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**Framework for interconnection between
VoLTE-based network and other networks
supporting emergency telecommunications
service (ETS)**

ITU-T Q-series Recommendations – Supplement 69

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING, AND ASSOCIATED MEASUREMENTS AND TESTS

For further details, please refer to the list of ITU-T Recommendations.

Supplement 69 to ITU-T Q-series Recommendations

Framework for interconnection between VoLTE-based network and other networks supporting emergency telecommunications service (ETS)

Summary

Supplement 69 to ITU-T Q-series Recommendations specifies the framework for interconnection between VoLTE-based network and other networks supporting emergency telecommunications service (ETS).

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Framework for interconnection between VoLTE-based network and other networks supporting emergency telecommunications service (ETS)

1 Scope

This Supplement to the Q-series Recommendations identifies and discusses the scenarios, framework and signalling requirements for interconnection between VoLTE-based network and other networks supporting emergency telecommunications service (ETS).

2 References

[ITU-T E.107]	Recommendation ITU-T E.107 (2007), *Emergency Telecommunications Service (ETS) and interconnection framework for national implementations of ETS.*
[ITU-T Q.763]	Recommendation ITU-T Q.763 (1999), *Signalling System No. 7 – ISDN User Part formats and codes.*
[ITU-T Q.1912.5]	Recommendation ITU-T Q.1912.5 (2018), *Interworking between session initiation protocol (SIP) and bearer independent call control protocol or ISDN user part.*
[ITU-T Q-Sup.63]	ITU-T Q-series Recommendations – Supplement 63 (2013), *Signalling protocol mappings in support of the Emergency Telecommunications Service in IP networks.*
[ITU-T Y.2012]	Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of next generation networks.*
[ITU-T Y.2271]	Recommendation ITU-T Y.2271 (2006), *Call server based PSTN/ISDN emulation.*
[ETSI TS 123 167]	ETSI TS 123 167 V14.5.0 (2017), *Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS) emergency sessions.*
[IETF RFC 3261]	IETF RFC 3261 (2002), *SIP: Session Initiation Protocol.* https://www.ietf.org/rfc/rfc3261.txt

3 Definitions

3.1 Terms defined elsewhere

This Supplement uses the following term defined elsewhere:

3.1.1 emergency telecommunications service (ETS) [ITU-T E.107]: A national service providing priority telecommunications to ETS authorized users in times of disaster and emergencies.

3.2 Terms defined in this Supplement

This Supplement defines the following terms:

3.2.1 IMS SIP: Session initiation protocol (SIP) supporting the extension header fields for IP multimedia core network subsystem (IMS).

3.2.2 PES SIP: Session initiation protocol (SIP) used in call server-based PSTN/ISDN emulation service component (CS-PES) without supporting the extension header fields for IMS.

4　Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

CS-PES　　　　Call Server-based PSTN/ISDN Emulation Service component

E-CSCF　　　　Emergency Call Session Control Function

ETS　　　　　Emergency Telecommunications Service

IEPS　　　　　International Emergency Preference Scheme

IMS　　　　　IP Multimedia Subsystem

IMS SIP　　　　IP Multimedia Subsystem Session Initiation Protocol

ISDN　　　　　Integrated Services Digital Network

ISUP　　　　　ISDN User Part

LTE　　　　　Long Term Evolution

MGC-FE　　　　Media Gateway Control Functional Entity

MPS　　　　　Multimedia Priority Service

PES SIP　　　　PSTN/ISDN Emulation Service component Session Initiation Protocol

PLMN　　　　　Public Land Mobile Network

P-CSC-FE　　　　Proxy Call Session Control Functional Entity

PSTN　　　　　Public Switched Telephone Network

RPH　　　　　Resource Priority Header

SIP-I　　　　　SIP with encapsulated ISUP

UE　　　　　User Equipment

VoLTE　　　　Voice over LTE

5　Conventions

This Supplement uses the term "ETS" according to [ITU-T E.107]. When the term "ETS" is used in this Supplement, it also means other authority-to-authority priority services that may be using terminology other than ETS such as international emergency preference scheme (IEPS), multimedia priority service (MPS), etc.

