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Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

This document defines the stage 2 service description for emergency services in the IP Multimedia Core Network Subsystem (IMS), including the elements necessary to support IP Multimedia (IM) emergency services and IM emergency services for eCall. ITU-T Recommendation I.130 [4] describes a three-stage method for characterisation of telecommunication services, and ITU-T Recommendation Q.65 [3] defines stage 2 of the method.

This document covers also the Access Network aspects that are crucial for the provisioning of IMS emergency services. Other 3GPP specifications that are related to the IMS emergency services are TS 23.228 [1] on IMS in general, including fixed broadband access aspects, TS 23.060 [2] describing GPRS (UTRAN): TS 23.401 [28] describing EPS (UTRAN and E-UTRAN); TS 23.402 [29] describing Non 3GPP access (WLAN) to EPC; TS 23.271 [5] that covers location services; TS 23.216 [31] and TS 23.237 [32] describing Single Radio Voice Call Continuity (SRVCC) and Dual Radio Voice Call Continuity (DRVCC) for IMS Emergency session, TS 23.292 [45] describing the use of IMS services when using CS access for the media bearer and TS 23.501 [48] and TS 23.502 [49] describing support of emergency services and location for 5GS. TS 25.301 [6] contains an overall description of the UMTS Terrestrial Radio Access Network; TS 36.300 [30] contains an overall description of the Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); and TS 38.300 [50] contains an overall description of the Next Generation Radio Access Network (NG-RAN). Other non-3GPP specifications that are related to the IMS emergency services include 3GPP2 cdma2000 HRPD IP-CAN, as specified in 3GPP2 X.S0060 [25] when the UE is connected to a PDS core network and 3GPP2 X.S0057-A [39] when the UE is connected to an EPC core network.

The emergency support in different IP-CANs is described in the Informative Annex E.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 23.228: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; IP Multimedia Subsystem (IMS); Stage 2".

[2] 3GPP TS 23.060: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; General Packet Radio Service (GPRS); Service description; Stage 2".

[3] CCITT Recommendation Q.65: "Methodology – Stage 2 of the method for the characterisation of services supported by an ISDN".

[4] ITU Recommendation I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[5] 3GPP TS 23.271: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Functional stage 2 description of LCS".

[6] 3GPP TS 25.301: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Radio Interface Protocol Architecture".

[7] Void.

[8] 3GPP TS 22.101: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Service aspects; Service principles".

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

[10] IETF RFC 4676: "Dynamic Host Configuration Protocol (DHCPv4 and DHCPv6) Option for Civic Addresses Configuration Information ".

[11] 3GPP TR 21.905: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications".

[12] 3GPP TS 23.002: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Network architecture".

[13] 3GPP TS 24.008: "3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".

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

[15] OMA AD SUPL: "Secure User Plane Location Architecture", http://www.openmobilealliance.org.

[16] OMA TS ULP: "User Plane Location Protocol", http://www.openmobilealliance.org.

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

[18] ETSI ES 282 004: "Protocols for Advanced Networking (TISPAN); NGN Functional Architecture; Network Attachment Sub-System (NASS)".

[19] 3GPP TS 24.229: "IP multimedia call control protocol based on SIP and SDP; stage 3".

[20] 3GPP TS 23.203: "Policy and Charging Control architecture".

[21] 3GPP TS 23.003: "Numbering, addressing and identification".

[22] Void.

[23] ANSI/J-STD-036-B: "Enhanced Wireless 9-1-1, Phase 2".

[24] 3GPP2 X.S0002-0: "MAP Location Services Enhancements".

[25] 3GPP2 X.S0060: "HRPD Support for Emergency Service".

[26] 3GPP TS 22.003: "Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".

[27] 3GPP TS 22.228: "Service requirements for the Internet Protocol (IP) multimedia core network subsystem; Stage 1".

[28] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[29] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[30] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[31] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SR VCC); Stage 2".

[32] 3GPP TS 23.237: "IP Multimedia Subsystem (IMS) Service Continuity; Stage 2".

[33] 3GPP TS 24.301: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[34] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction".

[35] 3GPP TS 32.260: "Telecommunication management; Charging management; IP Multimedia Subsystem (IMS) charging".

