can activate the subscription from any Network Termination Point.

– A telephone number from E.164 is not assigned to the terminal and hence the E112 service is not guaranteed.

Examples

Any Internet connection.

6.1.5 IP-based telephony from mobile terminal

An IP-telephony service offered to mobile terminals.

– The VoIP-subscription is related to the mobile subscription

– A telephone number from E.164 or the SIP URI from the operator's addressing plan, is assigned

Examples

Any PLMN-operator.

6.1.6 Internet telephony from mobile terminal

A telephony service offered over an Internet access without a possibility to use telephone numbers.

– The Internet telephony service is not related to the mobile subscription

– A telephone number from E.164 is not assigned

Examples

Any PLMN-operator that hasn't barred access to VoIP-servers (SIP-servers).

6.2 Emergency Calls

The short term solutions focus on a PSTN-interconnection and the long term solutions focus on IP-interconnection the between Communications Network and the PSAP.

In the case a proposed method is considered to be Long Term that is remarked.

6.2.1 IP-based telephony from fixed terminal

Normally this type of VoIP-service is treated in the same way as POTS.

6.2.1.1 Routing

Routing to the correct PSAP is achieved through knowledge of Network Access Point is transferred as a routing indicator in the telecommunications network.

6.2.1.2 Identification

The identification of the subscriber is done in the same way as for ordinary POTS-subscribers where the telephone number is used as identifier.

6.2.1.3 Location

The location of a Network Access Point is normally retrieved from the catalogue data using the telephone number as identifier.

6.2.2 Internet telephony from fixed terminal

This category is not discussed here since it doesn't support Emergency Calls.

6.2.2.1 Routing

6.2.2.2 Identification

6.2.2.3 Location

6.2.3 IP-based telephony from nomadic terminal

There are no standardised procedures for Emergency Calls from Nomadic IP-based fixed terminals.

6.2.3.1 Routing

Routing to the correct PSAP can be achieved using different solutions..

Examples

- Subscriber updates routing information on log-in to the service (Note 1)
- Network updates routing information on log in to the service
- IP-calls are marked and a specific PSAP is assigned
- The terminal request the DNI of the PSAP and uses that for routing (Long term)
- Geographical area of IP-address is known (Long-term)

Note 1: The purpose and consequences of subscriber settable location information is debated. Further, in conjunction with such information, a time stamp should be provided indicating when the location information was changed most recently.

6.2.3.2 Identification

The identification of the subscriber is done in the same way as for ordinary POTS-subscribers where the telephone number is used as identifier.

6.2.3.3 Location

Since location of the subscriber based on the received telephone number is depending on how updated the latest location information is procedures for verification and updates have to be established.

Examples

- Subscriber updates location information on log-in to the service(Note 1)
  - Validated by the network and contractual relationship
  - Not validated, transparent to the network
- Network updates location information on log in to the service
- Location information is provided by the network to the PSAP on a database data look-up interface
- Coordinate information is provided by the terminal through the signalling (Long-term)
  - Validated by the network and contractual relationship
  - Not validated, transparent to the network
- Coordinate information is provided by the network through the signalling (Long-term)
- Geographical area of IP-address is known (Long-term)

Note 1: The purpose and consequences of subscriber settable location information is debated. Further, in conjunction with such information, a time stamp should be provided indicating when the location information was changed most recently.

6.2.4 Internet telephony from nomadic terminal

6.2.4.1 Routing

6.2.4.2 Identification

6.2.4.3 Location

6.2.5 IP-based telephony from mobile terminal

6.2.5.1 Routing

Routing to the correct PSAP can be achieved using different solutions..

Examples

- Location of Base Station is known and used for routing
- Location information is provided by the network to the PSAP on a database data look-up interface
- Subscriber updates routing information on log-in to the service (Note 1)
  - Validated by the network and contractual relationship
  - Not validated, transparent to the network
- Network updates routing information on log in to the service
- IP-calls are marked and a specific PSAP is assigned
- The terminal request the DNI of the PSAP and uses that for routing (Long term)
- Geographical area of IP-address is known (Long term)

Note 1: The purpose and consequences of subscriber settable location information is debated. Further, in conjunction with such information, a time stamp should be provided indicating when the location information was changed most recently.

6.2.5.2 Identification

The identification of the subscriber is done in the same way as for ordinary POTS-subscribers where the telephone number is used as identifier.

6.2.5.3 Location

Location of the subscriber can basically be done in two ways that also can be complements to each other.

The mobile network can provide location based on base station.

The received telephone number can be used. Depending on how updated the latest location information related to the telephone number is, procedures for verification and updates have to be established.

Examples related to telephone number

- Subscriber updates location information on log-in to the service (Note 1)
- Network updates location information on log in to the service
- Coordinate information is provided by the terminal through the signalling (Long term)
- Coordinate information is provided by the network through the signalling (Long term)
- Geographical area of IP-address is known (Long term)

Note 1: The purpose and consequences of subscriber settable location information is debated. Further, in conjunction with such information, a time stamp should be provided indicating when the location information was changed most recently.

Examples related to mobile network

- Location of Base Station is known and used for routing

6.2.6 Internet telephony from mobile terminal

This category is not discussed here since it doesn't support Emergency Calls.

