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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Mobile Standards Group (MSG).

Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document defines Interoperability Test Descriptions for the eCall High Level Application (HLAP) protocol.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 122 101: "Universal Mobile Telecommunications System (UMTS); LTE; Service aspects; Service principles (3GPP TS 22.101)".
- [2] ETSI TS 124 008: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (3GPP TS 24.0080)".
- [3] CEN EN 15722:2015: "Road transport and traffic telematics - eSafety - eCall Minimum Set of Data".
- [4] CEN EN 16062:2015 : "Intelligent Transport Systems - eSafety - eCall High Level Application Requirements (HLAP) Using GSM/UMTS Circuit Switched Networks".
- [5] CEN EN 16072:2015: "Intelligent transport systems - eSafety - Pan European eCall - Operating requirements".
- [6] ETSI TS 134 123-1: "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification (3GPP TS 34.123-1)".
- [7] ETSI TS 151 010-1: "Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 1: Conformance specification (3GPP TS 51.010-1)".
- [8] ETSI TS 122 003: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Circuit Teleservices supported by a Public Land Mobile Network (PLMN) (3GPP TS 22.003)".
- [9] ETSI TS 102 936-1: "eCall Network Access Device (NAD) conformance specification; Part 1: Protocol test specification".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI ETR 266: "Methods for Testing and Specification (MTS); Test Purpose style guide".
- [i.2] CEN EN 16062:2011: "Intelligent Transport Systems - eSafety - eCall - High Level Application Requirements (HLAP)".
- [i.3] ETSI EG 202 798 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

3 Definitions and abbreviations

3.1 Definitions

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

base specification: specification of a protocol, telecommunication service, interface, abstract syntax, encoding rules, or information object

eCall: manually or automatically initiated emergency call, (TS12) from a vehicle, supplemented with a minimum set of emergency related data (MSD), as defined under the EU Commission's eSafety initiative

implementation: instance of the reference specification for which conformity to that reference specification is claimed

IVS configured for eCall only service (restricted): eCall capable IVS that is not subscribed to other non-emergency services

NOTE: The IVS is not permitted to register on a PLMN except for the purpose of making an eCall, or a test/reconfiguration call to a designated non-emergency number, in accordance with ETSI TS 122 101 [1]. Following power-up the IVS may perform a PLMN search and maintain a list of available networks upon which to register, when an eCall or test / reconfiguration call is activated. Following an eCall or test / reconfiguration call, the IVS de-registers from the serving network within 12 hours.

IVS configured for eCall and other services (unrestricted): eCall capable IVS that has valid subscriptions to access other non-emergency services

NOTE: The IVS may register on a PLMN at anytime and may remain registered on a serving network indefinitely.

Minimum Set of Data (MSD): data component of an eCall sent from a vehicle to a Public Safety Answering Point or other designated emergency call centre

NOTE: The MSD has a maximum size of 140 bytes and includes, for example, vehicle identity, location information and time-stamp.

PSAP eCall Modem-server: PSAP equipment used to receive, validate and acknowledge the MSD sent from an IVS, to manage the voice call transfer to the PSAP operator and to facilitate call-back to the vehicle

NOTE: The eCall modem-server may also support other functions.

PSAP Pull mode: mode in which the PSAP is configured to immediately transmit the SEND-MSD (START) message without waiting for the INITIATION message send by the IVS

PSAP Push mode: mode in which the PSAP is configured to wait for the INITIATION message send by the IVS. After reception of the INITIATION message the PSAP transmits the SEND-MSD (START) message

reference specification: standard which provides a base specification, or a set of base specifications, or a profile, or a set of profiles, and for conformance to which the ICS proforma and test specifications are written

3.2 Abbreviations

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

3GPP	Third Generation Partnership Project
AL-ACK	Application Layer Acknowledgement (also called HL-ACK)
CEN	Comité Européen de Normalisation
CFG	Configuration
CLI	Calling Line Identity
CRC	Cyclic Redundancy Check
ETSI	European Telecommunications Standards Institute
EU	European Union
EUT	Equipment Under Test
GSM	Global System of Mobile telecommunications
HLAP	High Level Application Protocol
HMI	Human Machine Interface
IE	Information Element
IFS	Interoperable Functions Statement
IFS_ID	IFS Identifier
ISDN	Integrated Services Digital Network
IVS	In Vehicle System (eCall terminal and associated sub-systems in vehicle)
LL-ACK	Link Layer ACK
MNO	Mobile Network Operator
MSD	Minimum Set of Data
NACK	Negative Acknowledgement
NAD	Network Access Device
NEC	Network Echo Cancellor
PLMN	Public Land Mobile Network
PSAP	Public Service Answering Point
SIP	Session Initiation Protocol
TD	Test Description
TS11	Telephony Speech Call
TS12	Emergency Call TeleService
UL	Uplink
UMTS	Universal Mobile Telecommunications System

