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Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Analysis of Location Information Standards produced by various SDOs

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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 response organization 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 regarded by the European Commission as 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 to European regulations 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 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 102 660 [19] which reports on the Signalling Requirements and Signalling Architecture for Supporting the Various Location Information Protocols for Emergency Service on a NGN. The object of this work was to determine what, if any, standards existed and had been adopted for signalling details of an emergency caller's location, in order to assist in the response to emergency calls.

It should be recognized that 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.

The present document does not contain a fully detailed technical analysis of location information standards but concentrates on the background information and 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.

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<https://standards.iteh.ai/catalog/standards/sist/a43a194b-79b8-40c5-889c-691a96469f31/etsi-ts-102-650-v1.1.1-2008-07>

1 Scope

The present document represents an analysis of the work done by various ETSI work groups and other standards bodies worldwide on the acquisition and transmission of caller location information in various communications network types. It also contains information about the protocols used and of any known deployments for the location of users making emergency calls. It is not intended to examine the detailed workings of the protocols described or their possible use in other communications network types.

The document does not mandate any new requirements but does report on the normative requirements from other standards and regulatory bodies. It also refers, in part, to operating methods and national regulations in various jurisdictions but does not intend to endorse these as requirements.

The hypothetical accuracy of the caller location and the accuracy achieved by the assessing methods are also documented. Alternative methods for the coding of the emergency location information are also examined.

The present document also indicates a number of scenarios where location information may not be available or may be inaccurate to various degrees and may suggest solutions for improvement.

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;
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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 123 167 (V7.6.0): "Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS) emergency sessions (3GPP TS 23.167 version 7.6.0 Release 7).
- [2] ETSI TS 123 041 (V3.5.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Technical realization of Cell Broadcast Service (CBS) (3GPP TS 23.041 version 3.5.0 Release 1999)".

[3] ETSI ES 282 004: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture; Network Attachment Sub-system (NASS)".

[4] NENA «I2» architecture: "Interim VoIP Architecture for Enhanced 9-1-1 Services («i2»)".

NOTE: Available at http://www.nena.org/media/File/NENA_08-001_V1_12-06-05_1.pdf.

[5] ISO 3166-1(2006): "Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes".

[6] NIMA Technical Report TR8350.2: "Department of Defence World Geodetic System 1984, Its Definition and Relationships With Local Geodetic Systems"; Third Edition; National Imagery and Mapping Agency, 4 July 1997.

[7] IETF RFC 3046: "DHCP Relay Agent Information Option".

[8] IETF RFC 3825: "Dynamic Host Configuration Protocol Option for Coordinate-based Location Configuration Information".

[9] IETF RFC 4776: "Dynamic Host Configuration Protocol (DHCPv4 and DHCPv6) Option for Civic Addresses Configuration Information".

[10] IETF RFC 4119: "A Presence-based GEOPRIV Location Object Format".

[11] Coordination Group on Access to Location Information by Emergency Services (CGALIES): "Final Report V1.0".

NOTE: Available at http://ec.europa.eu/environment/civil/pdfdocs/cgaliesfinalreportv1_0.pdf and http://portal.etsi.org/docbox/STF/STF321_TISPAN3_EC_Emergency_Call_Location/Public/Library/EC%20Documents/cgalies_final.pdf.

[12] IP Location Information/04/006 V2.16Jan07; "Report from the IP Location Information Working Group".

[13] draft-arai-ecrit-japan-req-01: "Emergency Call Requirements for IP Telephony Services In Japan".

[14] 2003/558/EC (25 July 2003): "Commission Recommendation on the processing of caller location information in electronic communication networks for the purpose of location-enhanced emergency call services" (notified under document number C(2003) 2657 [i.5]).

NOTE: This recommendation is replicated in annex A of the present document.

[15] ETSI TR 180 000: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Terminology".

[16] ETSI TS 123 271: " Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Functional stage 2 description of Location Services (LCS) (3GPP TS 23.271)".

[17] ATIS Technical Report: "Location Acquisition and Location Parameter Conveyance for Internet Access Networks in Support of Emergency Services".

[18] GEOPRIV L7LCP: draft-ietf-geopriv-l7-lcp-ps-07.txt.

[19] ETSI TS 102 660: "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".