[36] ETSI TS 181 019 V2.0.0: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Business Communication Requirements".

[37] ETSI TS 182 024 v.2.1.1: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Hosted Enterprise Services; Architecture, functional description and signalling".

[38] ETSI TS 182 025 v.2.1.1: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Business trunking; Architecture and functional description".

[39] 3GPP2 X.S0057-C v1.0: "E-UTRAN - eHRPD Connectivity and Interworking: Core Network Aspects".

[40] NENA 08-002, Version 1.0 (i3): "NENA Functional and Interface Standards for Next Generation 9-1-1".

[41] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode".

[42] 3GPP TS 26.267: "Digital cellular telecommunication systems (Phase 2+); Universal Mobile Telecommunication System (UMTS); eCall data transfer; In-band modem solution General description".

[43] 3GPP TS 29.328: "IP Multimedia (IM) Subsystem Sh interface; Signalling flows and message contents".

[44] 3GPP TS 33.203: "3G security; Access security for IP-based services".

[45] ATIS-0700028: "Location Accuracy Improvements for Emergency Calls".

[46] 3GPP TS 23.292: "IP Multimedia Subsystem (IMS) centralized services".

[47] IEEE Std 802.11-2012: "IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

[48] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[49] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[50] 3GPP TS 38.300: "NR; Overall description; Stage-2".

[51] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[52] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [11] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [11].

Charging Data Record: Record generated by a network element for the purpose of billing a subscriber for the provided service. See TS 32.260 [35] for further details.

Connectivity Session Location and Repository Function (CLF): As per ETSI ES 282 004 [18], the Connectivity Session Location and Repository Function (CLF) registers the association between the IP address allocated to the UE and related network location information, i.e.: access transport equipment characteristics, line identifier (Logical Access ID), IP Edge identity.

NG-eCall (eCall Over IMS): A manually or automatically initiated IMS emergency call, from a vehicle, supplemented with a minimum set of emergency related initial data (MSD).

Emergency Call Server (ECS): The functional entity consists of a Location Retrieval Function (LRF) and either a routing proxy or a redirect server, e.g. an ECS contains a VPC and a Routing Proxy or Redirect Server in NENA I2 architecture [17].

Emergency-CSCF: The Emergency-**CSCF** handles certain aspects of emergency sessions, e.g. routing of emergency requests to the correct emergency centre or PSAP.

Emergency Service Query Key (ESQK): A 10-digit North American Numbering Plan number used to identify a particular emergency call instance. It is used by the LRF as a key to look up for the location information and callback information associated with the emergency call instance and is also used by the PSAP to query location information from the LRF.

Emergency Service Routing Key (ESRK): see TS 23.271 [5] or J-STD-036 [23].

Emergency Service Routing Number (ESRN): North American Numbering Plan number used for routing of an emergency call to the appropriate gateway for an eventual delivery towards a CS-based PSAP.

Geographical Location Information: Location indicated in geographical terms, for example geographical coordinates or street address (e.g. as supported by IETF RFC 4119 [14]).

Local regulation: Condition defined by the authority whose legislation applies where the emergency service is invoked.

Location Identifier: Information about the current location of the UE in the network. Location is indicated in network terms, for example using the global cell id in cellular networks, line-id in fixed broadband networks, (OMA-Location also uses this term, but OMA so far defines the Location Identifier only for cellular access.)

Location Information: The location information may consist of the Location Identifier, and/or the Geographical location information.

Location Retrieval Function (LRF): This functional entity handles the retrieval of location information for the UE including, where required, interim location information, initial location information and updated location information. The LRF may interact with a separate RDF or contain an integrated RDF in order to obtain routing information. The LRF may interact with a separate Location Server or contain an integrated Location Server in order to obtain location information. The LRF may interact with or contain other types of location server functions in order to obtain location information.

Location Server (LS): General term for the entity responsible for obtaining the location of the UE (e.g. GMLC see TS 23.271 [5], MPC see 3GPP2 X.S0002 [24] or SLP see OMA AD SUPL [15]).

Last Routing Option (LRO): A number, which may be used in the event of network failure towards a specific location based PSAP or a number that can be associated to a national or default PSAP/Emergency centre.