4 Conventions

4.1 Interoperability test process

4.1.1 Principles

The goal of interoperability tests is to check that devices resulting from protocol implementations are able to work together and provide the functionalities provided by the protocols. As necessary, one message may be checked during a test, when a successful functional verification may result from an incorrect behaviour for instance. Detailed protocol checks are part of the conformance testing process and are thus avoided during the Interoperability tests.

The test sessions will be mainly executed between 2 devices (IVS and PSAP eCall modem-server) from different vendors.

In the present document, test description is provided to guide the test process during the test sessions.

4.1.2 The test description proforma

The test descriptions are provided in proforma tables following the format described in ETSI EG 202 798 [i.3] and ETSI ETR 266 [i.1]. The following different test events are considered during the test execution:

- A **stimulus** corresponds to an event that enforces an EUT to proceed with a specific protocol action, like sending a message for instance.

- A **verify** consists of verifying that the EUT behaves according to the expected behaviour (for instance the EUT behaviour shows that it receives the expected message).
- A **configure** corresponds to an action to modify the EUT configuration.
- A **check** ensures the receipt of protocol messages on reference points, with valid content. This "check" event type corresponds to the interoperability testing with conformance check method.

For the execution of the interoperability test sessions, the following conventions apply:

- Optional (check) tests should be performed using High Level Application Protocol (HLAP) monitor tools (see clause 'Tooling' below) and may be skipped due to time restrictions.

4.1.3 Interoperable Functions Statement

The "Interoperable Functions Statement" (IFS) identifies the standardized functions of an EUT. These functions can be mandatory, optional or conditional (depending on other functions), and depend on the role played by the EUT.

The IFS can also be used as a pro-forma by a vendor to identify the functions that its EUT will support when interoperating with corresponding functions from other vendors.

Item column

The item column contains a number which identifies the item.

Item description column

The item description column describes in free text each respective item (e.g. parameters, timers, etc.). It implicitly means "is <item description> supported by the implementation?"

IFS ID column

The IFS ID column defines an identifier for this particular IFS item. The IFS ID is in the Test Description field "Applicability" to select/deselect the execution of a test.

Status column

The following notations are used for the status column:

- | | |
|-----|---|
| m | mandatory - the capability is required to be supported. |
| o | optional - the capability may be supported or not. |
| n/a | not applicable - in the given context, it is impossible to use the capability. |
| x | prohibited (excluded) - there is a requirement not to use this capability in the given context. |
| o.i | qualified optional - for mutually exclusive or selectable options from a set. "i" is an integer which identifies an unique group of related optional items and the logic of their selection which is defined immediately following the table. |
| c.i | conditional - the requirement on the capability ("m", "o", "x" or "n/a") depends on the support of other optional or conditional items. "i" is an integer identifying an unique conditional status expression which is defined immediately following the table. |
| i | irrelevant (out-of-scope) - capability outside the scope of the reference specification. No answer is requested from the supplier. |

NOTE: This use of "i" status is not to be confused with the suffix "i" to the "o" and "c" statuses above.

Support column

The support column shall be filled in by the supplier of the implementation using the following notations:

- | | |
|--------|----------------------------------|
| Y or y | supported by the implementation. |
|--------|----------------------------------|

N or n not supported by the implementation.

N/A, n/a or - no answer required (allowed only if the status is n/a, directly or after evaluation of a conditional status).

4.2 Tooling

Message monitoring solutions, including audio recording and event logging, where supported, may be used to facilitate the resolution of any interoperability and/or performance issues that may be encountered during interoperability testing.

