CEN/TC 278

Date: 2009-06

TC 278 WI

CEN/TC 278

Secretariat: NEN

Intelligent transport systems — ESafety — ECall High level application protocols

Strassenverkehrstelematic — ESafety — ECall

Systems de transporte intelligente — E-Safety — ECall

ICS:

Descriptors:

Document type: European Standard
Document subtype:
Document stage: Working Document
Document language: E

HLAP 090610

Contents

Page

Foreword 5
Introduction 5
1 Scope 5
2 Conformance 6
3 Normative references 7
4 Terms and definitions 9
5 Symbols and abbreviations 11
6 General overview of the eCall transaction 14
7 Requirements 18
7.1 Procedures following power-up of the in-vehicle system 18
7.1.1 Enabled IVS 18
7.1.2 Enabled PSAP 18
7.1.3 IVS configured only for eCall 19
7.1.4 Self test 19
7.1.5 Standby mode applicable to IVS configured for eCall only 20
7.2 Activation 20
7.2.1 Activation of Pan European eCall 20
7.2.2 Activation of a test eCall 20
7.3 Call set-up 21
7.3.1 IVS network access device (NAD) already registered on PLMN 21
7.3.2 eCall in progress 21
7.3.3 Network selection and registration 21
7.3.4 Authentication of the subscriber 21
7.3.5 eCall establishment 21
7.3.6 Cell localisation (by network) 22
7.3.7 Manual termination of eCall by vehicle occupants 22
7.4 MSD transfer 22
7.4.1 Send initiation signal from IVS eCall modem to PSAP 23
7.4.2 eCall Modem synchronisation 23
7.4.3 Request MSD by PSAP eCall modem to IVS eCall modem 23
7.4.4 Send MSD from vehicle IVS to PSAP eCall modem 24
7.4.5 Link layer error check 24
7.4.6 Link layer ACK from PSAP eCall modem to IVS eCall modem 24
7.5 Application layer acknowledgement (AL- ACK) 24
7.5.1 Following transmission of the MSD to the eCall PSAP application 24
7.5.2 PSAP acknowledges the MSD 24
7.5.3 No receipt of application layer ACK 25
7.5.4 PSAP requests a new MSD 25
7.5.5 PSAP clears down the call 25
7.5.6 Form of presentation of the AL-ACK 25
7.6 Request 'Send MSD' 26
7.6.1 Before call clear-down 27
7.6.2 After call clear-down 27
7.7 PSAP application features 28
7.7.1 General requirements 28
7.7.2 MSD display to the PSAP operator 28
7.7.3 MSD validation/PSAP operator user interface 28
7.8 Check audio link to vehicle occupants 29

7.9 Call clear-down 29
7.10 PSAP call back 29
7.11 Rerouting to another PSAP 30
7.12 Handling non equipped situations / error cases 30
7.12.1 MSD not transmitted correctly 30
7.12.2 False generation of eCalls 30
7.12.3 Network registration fails 31
7.12.4 Call failure 31
7.12.5 Mobile network not capable to support eCall flag 31
7.12.6 eCall routed to a non equipped PSAP 32
7.12.7 PSAP modem failure 32
7.12.8 PSAP network/ICT failure 32
7.12.9 PSAP application failure 32
7.12.10 PSAP Operator does not respond 32
7.12.11 MSD not sent 33
7.12.12 MSD not received 33
7.12.13 Audio link not established 33
7.12.14 Audio link established but subsequently fails 33
7.12.15 Re-attempt in case of interrupted call 34
7.12.16 Automatic repeat attempts 34
7.12.17 IVS NAD does not receive clear-down 34
7.12.18 IVS NAD configured for eCalls only 34

8 Third party support for eCall 34
8.1 Overview 34
8.2 Principles of TPS-eCall data transmission 35
8.2.1 Push of TSD to PSAP 35
8.3 Reception of TPS eCall by the TPSP 36
8.4 Qualification (filtering) of the TPS eCall by the TPSP operator 36
8.5 Sending the TSD data to the PSAP 36
8.6 Link layer ACK to the TPSP 36
8.7 Application layer ACK from PSAP to TPSP 37
8.8 Establishing voice link between PSAP operator and vehicle occupants 37
8.9 Request Send TSD 37
8.10 Call clear-down 37