Operator policy: Condition set by operator.

Private Numbering Plan: According to ETSI TS 181 019 [36], a numbering plan explicitly relating to a particular private numbering domain.

Public Safety Answering Point (PSAP): A physical location, where emergency calls from the public are received.

Routing Determination Function (RDF): The functional entity, which may be integrated in a Location Server or in an LRF, provides the proper PSAP destination address to the E-CSCF for routing the emergency request. It can interact with a LS to manage ESQK allocation and management, and deliver location information to the PSAP.

For the purposes of the present document, the following terms and definitions given in TS 24.229 [19] apply:

Private Network Traffic

NOTE: All traffic from UEs having registered a contact bound to a public user identity receiving hosted enterprise services, is private network traffic.

Public Network Traffic

For the purposes of the present document, the following terms and definitions given in TS 23.401 [28] apply:

eCall Only Mode: See TS 23.401 [28].

For the purposes of the present document, the following terms and definitions given in TS 22.101 [8] apply:

eCall: See TS 22.101 [8].

Minimum Set of Data (MSD): See TS 22.101 [8].

3.2 Abbreviations

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

CDR	Charging Data Record
CLF	Connectivity session Location and repository Function
CS	Circuit Switched
DRVCC	Dual Radio Voice Call Continuity
E-CSCF	Emergency-CSCF
EATF	Emergency Access Transfer Function
ECS	Emergency Call Server
ESQK	Emergency Service Query Key
ESRK	Emergency Service Routing Key
ESRN	Emergency Service Routing Number
HRPD	High Rate Packet Data
LRF	Location Retrieval Function
LRO	Last Routing Option
LS	Location Server
MPC	Mobile Positioning Centre
MSD	Minimum Set of emergency related Data
PDS	Packet Data Subsystem
PSAP	Public Safety Answering Point
RDF	Routing Determination Function
SET	SUPL Enabled Terminal
SLP	SUPL Location Platform
SRVCC	Single Radio Voice Call Continuity
SUPL	Secure User Plane for Location
URN	Uniform Resource Name
VPC	VoIP Positioning Centre
WLAN	Wireless LAN

4 High level Principles

4.1 Architectural Principles

The solution for emergency sessions in the IMS fulfils the emergency principles and requirements of TS 22.101 [8], TS 22.228 [27] and the following architectural requirements:

1. Void.

2. Emergency services are independent from the IP-CAN with respect to the detection and routing of emergency sessions. The emergency services shall be possible over at least a cellular access network, a fixed broadband access, a nomadic access and a WLAN access to EPC or non-3GPP access to 5GC.

2a. Emergency numbers and associated types or URN information received via WLAN (for access to EPC) are only used for detecting emergency calls in the same country, if permission from PLMN selected in 3GPP access was received (see TS 23.401 [28] and TS 23.060 [2] for EPC access).

NOTE 1: Some features described in this clause do not apply for emergency session set-up over WLAN access to EPC or to 5GC. The limitations are documented in Annex J and Annex L.

2b. Emergency numbers and associated types received using a list as described in TS 24.008 [13] are only used for detecting emergency calls in the same country. The UE can obtain these numbers and associated types via mobility management procedures as described in TS 24.008 [13], TS 24.301 [33] and TS 24.501 [52]. The associated types consist of a limited number of emergency service categories from which a limited number of URNs can be derived.

2c. Emergency numbers and associated URN information received using a list as described in TS 24.301 [33] are only used when they are valid. The validity of these numbers and associated URN information is specified in TS 22.101 [8] clause 10.4.1 (i.e. the serving network indicates whether this list is valid in the country or only in the PLMN). The UE can obtain these numbers and associated URN information via mobility management procedures as described in TS 24.301 [33] and TS 24.501 [52].

3. Any kind of emergency numbers, and emergency SIP and TEL-URIs as specified in TS 22.101 [8], and special indications for emergency sessions within the SIP signalling shall be supported. The URIs allowed to resolve to emergency services may be subject to local regulation in the serving network.