6　Scenarios in terms of interconnection supporting ETS

6.1　Emergency centres connected to CS-PES

Figure 1 shows an e2e scenario in which the emergency centres are connected to a call server-based PSTN/ISDN emulation service component (CS-PES).

In this scenario, when a VoLTE user equipment (UE) initiates an emergency session request, both the media gateway control functional entity (MGC-FE) and the CS-PES are responsible for the ETS-related signalling mapping functions. The MGC-FE provides the ETS-related signalling mapping functions from IP multimedia subsystem session initiation protocol (IMS SIP) to PSTN/ISDN emulation service component session initiation protocol (PES SIP). The CS-PES provides ETS-related signalling mapping functions from PES SIP to the ISDN user part (ISUP) and forwards the session request to the emergency centre.
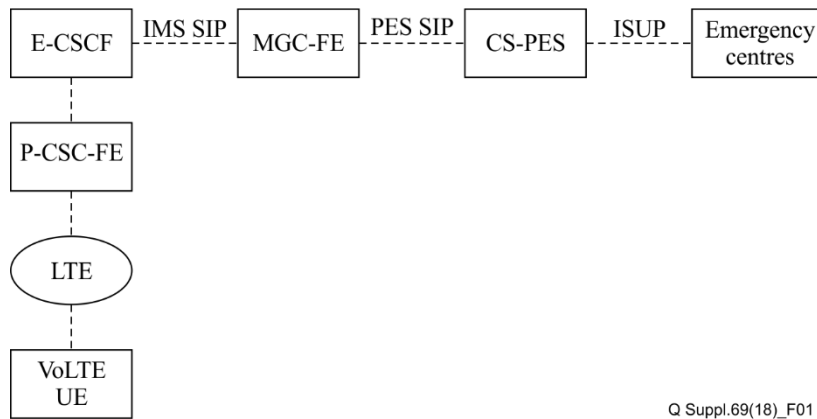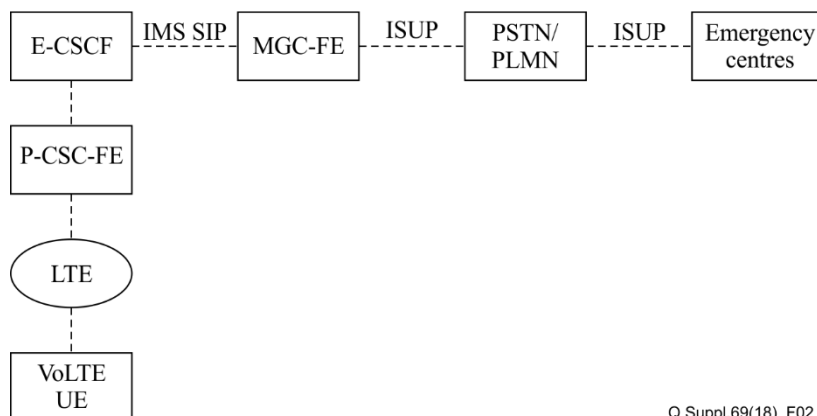
Figure 1 – e2e emergency centres connected to CS-PES

6.2   Emergency centres connected to PSTN/PLMN interconnecting with IMS

Figure 2 depicts an e2e scenario in which the emergency centres are connected to the PSTN/PLMN that interconnects directly with IP multimedia subsystem (IMS).

In this scenario, when a VoLTE UE initiates an emergency session request, the MGC-FE provides the ETS-related signalling mapping functions from IMS SIP to ISUP and forwards the session request to the emergency centre.

Figure 2 – Emergency centres connected to PSTN/PLMN interconnecting with IMS

6.3   Emergency centres connected to PSTN/PLMN interconnecting with IMS via CS-PESs

Figure 3 presents an e2e scenario in which the emergency centres are connected to the PSTN/PLMN that interconnects with IMS via the CS-PESs. When more than one CS-PES are involved in this scenario, SIP-I protocol is used between two CS-PESs.