[20] DCITA report: " Examination Of Policy And Regulation Relating to Voice Over Internet Protocol (VoIP) Services - Report To The Minister For Communications, Information Technology And The Arts ".

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.

- [i.1] "GPS-free positioning in mobile Ad-Hoc networks", Cluster Computing, 5(2), April 2002. Srdan Čapkun, Maher Hamdi, Jean-Pierre Hubaux.
 - [i.2] "Towards Mobile Ad-Hoc WANS: Terminodes", J.-P. Hubaux, J.-Y. Le Boudec, S. Giordano, M. Hamdi, L. j. Blazevic, L. Buttyan and M. Vojnovic. IEEE WCNC, September 2000.
 - [i.3] "Location aided routing (LAR) in mobile ad-hoc networks", Y.B. Ko and N.H. Vaidya, MOBICOM, 1998.
 - [i.4] "Self-Organizing Wide-Area routing", Lj. Blazevic, S. Giordano and J. Y. Le Boudec, SCI 2000/ISAS 2000, Orlando, July 2000.
 - [i.5] C(2003)2657 25 (July 2003): "Commission Recommendation of the processing of caller location information in electronic communication networks for the purpose of location-enhanced emergency call services".
 - [i.6] AS/NZS 4819:2003: "Geographic information - Rural and urban addressing". .
- NOTE: Plus draft DR 05191 CP: Amendment 1 to AS/NZS 4819:2003.
- NOTE: Australian Standards are available from: <http://www.saiglobal.com/shop/Script/Provider.asp?Db=AS>.
- [i.7] IETF RFC 3693: "Geopriv Requirements".
 - [i.8] IETF RFC 4676: "Dynamic Host Configuration Protocol Option for Civic Addresses Configuration Information"
- NOTE: IETF RFCs are available from: <http://www.ietf.org>.
- [i.9] NENA: "NENA VoIP Recommended Methods for Determining Location to Support Emergency Calling Technical Information Document (TID)".
- NOTE: Available from: http://www.nena.org/media/files/08-505_20061221.pdf.
- NOTE: Available from: <http://www.3gpp.org/ftp/Specs/html-info/23167.htm>.
- [i.10] Directive 2002/21/EC on a common regulatory framework for electronic communications and services (the "Framework Directive") (OJ L 108, 24.4.2002).
 - [i.11] COUNCIL DECISION of 29 July 1991 on the introduction of a single European emergency call number (91/396/EEC). (OJ L 217, 6.8.1991).
 - [i.12] Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services (the "Universal Service Directive") (OJ L 108, 24.4.).
 - [i.13] Directive 2002/58/EC concerning the processing of personal data and the protection of privacy in the electronic communications sector (the "Directive on privacy and electronic communications") (OJ L 201, 31.7.2002).
 - [i.14] ETSI TS 123 167: "Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS) emergency sessions (3GPP TS 23.167 version 7.9.0 Release 7)".
 - [i.15] ETSI EN 300 403: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".
 - [i.16] ETSI TS 124 008: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (3GPP TS 24.008 version 7.12.0 Release 7)".

- [i.17] ITU-T Recommendation Q.931: "ISDN user-network interface layer 3 specification for basic call control".
- [i.18] DR 05191 CP: "Amendment 1 to AS/NZS 4819:2003 - Geographic information - Rural and urban addressing".

3 Definitions and abbreviations

3.1 Definitions

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

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

NOTE 1: In a PLMN this is a radio access via a Base Station.

NOTE 2: c.f. (ITU-T Recommendation Q.931 [i.17], EN 300 403 [i.15], TS 124 008 [i.16]).

disaster: serious disruption of the functioning of society, posing a significant, widespread threat to human life, health, property or the environment, whether caused by accident, nature or human activity, and whether developing suddenly or as the result of complex, long-term processes

disaster mitigation: measures designed to prevent, predict, prepare for, respond to, monitor and/or reduce the impact of, disasters

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 (e.g. fire department, police, ambulance)

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 forwarded from a PSAP

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

NOTE: There are two different types of emergency numbers in Europe:

- European emergency number, 112: unique emergency number for pan-European and GSM emergency services and used, for example, in EU member-states, Switzerland and other countries.
- National emergency numbers: each country may also have its own national emergency number and/or one or more numbers for alerting specific services.

