

I n t e r n a t i o n a l T e l e c o m m u n i c a t i o n U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Series Q
Supplement 70
(06/2019)

SERIES Q: SWITCHING AND SIGNALLING, AND
ASSOCIATED MEASUREMENTS AND TESTS

**Signalling requirements for IMS and GSM/UMTS
network supporting multi-device emergency
telecommunications service**

ITU-T Q-series Recommendations – Supplement 70



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| | |
|--|---------------|
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| TESTING SPECIFICATIONS | Q.3900–Q.4099 |
| SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2020 | Q.5000–Q.5049 |
| COMBATING COUNTERFEITING AND STOLEN ICT DEVICES | Q.5050–Q.5069 |

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Supplement 70 to ITU-T Q-series Recommendations

Signalling requirements for IMS and GSM/UMTS network supporting multi-device emergency telecommunications service

Summary

Supplement 70 to ITU-T Q-series Recommendations specifies the signalling requirements for IP multimedia system (IMS) and GSM/UMTS network supporting multi-device emergency telecommunications service (ETS).

History

| Edition | Recommendation | Approval | Study Group | Unique ID* |
|---------|-------------------|------------|-------------|---|
| 1.0 | ITU-T Q Suppl. 70 | 2019-06-26 | 11 | 11.1002/1000/13981 |

Keywords

Emergency telecommunications service, IMS, multi-device service.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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Table of Contents

| | Page |
|---|-------------|
| 1 Scope..... | 1 |
| 2 References..... | 1 |
| 3 Definitions | 1 |
| 3.1 Terms defined elsewhere | 1 |
| 3.2 Terms defined in this Supplement | 2 |
| 4 Abbreviations and acronyms | 2 |
| 5 Conventions | 3 |
| 6 General aspects of multi-device services..... | 3 |
| 6.1 Description of the multi-device service..... | 3 |
| 6.2 Scenarios of multi-device service..... | 3 |
| 7 General requirements of multi-device ETS | 4 |
| 8 Signalling requirements for IMS and GSM/UMTS network | 4 |
| 8.1 CS connected multi-device emergency call anchored to IMS..... | 4 |
| 8.2 IMS connected multi-device emergency call | 5 |
| Bibliography..... | 7 |

Supplement 70 to ITU-T Q-series Recommendations

Signalling requirements for IMS and GSM/UMTS network supporting multi-device emergency telecommunications service

1 Scope

This Supplement to the Q-series of Recommendations identifies and discusses signalling requirements for IP multimedia system (IMS) and GSM/UMTS network supporting multi-device emergency telecommunications service (ETS).

The scope of this Supplement includes:

- Multi-device ETS scenarios of IMS and GSM/UMTS networks.
- General requirements of multi-device ETS.
- Signalling requirements of multi-device 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*.
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- [ETSI TS 124 229] ETSI TS 124 229 V15.0.0 (2017), *IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*.
- [ETSI TS 129 163] ETSI TS 129 163 V14.0.0 (2016), *Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks*.

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 multi-device service: A service providing the ability to map a phone number, usually the number of a mobile phone, to multiple devices. All devices of a multi-device service share a single phone number for communication services (i.e., voice calls, SMS, etc.). Any underlying phone number used by individual devices should not be exposed to the user.

3.2.2 multi-device service user: A user who subscribes to the multi-device service. The user may have multiple devices including one primary device and several secondary devices.

3.2.3 primary device: A device with a phone number which could be used as the primary phone number of a multi-device service user.

3.2.4 primary phone number: A single phone number presented by all of the devices of a multi-device service user for communication services (i.e., voice calls, SMS, etc.), which is the phone number of the primary device.

3.2.5 secondary device: A device that is combined with the primary device for a multi-device service user, which presents the primary phone number for communication services (i.e., voice calls, SMS, etc.).

3.2.6 secondary phone number: The phone number of the secondary device which is not exposed to the user and is used for authentication.

3.2.7 secondary device tag: A tag inserted in the initial emergency call request by a secondary device.

4 Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

| | |
|--------|---|
| AS | Application Server |
| CS | Circuit Switched |
| EC | Emergency Centre |
| E-CSCF | Emergency Call Session Control Function |
| ETS | Emergency Telecommunications Service |
| GSM | Global System for Mobile communication |
| I-CSCF | Interrogating Call Session Control Function |
| iFC | Initial Filter Criteria |
| IMS | IP Multimedia System |
| ISDN | Integrated Service Digital Network |
| LTE | Long Term Evolution |
| MGCF | Media Gateway Control Function |
| MSC | Mobile services Switching Centre |
| MSISDN | Mobile Subscriber International ISDN number |
| P-CSCF | Proxy Call Session Control Function |
| S-CSCF | Serving Call Session Control Function |
| UE | User Equipment |

| | |
|-------|--|
| UICC | Universal Integrated Circuit Card |
| UMTS | Universal Mobile Telecommunications System |
| VoLTE | Voice over LTE |
| VoIP | Voice over IP |

5 Conventions

None.