4. Emergency sessions should be prioritized over non-emergency sessions by the system.

5. The establishment of IMS emergency sessions shall be possible for users with a barred public user identity.

6. The primary solution shall be that the UE can detect an emergency session (e.g. by evaluating the SIP-URI or the dialled number) by itself and indicates the emergency session to the network. The cases where the UE can't detect an emergency session shall also be supported.

7. The solution shall work if the UE has sufficient credentials to authenticate with the IMS and is registered to the IMS or is not registered with the IMS. The case where the UE does not have sufficient credentials to authenticate with the IMS shall also be supported if required by local regulation.

   In the case that UE is not already IMS registered, it shall perform a registration for the support of emergency services (emergency registration).

   In the case a UE is already IMS registered, the UE may skip the additional emergency registration if the UE is aware that it is in its home network (e.g. including IP-CANs where roaming outside the home network is not supported).

   If the UE does not have sufficient credentials to authenticate with the IMS it shall be possible to perform session establishment without an existing security association between UE and P-CSCF, and the UE shall include an equipment identifier (the specific details of the equipment identifier to use may depend upon the IP-CAN) in the request to establish an emergency session.

   Subject to local regulation or operator policy, the network and the UE shall support the same authentication and security methods for an emergency service request as for non-emergency requests.

8. It shall be possible to reject emergency service requests from an UE, without sufficient credentials to authenticate with the IMS in networks where emergency services from UEs with sufficient credentials to authenticate with the IMS are required.

9. Emergency Service is not a subscription service.

9a. When the UE has roamed out of its home network, emergency services shall not be provided by the home network and shall be provided in the roamed-to network if the roamed-to network supports emergency sessions. If a UE has sufficient credentials, it shall initiate an emergency registration with the network (requiring the involvement of the home network). The CSCFs providing service for emergency sessions may be different from the CSCFs involved in the other IMS services. If the registration fails and if the serving IMS has indicated support for anonymous IMS emergency sessions as part of the IMS registration failure, the UE shall attempt an anonymous emergency session. If the IMS registration fails and if the serving IMS has not indicated support for anonymous IMS emergency sessions as part of the IMS registration failure, the UE may attempt an anonymous IMS emergency session.

NOTE 2: UEs compliant with pre-Rel-14 versions of this specification are unable to interpret this indication and ignore the indication. Such UEs might attempt an anonymous IMS emergency session or proceed according to Annex H.5.

10. If an emergency session establishment request is routed to a P-CSCF located in the home network, the home network should be able to detect that the session is for emergency service (whether indicated as such or not) and respond to the UE indicating that the UE should initiate an emergency session in the visited network (e.g. via the CS domain of the visited network).

11. Emergency centres and PSAPs may be connected to the PSTN, CS domain, PS domain or any other packet network.

12. The architecture shall enable emergency centres and PSAPs to request a PSAP call back to a UE with which the Emergency centres or PSAPs had an emergency session. The serving network of the UE shall use the appropriate call termination procedures e.g. IMS if the UE is available for voice over PS, or ICS if the user is available over CS. PSAP call back is subject to local regulation.

NOTE 3: PSAP call back sessions are treated as normal calls.

NOTE 4: Subject to local regulation, any supported media can be used during a call back attempt from a PSAP.

13. The IMS core network shall be able to transport information on the location of the subscriber.

14. Void.

15. The network shall be able to retrieve the caller's location;

16. As a regional option, the network shall be capable of assigning a routable location key (i.e. Emergency Services Query Key, a.k.a. ESQK, which has the same properties as the existing ESRK in wireless 911 services) to an IMS emergency session, and releasing the ESQK when the emergency session is terminated.

17. The network shall provide the caller's location information to the PSAP upon query from the PSAP.

18. The network shall provide the possibility to route to a default answering point given the scenario where the local PSAP can not be determined.

19. The network may provide a capability to enable a UE to obtain local emergency numbers.

20 A UE should support a capability to obtain local emergency numbers from the network once such a capability has been defined and agreed.

21. The network (e.g. in the E-CSCF) shall prevent the sending of the information of the users, such as public user identifiers and the location information, to the PSAP if explicitly requested by the user (i.e. request on session by session basis), and local regulation requires the operator to provide privacy to the user.