6.2.6.1 Routing

6.2.6.2 Identification

6.2.6.3 Location

7 Standardisation activities

7.1 IETF/ECRIT

7.1.1 Draft IETF ecrit requirements

<Text to be provided; Steve Norreys & Chritian Militeau.>

http://www.ietf.org/internet-drafts/draft-ietf-ecrit-requirements-12.txt

7.1.2 Service contact URIs

The IRIS scheme describes an XML-based protocol for passing location information to a server that returns emergency service contact URIs.It is intended to fit within a larger framework of standards.Specifically, it presumes the existence of a URI scheme appropriatefor signalling that emergency service is required and distinguishing among emergency ervices if appropriate. It also presumes that an entity requesting this response will be able to handle the URIs returned as input to appropriate handlers.

http://www.ietf.org/internet-drafts/draft-hardie-ecrit-iris-03.txt

7.1.3 Emergency Call Information in the Domain Name System

Location of a caller is essential to processing an emergency call. Location is needed to correctly route the call, and to correctly dispatch help to the right place. Location can be specified in geographic (latitude, longitude) or civic (country, province,locality) forms. This document proposes a DNS-based mechanism to lookup emergency calling URIs and related emergency information from a known civic location in a specific form. Other companion documents propose a non DNS-based approach to determine civic location from geographic location, and describe how to discover a civic location in the appropriate local form(s) for this application.

http://tools.ietf.org/id/draft-rosen-dns-sos-01.txt

7.1.4 Location-to-URL Mapping Protocol (LUMP)

LUMP (Location-to-URL Mapping Protocol) maps geographic locations, described as Precence Information Data Format – Location Object (PIDF-LO) objects containing civic or geospatial information, to one or more URLs. It is based on a standard Remote Procedure Protocol Call (RPC) mechanism and supports updates. This document describes the message formats, while a companion document describes the overall system architecture.

http://www.ietf.org/internet-drafts/draft-schulzrinne-ecrit-lump-0x.txt

7.1.5 Requirements for Emergency Context Resolution with Internet Technologies

This document enumerates requirements for emergency calls placed by the public using voice-over-IP (VoIP) and general Internet multimedia systems, where Internet protocols are used end-to-end.

http://www.ietf.org/internet-drafts/draft-ietf-ecrit-requirements-0x.txt

7.1.6 Security Threats and Requirements for Emergency Calling

This document reviews the security threats to routing of emergency calls through the IP network to Public Safety Answering Points (PSAPs). It establishes a set of security requirements for the

http://www.ietf.org/internet-drafts/draft-taylor-ecrit-security-threats-0X.txt

7.1.7 Session Initiation Protocol Location Conveyance

This document presents the framework and requirements for usage of the Session Initiation Protocol (SIP) to convey user location information from one Session Initiation Protocol (SIP) entity to another SIP entity. Considering cases where location information is conveyed from end to end, as well as cases where message routing by intermediaries is influenced by the location of the session initiator, the user agent client (UAC).

http://www.ietf.org/internet-drafts/draft-ietf-sip-location-conveyance-0X.txt

7.1.8 Requirements for Emergency Context Resolution with Internet Technologies

This document enumerates requirements for emergency calls placed by the public using voice-over-IP (VoIP) and general Internet multimedia systems, where Internet protocols are used end-to-end.

http://www.ietf.org/internet-drafts/draft-ietf-ecrit-requirements-0X.txt

7.1.9 Session Initiation Protocol

This document describes Session Initiation Protocol (SIP), an application-layer control (signaling) protocol for creating, modifying, and terminating sessions with one or more participants. These sessions include Internet telephone calls, multimedia distribution, and multimedia conferences.

SIP invitations used to create sessions carry session descriptions that allow participants to agree on a set of compatible media types. SIP makes use of elements called proxy servers to help route requests to the user's current location, authenticate and authorize users for services, implement provider call-routing policies, and provide features to users. SIP also provides a registration function that allows users to upload their current locations for use by proxy servers. SIP runs on top of several different transport protocols.

http://www.rfc-archive.org/getrfc.php?rfc=3261

7.2 ETSI

7.2.1 Requirements of the NGN network to support Emergency Communication from Citizen to Authority (TISPAN)

The present document contains the requirements of NGN to support emergency communications (EMTEL) from the citizen to the authority. The requirements are independent of the NGN subsystem and transport layer unless specifically referred to.

ETSI TS 102 424 V1.1.1 (2005-09)

7.3 3GPP

7.3.1 IP Multimedia Subsystems (IMS) emergency sessions (Release 7)

<Review and refer to TS 23.167 & TR 23.867>

7.3.2 Support of Location of emergency sessions and CLI using OMA MLP (Release 7)

<text to be provided bt David Williams>

8 Standardisation activities in a network environment

Annex A: Bibliography

History

Document history		
V0.0.1	April 2006	First draft for discussion (Table of Contents)
V0.0.2	August 2006	Second draft with revised Table of Contents and first version of proposed solutions
V0.0.3	September 2006	Same draft as V0.0.2 but with editing clean up
V0.0.4	January 2007	Merging chapter 6 and 7. Other changes, mainly of editorial nature