6 General aspects of multi-device services

6.1 Description of the multi-device service

Multi-device service refers to the mapping of a phone number, usually the number of a mobile phone, to multiple devices. All devices of one multi-device service user share a single phone number which is known as the primary phone number, correspondingly the mobile phone with the primary phone number is known as the primary device. Other devices in the group are known as the secondary devices. The secondary devices can also have individual phone numbers which are known as the secondary phone numbers that would not be exposed to the other users.

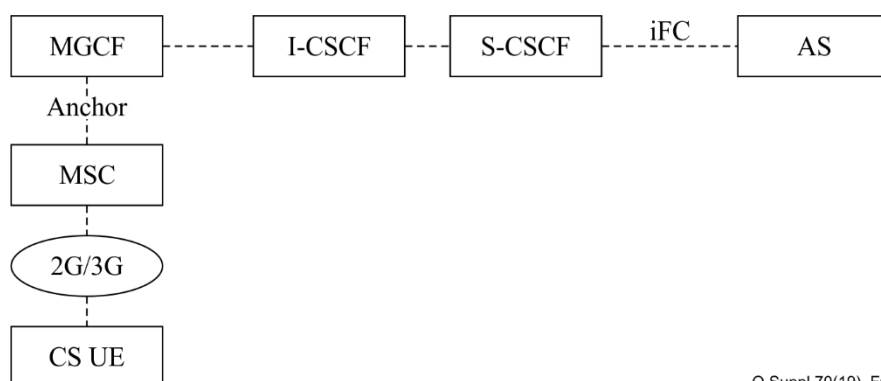
To implement this multi-device service function, the network needs to map the primary phone number to the secondary devices and to ensure that the services (i.e., voice calls, SMS, etc.) provisioned for the primary phone number should also be available for all the secondary devices of a same multi-device service user.

6.2 Scenarios of multi-device service

NOTE – The term user equipment (UE) used here represents devices where it is irrelevant whether the device is a primary device or a secondary device.

Considering the various kinds of access technologies, there are several scenarios to implement a number mapping function for a multi-device service based on IMS.

Scenario 1: Circuit switched (CS) UE attaches to GSM/UMTS network and follows the circuit-based call procedures according to [ETSI TS 122 003], with number mapping function implemented by a specific application server (AS) in an IMS network, which means the UE call should be anchored to the IMS network according to [ETSI TS 123 292].



Q Suppl.70(19)_F01

Figure 1 – CS connected ETS anchored to IMS

Scenario 2: Voice over LTE (VoLTE) UE attaches to a long term evolution (LTE) network and registers in an IMS and follows the VoLTE-based call procedures according to [ETSI TS 124 229], with the number mapping function implemented by the IMS network directly.

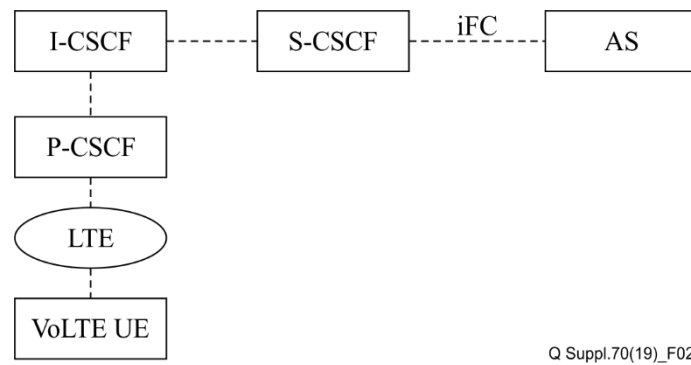


Figure 2 – LTE connected ETS based on IMS

Scenario 3: Voice over IP (VoIP) UE registers in an IMS through an Internet connection and follows the IMS-based call procedures according to [ETSI TS 124 229], with the number mapping function implemented by the IMS network directly.