9 Defences against attack 37
9.1 Call line security 37
9.2 Hoax calls 38
9.3 Denial of service attack 38
9.4 Malicious attack on PSAP 38

10 Quality of service requirements 38

11 Test and conformance requirements 39
11.1 Test and conformance requirements for the IVS 40
11.1.1 Selection of conformance points for the IVS 40
11.1.2 Test purpose for the IVS 41
11.1.3 Conformance requirements catalogue for the IVS 42
11.2 Test and conformance requirements for the PSAP equipment 44
11.2.1 Selection of conformance points for the PSAP equipment 44
11.2.2 Test purpose for the PSAP equipment 45
11.2.3 Conformance requirements catalogue for the PSAP equipment 46

12 Marking, labelling and packaging 47

Annex A (normative) Table of timings 48

Annex B (informative) Summary abstracts of normative referenced documents 50

Annex C (informative) Test system strategies 61
C.1 General 61
C.2 Vehicle and PSAP equipment life cycle 61

C.3 Laboratory environment 63
C.4 OEM or third party test systems 63

Bibliography 65

Foreword

This document (TC 278 WI) has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematics”, the secretariat of which is held by NEN.

This document is a working document.

NOTE: Values shown in red to be confirmed/debated by WG15. This deliverable provides the sequence and the recommended time according to best information available to HLAP PT. However the times should be decided within WG15 after adoption of the deliverable.

Introduction

An 'eCall' is an emergency call generated either automatically via activation of in-vehicle sensors or manually by the vehicle occupants; when activated, to provide notification and relevant location information to the most appropriate 'Public Safety Answering Point's (PSAP), by means of *mobile wireless communications networks* and carries a defined standardised *Minimum Set of Data*, notifying that there has been an incident that requires response from the emergency services and establishes a voice channel between the occupants of the vehicle and the most appropriate 'PSAP'.

EN 15722 specifies a standardized 'Minimum set of Data' for eCall, and EN XXXXX specifies 'Pan European eCall- Operating requirements'. (for third party systems EN XXXXX specifies 'Third party services supporting eCall -Operating requirements').

The operating requirements for Pan European eCall are made using 'Public Land Mobile Networks'(PLMN) (such as GSM and 3G), as specified in a number of ETSI standards and technical specifications.

In order to provide the eCall service across a wireless network, high level application protocols are required as an important essential element to effect this service provision. This European Standard specifies the protocols to put into effect the 'Pan European eCall- Operating requirements' using PLMNs, and also identifies common elements that can be used in the link between third party services supporting eCall and 'Public Safety Answering Points'.

1 Scope

In respect of 'Pan European' eCall (operating requirements defined in EC xxxxxxx Intelligent transport systems- eCall- Pan European eCall operating requirements), this European Standard defines the high level application protocols, procedures and processes required to provide the eCall service using a TS12 emergency call over a mobile communications network.

The objective of implementing the pan-European in-vehicle emergency call system (eCall) is to automate the notification of a traffic accident, wherever in Europe, with the same technical standards and the same quality of services objectives by using a mobile telecommunication network (e.g. GSM) which supports the European harmonised 112/E112 emergency number (TS12 [Ref.12]) and to provide a means of manually triggering the notification of an incident.

In respect of 'Third party support for eCall' (operating requirements defined in EC xxxxxxx 'Intelligent transport systems- eSafety- Third Party support for eCall- Operating Requirements), this European Standard defines the high level procedures and functionalities required to provide the eCall service at the PSAP level (but makes no requirements nor specifications in respect of the wireless communication link between the affected vehicle and the third party service operator).

2 Conformance

Conformance to this European Standard is achieved by conforming to the Requirements clauses of this European Standard specified in Clause 6 below, the test methods specified in Clause 10 of this European Standard, and the test requirements of the appropriate clauses of the Standards referenced in Clause 3 of this European Standard.

Pan European eCall equipment providers, PLMNs and PSAPs that cannot support the eCall flag and MSD, as defined within this European Standard and Ref.1, cannot claim compliance to this European Standard.