4.3 Test Description naming convention

Table 1: TD naming convention

TD/<root>/<mode><nn>/<gr>		
<root> = root applicability	MAN	Mandatory tests
	OPT	Optional tests
	PER	Optional performance tests
<nn> = sequential number	01 to 99	Sequential numbers
<gr> = group	IVS	eCall terminal
	PSAP	PSAP eCall modem-server
		IVS or PSAP

4.4 Test Summary

Test scenario with a detailed test description, are provided in the present document to provide guidance to the participants and to ensure consistent testing among the different test sessions and participants. The detailed test descriptions are in the clause 7. It is recommended to conduct all test cases for all technologies supported by the IVS, e.g. a dual mode GSM and UMTS IVS should conduct all tests with both technologies.

The test scenarios are split in 3 groups:

- The mandatory scenarios, which shall be executed during all test sessions, covering the mandatory features of an eCall devices (IVS or PSAP).
- The optional test scenarios, which are provided to do additional testing according to the time left during the test sessions. These scenarios are focusing either on IVS or PSAP features.
- An optional performance test scenario, similar to a real eCall service, dedicated to check some performance issues from PSAP side. These scenarios are focusing on some performance check relating to repetitive or parallel calls from different IVS or IVS simulator to the same PSAP.

The following test cases are foreseen to be executed during all interoperability test sessions, either with real IVS and PSAP, but also with testing devices simulating an IVS or a PSAP.

Table 2: Mandatory Tests

Test case ID	Summary
TD_MAN_01	MSD transmission / reception / acknowledgement with PSAP in Pull mode
TD_MAN_02	MSD transmission / reception / acknowledgement with PSAP in Push mode
TD_MAN_03	Voice communication after receipt of AL-ACK
TD_MAN_04	Retransmission of MSD on request from PSAP
TD_MAN_05	Voice communication after retransmission of MSD
TD_MAN_06	Clear-down / PSAP initiated network clear-down
TD_MAN_07	Clear-down / PSAP initiated application layer AL-ACK clear-down
TD_MAN_08	Call Back / PSAP initiated call back to IVS and re-send MSD
TD_MAN_09	PSAP correct handling of voice call in case of in-band modem resources busy or out of service
TD_MAN_10	MSD activation type indicator set to 'Automatic'
TD_MAN_11	MSD activation type indicator set to 'Manual'
TD_MAN_12	MSD call type indicator set to 'Test Call'
TD_MAN_13	Mute IVS audio during MSD transmission and un-mute after application layer acknowledgement
TD_MAN_14	Mute PSAP audio during MSD request / MSD transfer and un-mute after application layer acknowledgement
TD_MAN_15	Format of encoded and decoded MSD in accordance with CEN EN 15722 [3]
TD_MAN_16	MSD transmission following NEC disabling tone with PSAP in Pull mode
TD_MAN_17	MSD transmission following NEC disabling tone with PSAP in Push mode

Table 3: Optional Tests

Test case ID	Summary
TD_OPT_01_IVS	Auto redial following busy during call set-up
TD_OPT_02_IVS	Auto redial following no-answer during call set-up
TD_OPT_03_IVS	IVS configured for eCall 'only' service (restricted)
TD_OPT_04_PSAP	Un-mute PSAP audio when Initiation Signal not received within 5 seconds (T4 expired)
TD_OPT_05_PSAP	PSAP handling of more than 1 eCall simultaneously
TD_OPT_06_PSAP	PSAP correct MSD additional data decoding
NOTE:	Optional tests verify the behaviour of the IVS and PSAP individually and may be used to help identify the cause of interoperability failures.

Table 4: Performance Tests

Test case ID	Summary
TD_PER_01_PSAP	PSAP handling a number of parallel random eCalls from different IVS
NOTE:	These optional performance tests are intended to simulate a real situation and will not be performed inside of a single test session between two vendors but on a dedicated time schedules where any single PSAP will be called from a certain number of IVS (e.g. 5) or from a multi IVS simulator (if available).

5 Test Bed Architecture

5.1 Test site layout

The generic test bed used to carry out interoperability tests, is summarized in the figure 1. In normal operation conditions, the IVS calls the 112 called party number and shall set the Emergency Category IE of the Emergency Setup message as defined in table 10.5.135d of ETSI TS 124 008 [2]. This call setting is then interpreted by the mobile network as a requirement to connect the IVS with the most appropriate PSAP, able to handle pan EU eCalls, accordingly to CEN EN 16062:2015 [4].

However, during an eCall interoperability event, IVS will need to be connected to given PSAP in order to carry out pairing test sessions, following the test scenario provided in the present document. The selection of the PSAP is therefore achieved by the use of the called party number, corresponding to the access where the PSAP is connected (ISDN or SIP trunk).