22. Void.

NOTE 5: TS 24.008 [13] contains a procedure to provide local emergency numbers for UMTS and GPRS access but the procedure is not applicable to cdma2000 HRPD and contains a limited number of emergency service categories.

23. Void.

24. Subject to operator policy, the architecture shall allow an emergency session to be initiated by a trusted AS on behalf of a user that is not roaming.

25 Subject to local regulation, for non-roaming subscribers the network shall apply normal routing procedures for private network traffic even if that is marked as emergency session.

26. When a call is established with a PSAP that supports voice only, voice media is supported and GTT if required by local regulation or operator policy.

27. When a call is established with a PSAP that supports voice and other media, voice, GTT and other media according to TS 22.101 [8] (e.g. video, session mode text-based instant messaging) can be used during an IMS emergency session if required by local regulation. This media may be used in addition to or instead of voice and/or GTT.

28. NG-eCall is a variant of IMS emergency services and follows the same principles, architecture, and procedures as other emergency services over IMS.

In addition to the architectural requirements, the following architectural principles apply to IMS emergency sessions:

- The IMS network shall be able to discriminate between emergency sessions and other sessions. This shall allow special treatment (e.g. with respect to filtering, higher priority, routing, QoS, supplementary services interactions) of emergency sessions.

- If a visited network can support PS emergency service, the emergency session shall be established in the visited network whether or not UE is registered in IMS in the home network.

- When a UE using public network traffic initiates an emergency session, the P-CSCF is the IMS network entity, which is responsible to detect the request for emergency session. The P-CSCF then forwards the request to E-CSCF in the same network, unless authentication and security procedures (see principle #7) require the request to be forwarded to the S-CSCF in the same network.

NOTE 6: While in the home network, forwarding of an emergency session to the S-CSCF is only expected over a non-emergency registration.

- The P-CSCF serving the emergency call is the IMS network entity which may retrieve the location identifier from the IP-CAN. For emergency sessions initiated by a trusted AS on behalf of a non-roaming subscriber, the AS may provide the location identifier.

- The P-CSCF serving the emergency call is the IMS network entity which may receive additional caller related identifier(s) from the IP-CAN (e.g. IP-CAN level's subscriber ID). If required by local regulation, these additional identifier(s) shall be forwarded by the IMS network to the emergency control centre/PSAP for those UEs that have not been authenticated by IMS network and are requesting to establish an emergency session,

- The E-CSCF is the IMS network entity, which shall be able to retrieve geographical location information from the LRF in the case that the geographical location information is not available and is required.

- If required, the E-CSCF shall be able to forward the location information to the LRF for validation of geographical location information in the case that the geographical location information is included by the UE over any access network type.

- The E-CSCF is the IMS network entity, which is responsible to route the request to an emergency centre/PSAP via or BGCF, IBCF or IP multimedia network based on location information and additionally other information such as type of emergency service in the request.

- As a regional option where the emergency centre/PSAP is connected to the IMS of another network (e.g. TTC spec), emergency sessions may be routed over Inter-IMS Network to Network Interface between two IM CN subsystem networks.

- The architecture shall allow for compliance with other regional regulations (i.e. ATIS and NENA specs in North America region) in which the originating network shall have the ability to route an emergency call via an IBCF to an emergency services network.

4.2 Naming and Addressing

When a UE performs an emergency registration, barring and roaming restrictions are ignored. The implicit registration set of the Public User Identifier used for emergency registrations shall contain an associated TEL-URI.

NOTE: Annex G provides recommendations for the provisioning of TEL-URI(s) in the IMS subscription for the purposes of IMS emergency sessions.

When a call is initiated to a PSAP from a UE without credentials, the E-CSCF shall derive a non-dialable callback number where required by local regulation (e.g. see Annex C of ANSI/J-STD-036 B [23]).

4.3 Location information for Emergency Sessions

Location information is needed for 2 main reasons in emergency services. The initial purpose of the location information is to enable the IMS network to determine which PSAP serves the area where the UE is currently located, so that the IMS network can route the emergency session to the correct PSAP. The second purpose is for the PSAP to get more accurate or updated location information for the terminal during or after the emergency session where required by local regulation.