Pan-European eCall system conformance testing ensures the full interoperability of its distributed elements, in an emergency context, to conform to Pan-European eCall service functional and operating requirements.

This Standard makes no conformance specifications or requirements in respect of TPS eCall Operating requirement , and conformance requirements in respect of TPS eCall are to be found in Ref.5.

The first step enabling the interoperability of the Pan-European eCall system elements is to verify the conformity of each element to the relevant Pan-European eCall set of standards. In such cases, each element becomes a 'System Under Test' (SUT) which is tested against a reference conformance test system. Two levels of conformity have to be achieved:

- Conformity of the SUT to the network standards being used to achieve the end to end transport of information between the IVS and the PSAP and the establishment maintenance and termination of an audio link between both using the 112 emergency number (or dedicated test number).

- Conformity of the SUT to the high level application protocol as specified in this document and conformity to both EN 15 722 (MSD) and ENxxxxx (Pan-European eCall Operating Requirements).

A second step will be necessary to test in real conditions the interoperability between a given vehicle type and an operational PSAP. Such test shall be achieved without generating significant interference to an operational emergency system.

Both approval testing and ongoing maintenance testing are specified in Clause 10 of this European Standard

The eCall system is composed of three distributed main subsystems to which shall be added some conformance test system as represented on Figure 1 below.

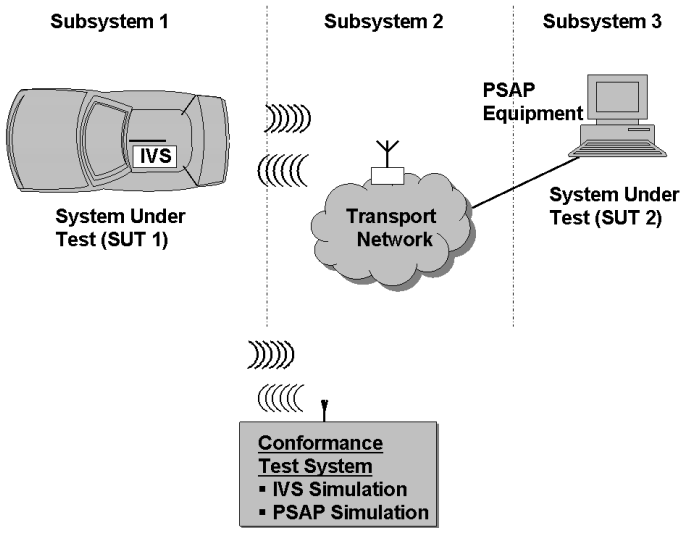

Figure 1: End-to-End eCall system extended with conformance test system

Clause 10 of this document provides the test and conformance requirements for both the IVS and the PSAP equipment. The only evolution of the transport network is the processing of eCall flags.

Consequently, at the transport network level, the conformance testing shall be simply achieved by verifying that the eCalls are well routed to relevant PSAPs designated to handle them according to their triggering sources (manual or automatic).

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[*Ref.1*] EN 15722 Road transport and traffic telematics, eSafety, 'eCall' minimum set of data

[*Ref.2*] ISO 24978 Intelligent transport systems-ITS safety and emergency messages – Data registry procedures

[*Ref.3*] WGS 84 World Geodetic System 84 (The latest revision is WGS 84 dating from 1984 (last revised in 2004]

[*Ref.4*] Intelligent transport systems, eSafety, Pan European eCall – Operating requirements

[*Ref.5*] Intelligent transport systems, eSafety, Third party support for eCall – Operating requirements

[*Ref.6*] ETSI TS 122 101 TSG Services and system aspects: service aspects; service principles (Release 8)

[*Ref.7*] ETSI TS 124 008 TSG core network and terminals: mobile radio interface layer 3 specification; core network protocols; stage 3 [Release 8)

[*Ref.8*] ETSI TS 126 267 TSG services and system aspects; eCall data transfer – in-band modem solution; general description [Release 8)

[*Ref.9*] ETSI TS 126 268 eCall data transfer – in-band modem solution; ANSI-C reference code [Release 8)

[*Ref.10*] ETSI TS 126 269 eCall data transfer – in-band modem solution; conformance testing [Release 8)