In this scenario, when a VoLTE UE initiates an emergency session request, the MGC-FE provides the ETS-related signalling mapping functions from IMS SIP to PES SIP. The CS-PES1 provides the ETS-related signalling mapping functions from PES SIP to SIP-I. The CS-PES2 provides the ETS-related signalling mapping functions from SIP-I to ISUP.
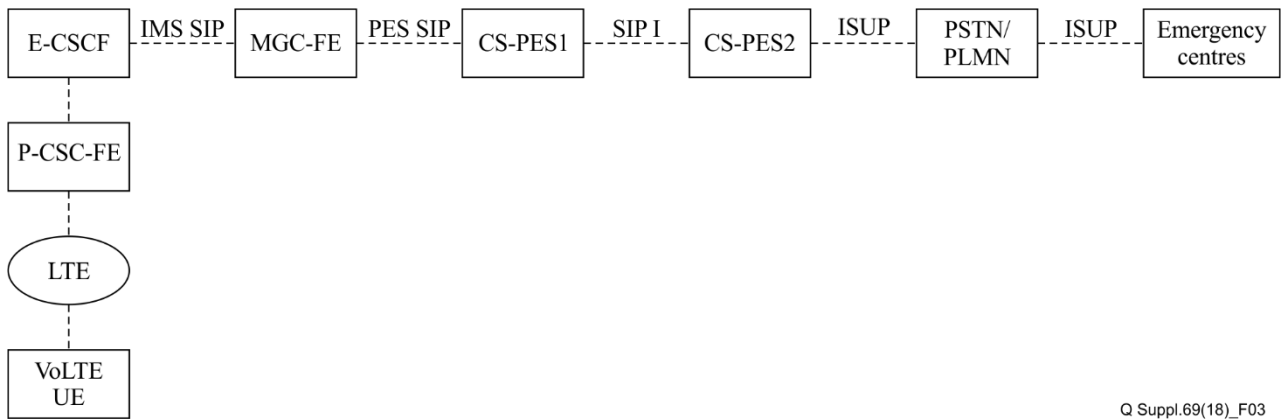
Figure 3 – Emergency centres connected to PSTN/PLMN interconnecting with IMS via CS-PESs
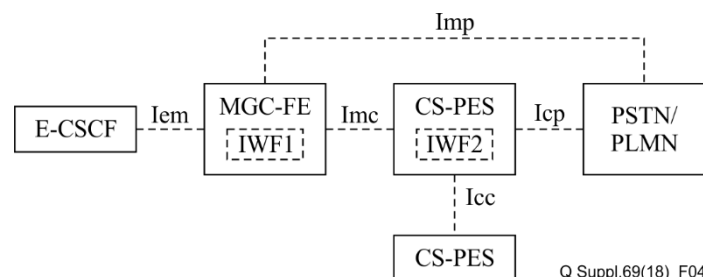
7 Interconnection framework supporting ETS

Figure 4 shows the interconnection framework supporting ETS. There are some additional functional requirements for the following functional entities:

– The MGC-FE contains an interconnection functional block IWF1, which provides the ETS-related signalling mapping functions from IMS SIP to PES SIP and from IMS SIP to ISUP as well. Other functions of the MGC-FE refer to [ITU-T Y.2012].

– The CS-PES provides an interconnection functional block IWF2, which supports the ETS-related signalling mapping functions from PES SIP to SIP-I and from PES SIP to ISUP as well. Other functions of CS-PES refer to [ITU-T Y.2271].

– The emergency call session control function (E-CSCF) handles the ETS-related signalling parameters of the emergency session, which refer to [ETSI TS 123.167].

The following interfaces are involved in the interconnection framework supporting ETS:

– The interface Iem is between E-CSCF and MGC-FE. IMS SIP that supports the ETS-related header fields is used in this interface.

– The interface Imc is between MGC-FE and CS-PES. PES SIP is used in this interface.

– The interface Icp is between CS-PES and PSTN/PLMN. ISUP is used in this interface.

– The interface Imp is between MGC-FE and PSTN/PLMN. ISUP is used in this interface.

– The interface Icc is between two CS-PES. SIP-I is used in this interface.