emergency response organization: local or national force established to provide assistance to citizens in the event of their being involved in an emergency situation and requiring specialised help, for example, the police, fire service and emergency medical 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 (Recommendation 2003/558/EC [14] and C(2003)2657 [14])

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 (Recommendations 2003/558/EC [14] and C(2003)2657 [i.5])

enhanced 911 (E911) wireless service: a network based system that associates a physical address with the calling party's telephone number and routes the call to the most appropriate Public Safety Answering Point (PSAP) for that address, thus providing emergency call-takers with the location of the emergency without the person calling for help having to provide it

NOTE Wireless E911 program (in North America) is divided into two parts:

- Phase I requires carriers, upon valid request by a local Public Safety Answering Point (PSAP), to report the telephone number of a wireless 911 caller and the location of the antenna that received the call.
- Phase II requires wireless carriers to provide far more precise location information, within 50 metres to 300 metres in most cases.

health hazard: a 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

geoid: equi-potential surface of the Earth's gravity field which best fits, in a least squares sense, global mean sea level

location acquisition: process of a client device or application requesting, and receiving, location information from the Location Information Server (LIS)

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

Information 2): in a public fixed network, data defining the physical address of the termination point. (Recommendation 2003/558/EC [14] and C(2003)2657 [i.5])

INVITE: SIP PDU that is sent by a terminal device asking for connection to another terminal or service

Mobility: ability for the user or other mobile entities to communicate and access services irrespective of changes of the location or technical environment

NOTE: The degree of service availability may depend on several factors including the Access Network capabilities, service level agreements between the user's home network and the visited network (if applicable), etc. Mobility includes the ability of telecommunication with or without service continuity.

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

nomadism: ability of the user to change his network access point

NOTE: When changing the network access point, the user's service session is completely stopped and then started again, i.e. there is no session continuity or hand-over possible. It is assumed that normal usage pattern is that users shutdown their service session before changing to another access point.

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 be expected to 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 (PSAP): physical location where emergency calls are received under the responsibility of a public authority (Recommendation 2003/558/EC [14] and C(2003)2657 [i.5])

REGISTER: SIP PDU that is sent by a terminal device to establish its presence and location on a network

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

roaming: ability of users to access services while outside of their subscribed home network, i.e. by using an access point of a visited network

NOTE: This is usually supported by a roaming agreement between the respective network operators.

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: point of access to a telecommunication network from which a call can be requested. This includes public telephones and "emergency call facilities"

widespread outage: sustained interruption over a considerable area, of telecommunications services 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:

| | |
|-----------|----------------------------------------------------------------------------------|
| 3G | Third Generation |
| 3GPP | 3rd Generation Partnership Project |
| 3GPP2 | 3rd Generation Partnership Project 2 |
| ADSL | Asymmetrical Digital Subscriber Line |
| ALE | Access Location Entity |
| ALI | Automatic Location Identification |
| ANP | Access Network Provider |
| ATIS | Alliance for Telecommunications Industry Solutions |
| BGCF | Border Gateway Control Function |
| CAEMS | Committee for the Advancement of Emergency Message Systems |
| CAMA | Centralized Automatic Message Accounting |
| CATV | Cable TV |
| CDMA | Code Division Multiple Access |
| CGALIES | Co-ordination Group on Access to Location Information for Emergency Services |
| CLI | Calling Line Identity or Calling Line Identification |
| CLIR | Calling Line Identity Restriction |
| CPN | Customer Private Network |
| CRC | Cyclic Redundancy Check |
| CS | Circuit Switch |
| CSCF | Call Session Control Function |
| DCITA | Department for Communications, Information Technologies and the Arts (Australia) |
| DECT | Digital Enhanced Cordless Telecommunications |
| DG INFSOC | (EU) Directorate Information Society |
| DHCP | Dynamic Host Configuration Protocol |
| DSL | Digital Subscriber Line |
| DSLAM | Digital Subscriber Line Access Multiplexer |
| DT | Deutsche Telekom |
| E2+/ESP | NENA enhanced Emergency Services Protocol at reference point E2 |
| ECC | Emergency Control Centre |
| ECRIT | Emergency Context Resolution with Internet Technologies (IETF WG) |
| ECS | Emergency Call Server, or Electronic Communications Service |
| E-CSCF | Emergency-CSCF |
| EMTEL | EMergency TELcommunications |
| EPFL | Ecole Polytechnique Fédérale de Lausanne |