[*Ref.11*] Directive 98/34 EC Directive laying down a procedure for the provision of information in the field of Technical Standards and Regulations and Rules of Information Society Service and self certification

[*Ref.12]* Directive 99/5 EC Directive on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity

[*Ref.13*] ETSI TS 122 003 Circuit Teleservices supported by a Public Land Mobile Network (PLMN) (Teleservice 12/TC12) /E12

[*Ref.14*] ETSI TS 122 011 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); LTE; Service accessibility

[*Ref.15*] ETSI TS 127 007 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); AT command set for user equipment

[*Ref.16*] ETSI TS 122 071 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); LTE; Location services (LCS); Service description; Stage 1

[*Ref.17*] ETSI TS 122 002 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); Circuit bearer services (BS) supported by a public land mobile network (PLMN)

[Ref.18] ETSI TS 122 004 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); General supplementary services

[Ref.19] Directive 00/183 Universal Service Directive

[Ref.20] ETSI TS 122 001 Digital cellular telecommunications system (Phase 2+); TSG Services and System Aspects; Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN) (Release 8)

[Ref.21] ETSI TS 123 018 TSG Core Network and Terminals; Basic call handling; Technical realization (Release 8)

[Ref.22] ETSI TS 102 164 Telecommunications and internet converged services and protocols for advanced networking (TISPAN); Emergency location protocols

[Ref.23] ETSI TS 151 010 Digital cellular telecommunications system (Phase 2+);Mobile Station (MS) conformance specification; Part 1: Conformance specification (3GPP TS 51.010-1 version 8.1.0 Release 8)

[Ref.24] ETSI TS 124 123 Universal Mobile Telecommunications System (UMTS);User Equipment (UE) conformance specification; Part 1: Protocol conformance specification (3GPP TS 34.123-1 version 8.6.0 Release 8)

[Ref.25] ETSI 121 133 Universal Mobile Telecommunications System (UMTS); 3G security; Security threats and requirements; (3GPP TS 21.133 version 4.1.0 Release 4)

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply / the terms and definitions given in … and the following apply.

4.1
112
single European emergency call number supporting Teleservice 12 [Ref.13]

4.2
E112
means an emergency communications service using the single European emergency call number, 112, which is enhanced with location information of the calling user TS12

4.3
cellular network
wireless communications network consisting of multiple adjacent access points (cells) with the capability of homogeneous transfer of a communications session instance to an adjacent cell without significant interruption to the session

4.4
data
representations of static or dynamic objects in a formalized manner suitable for communication, interpretation, or processing by humans or by machines

4.4
data concept
any of a group of data structures (i.e., object class, property, value domain, *data elements,* message, interface dialogue, *association*) referring to abstractions or things in the natural world that can be identified with explicit boundaries and meaning and whose properties and behaviour all follow the same rules

4.5
data element
single unit of information of interest (such as a fact, proposition, observation, etc.) about some (entity) class of interest (e.g., a person, place, process, property, concept, *association*, state, event) considered to be indivisible in a particular context.

4.6
eCall
emergency call generated either automatically via activation of in-vehicle sensors or manually by the vehicle occupants; when activated, to provide notification and relevant location information to the most appropriate 'Public Safety Answering Point's, by means of *mobile wireless communications networks* and carries a defined standardised *Minimum Set of Data*, notifying that there has been an incident that requires response from the emergency services and establishes a voice channel between the occupants of the vehicle and the most appropriate *'Public Safety Answering Point'*

4.7
eCall generator
occupant of a vehicle or equipment within a vehicle that has cause to trigger an 'eCall' transaction by automatic or manual means

4.8
eCall service

end-to-end emergency service to connect occupants of an affected vehicle to the most appropriate PSAP via a voice link across a PLMN together with the transfer of a 'Minimum Set of Data' to the PSAP

4.9
eCall transaction
establishment of a *mobile wireless communications session* across a *public wireless communications network* and the transmission of a *minimum set of data* from a vehicle to a *public safety answering point* and the establishment of a voice channel between the vehicle and the PSAP

4.10
identifier
any label, symbol or token that names or identifies an entity or a collection of data or the means of designating or referring to a specific instance of a *data concept*