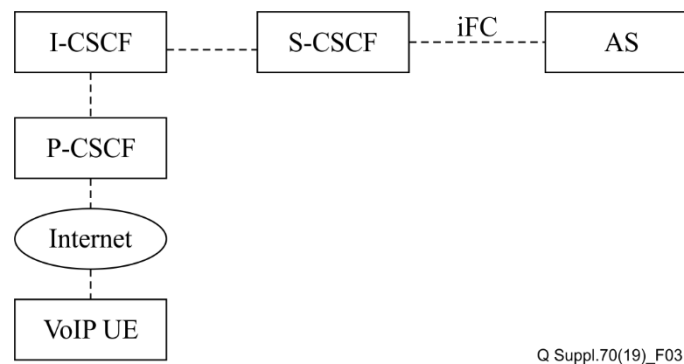


Figure 3 – IP connected ETS based on IMS

7 General requirements of multi-device ETS

The device and the network support emergency services in the CS domain or the IMS domain according to the access technologies. Emergency telecommunication service is a regulatory service which is not affected by multi-device service. For information on the functional requirements of ETS refer to [b-ITU-T Q-Sup.57].

The user of a multi-device service could initiate the emergency call with a primary device or a secondary device. For the emergency call of the secondary device, the secondary phone number could not be exposed to the user and emergency centre (EC). The network maps the secondary phone number to primary phone number for multi-device ETS.

When initiating an emergency call, the device conforms to the requirements of location [ETSI TS 122 071]. If the location is required by the national regulations, the secondary device must convey the actual location information in the ETS request.

8 Signalling requirements for IMS and GSM/UMTS network

8.1 CS connected multi-device emergency call anchored to IMS

8.1.1 Signalling procedures for multi-device emergency calls

When a mobile services switching centre (MSC) receives an initial emergency call request from a primary device, it handles it according to [ETSI TS 122 003].

When the MSC receives an initial emergency call request from a secondary device, it forwards the call request to a media gateway control function (MGCF) according to the anchor process defined in [ETSI TS 123 292]. MGCF forwards the call to a serving call session control function (S-CSCF). According to the initial filter criteria (iFC) of the user profile, the S-CSCF forwards the call request to the AS serving the multi-device service. The AS sends the call request back to S-CSCF by replacing the calling party identification with the primary phone number. S-CSCF forwards the call request to the MSC through MGCF. When the MSC receives the emergency call request from MGCF, it handles the emergency call request and forwards it to an appropriate emergency centre (EC).

Figure 4 shows the procedure for an emergency call initiated by a secondary device anchored to IMS.

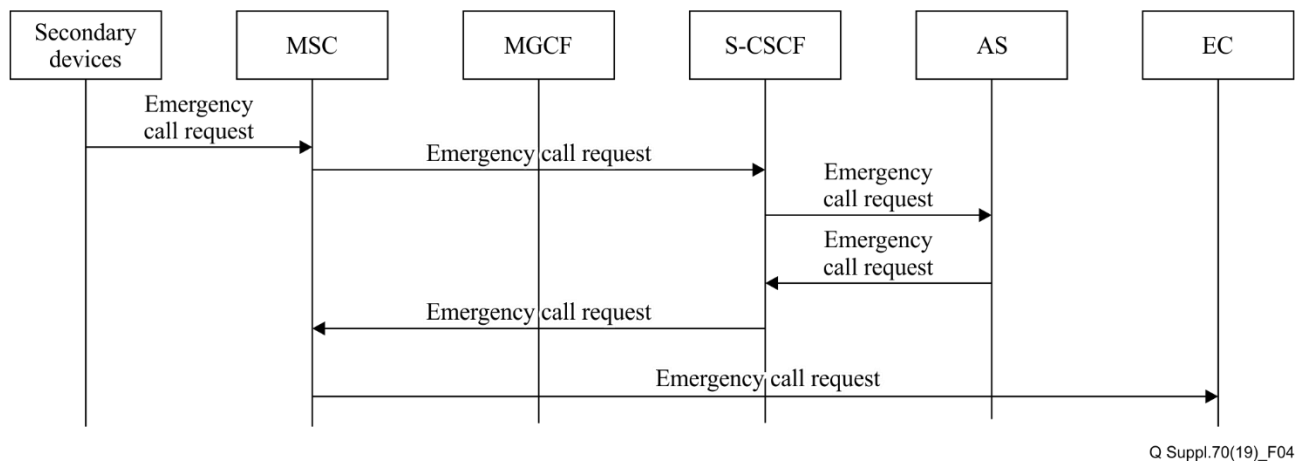


Figure 4 – Procedure for emergency call initiated by a secondary device anchored to IMS

8.1.2 Signalling requirements for multi-device emergency calls

a) Signalling requirements for the device:

When a secondary device initiates an emergency call, it contains a secondary device tag in the initial emergency call request.