Figure 4 – Interconnection framework supporting ETS

8 Signalling requirements for interconnection of VoLTE-based network and other networks

The resource priority header (RPH) or Priority header field contained in an initial INVITE request is used to indicate an emergency session in IMS. When a RPH header field is used to indicate an emergency session, the signalling requirements for interconnection of VoLTE-based network and other networks refer to [ITU-T Q-Sup.63].

When a Priority header field is used to indicate an emergency session, the interconnection of VoLTE-based network and other networks supporting ETS supports the following signalling requirements:

−   The interface Iem supports IETF RFC 3261 and extension header fields for IMS.

−   The interface Imc supports IETF RFC 3261.

−   The interface Icp and Imp support ITU-T Q.763.

−   The interface Icc supports ITU-T Q.1912.5 and ITU-T Q.763.

In support of ETS, the functional entities involved in the interconnection framework supports the following additional functions:

1)   E-CSCF

When E-CSCF receives an INVITE request of an emergency session, it inserts a Priority header field with the value Emergency before forwarding the INVITE request to the MGC-FE.

2)   MGC-FE

When MGC-FE receives an INVITE request that contains a Priority header field with the value Emergency, MGC-FE handles the emergency session with priority.

For interconnection between the IMS and CS-PES, the IWF1 within a MGC-FE is responsible for the protocol mapping between IMS SIP and PES SIP. When IWF1 receives an emergency session request of IMS SIP and the serving Emergency centre is located in CS-PES, IWF1 maps the request to PES SIP and insert a Priority header field with value Emergency before forwarding the request to CS-PES.

For interconnection between the IMS and PSTN/PLMN, the IWF1 within a MGC-FE is responsible for the protocol mapping between IMS SIP and ISUP. When IWF1 receives an emergency session request of IMS SIP and the serving Emergency centre is located in PSTN/PLMN, the IWF1 maps the request to ISUP and inserts a MLPP precedence parameter with precedence level "0011" in message IAM before forwarding it to PSTN/PLMN. If all ISUP circuits of an outgoing route for the emergency session request are occupied, the MGC-FE terminates a normal session and use the released ISUP circuit to establish the emergency session.

3)   CS-PES

When CS-PES receives an INVITE request of PES SIP containing a Priority header field with the value Emergency, CS-PES processes the request with priority.

For interconnection between the CS-PES and PSTN/PLMN, the IWF2 within a CS-PES is responsible for the protocol mapping between PES SIP and ISUP. When IWF2 receives an emergency request of PES SIP and the serving Emergency centre is located in PSTN/PLMN, the IWF2 maps the request to ISUP and insert a MLPP precedence parameter with precedence level "0011" in message IAM before forwarding it to PSTN/PLMN. If all ISUP circuits of an outgoing route for an emergency session request are occupied, CS-PES terminates a normal session and uses the released ISUP circuit to establish the emergency session.

For interconnection between two CS-PES domains, the IWF2 within a CS-PES is responsible for the protocol mapping between PES SIP and SIP-I. When IWF2 receives an emergency request of PES SIP and the emergency centre is located in another CS-PES domain, the IWF2 inserts a MLPP

precedence parameter with precedence level "0011" in message IAM enclosed in the INVITE request of SIP-I before forwarding it to another CS-PES domain with the serving emergency centre.

4)   PSTN/PLMN

PSTN/PLMN supports MLPP precedence parameter defined in [ITU-T Q.763]. If all ISUP circuits of an outgoing route for the emergency session request are occupied, PSTN/PLMN transit exchanges terminate a normal session and use the released circuit to establish the emergency session.

9   Security considerations

The security requirements of the SIP related protocols including IMS SIP, PES SIP and SIP-I refer to [IETF RFC 3261].There is no additional security requirement in support of ETS interconnection.

Bibliography

[b-ITU-T E.106]   Recommendation ITU-T E.106 (2003), *International Emergency Preference Scheme (IEPS) for disaster relief operations*.

[b-ITU-T Q.767]   Recommendation ITU-T Q.767 (1991), *Application of the ISDN User Part of CCITT signalling system No. 7 for international ISDN interconnections*.

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