There is no additional requirement for the primary device.

b) Signalling requirements for MSC:

MSC implements the anchor process according to [ETSI TS 123 078], and forwards the emergency call request to MGCF according to [ETSI TS 129 163]. When receiving an emergency call request from MGCF, MSC handles the emergency call request and forwards it to an appropriate EC.

c) Signalling requirements for S-CSCF:

When a priority header field with the value Emergency is received in an initial emergency call request, S-CSCF forwards the call request to MGCF after service triggering

d) Signalling requirements for AS providing the multi-device service:

When receiving the emergency call request initiated by a secondary device, the AS replaces the calling party identification with the primary phone number.

8.2 IMS connected multi-device emergency call

8.2.1 Signalling procedures for multi-device emergency call

For LTE and IP connected ETS based on IMS scenarios, signaling procedures for multi-device emergency call in IMS network are similar.

When a proxy call session control function (P-CSCF) receives an initial emergency call request from a primary device, it forwards the call request to an emergency call session control function (E-CSCF) directly according to [ETSI TS 123 167].

When a P-CSCF receives an initial emergency call request from a secondary device, the P-CSCF forwards the call request to an S-CSCF serving for the secondary device instead of forwarding it to E-CSCF directly. According to the iFC of the user profile, the S-CSCF forwards the call request to an AS which provides the multi-device service. The AS sends the call request back to S-CSCF by replacing the calling party identification with the primary phone number. The S-CSCF forwards the call request to an E-CSCF.

E-CSCF handles the emergency call request and forwards it to an appropriate EC.

Figure 5 shows the procedure for emergency call initiated by a secondary device connecting to IMS.

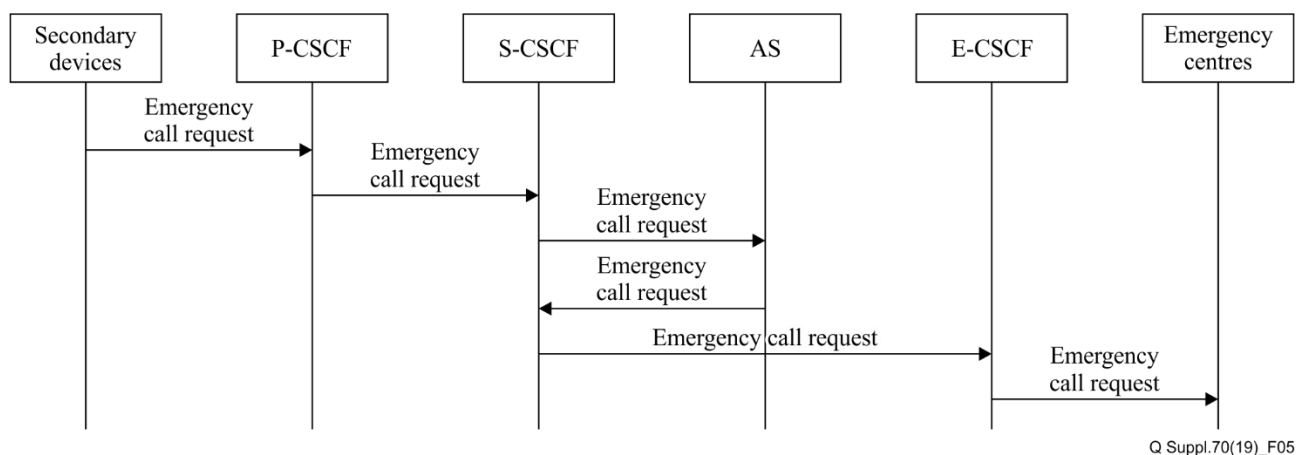


Figure 5 – Procedure for emergency call initiated by a secondary device connecting to IMS

8.2.2 Signalling requirements for multi-device emergency call

- a) Signalling requirements for the device:
When a secondary device initiates an emergency call, it contains a secondary device tag in the initial emergency call request.
There is no additional requirement for the primary device.
- b) Signalling requirements for P-CSCF:
When the secondary device tag is received in an initial emergency call request, P-CSCF forwards the call request to S-CSCF instead of forwarding it to E-CSCF.
- c) Signalling requirements for S-CSCF:
When priority header field with the value Emergency is received in an initial emergency call request, S-CSCF forwards the call request to E-CSCF after service triggering.
- d) Signalling requirements for AS providing the multi-device service:
When receiving the emergency call request initiated by a secondary device, the AS replaces the calling party identification with the primary phone number.
- e) Signalling requirements for E-CSCF:
No additional requirements for E-CSCF in support of multi-device emergency call.

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telecommunications service (ETS) in IP networks.*

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