4.11
in-vehicle equipment
equipment within the vehicle that provides or has access to in-vehicle data required for the *minimum set of data* and any other data that is to be sent as part of or complementary to the *minimum set of data* to effect the 'eCall' *transaction* via a *public mobile wireless communications network* providing a link between the vehicle and a means of enacting the 'eCall' *service* via a *public mobile wireless communications network*

4.12
in-vehicle equipment provider
provider of 'eCall' *in-vehicle equipment* which is given access to the relevant minimum set of data by the vehicle manufacturer for a vehicle in order to effect the 'eCall' service

NOTE the in-vehicle equipment provider may be the vehicle manufacturer or the provider of aftermarket equipment

4.13
in-vehicle system
in-vehicle equipment together with the means to trigger, manage and effect the eCall transaction

4.14
minimum set of data
standardised *data concept* comprising *data elements* of relevant vehicle generated data essential for the performance of the 'eCall' *service; as defined in EN 15722*

4.15
mobile wireless communications network
wireless communications network with homogeneous handover between *network access points*

4.16
mobile wireless communications network device
device providing communications to a *mobile wireless communications network* with homogeneous handover between *network access points*

4.17
most appropriate PSAP
PSAP defined beforehand by national authorities to cover emergency calls from a certain area or for emergency calls of a certain type. *See also PSAP*

NOTE A number of different instantiations of PSAP service are supported within this European Standard. A PSAP ay be a Public Authority or a private service provider operating under the control of a Public Authority

4.18
network access device (NAD)
see *mobile wireless communications network device*

4.19
network access points
beacon, antenna or similar source of signal propagation and receipt together with equipment to manage communication sessions with users operating within the operating reach of the *network access point* and provide connectivity for the users within the operating reach of the single *access point* to a wider communications network

NOTE a network access point may or may not provide homogeneous or heterogeneous handover to another network access point

4.20
public mobile wireless communications network
mobile wireless communications network with access to a public telecommunications network

4.21
'Public Safety Answering Point' (PSAP)
physical location where emergency calls are first received under the responsibility of a public authority or a private organisation recognised by the government. *See also 'most appropriate' PSAP*

NOTE A number of different instantiations of PSAP service are supported within this European Standard

4.22
service provider
physical and functional component responsible for providing telematics based services to its subscribers

4.22
vehicle manufacturer
entity which first assembles the vehicle and provides 'eCall' equipment as part of its specification and subsequently sells the vehicle directly or via an agent

4.23
vehicle occupant(s)
person(s) inside the vehicle

4.24
wireless communications network
network operating using an air-interface capable of bi-directional transfer of data and or voice

NOTE there are different types of wireless communications such as *PAN, LAN, cellular network* etc.

5 Symbols and abbreviations

5.1
3G
third generation mobile telecommunication system

5.2
ACK
positive acknowledgement

5.3
AIeC
'Automatic Initiated eCall'

5.4
AT
attention
(part of modem instruction to dial as specified in ETSI TS 127 007 [Ref.15])

5.5
BS
bearer services

5.6
CAN
controller-area network

5.7
CRC
cyclic redundancy check

5.8
EC
European Commission

5.9
EGEA
expert group on emergency access

5.10
ETSI
European Telecommunications Standards Institute

5.10
GIS
geographic information system

5.11
GNSS
global navigation satellite system

5.12
GSM
global system for mobile communications

5.13
HGV
heavy goods vehicle

5.14
HLR
home location registry

5.15
HMI
human machine interface

5.16
HPLMN
Home 'Public Land Mobile Network'

5.17
IAM

immediate alert message

5.18
IMEI
international mobile equipment identity

5.19
IMSI
international mobile subscriber identity

5.20
IVS
in-vehicle system

5.21
LAN
local area network

5.22
LTE
long term evolution (of 3G UMTS access network)

5.23
MIeC
manually initiated emergency call

5.24
MSC
mobile switching centre

5.25
MNO
mobile network operator

5.26
MSISDN
Mobile subscriber ISDN (integrated services digital network)

5.27
MSD
minimum set of data (CEN 15722)

5.28
NACK
negative acknowledgement

5.29
NAD
network access device (e.g. a GSM or UMTS module)

5.30
telephone system
private automatic branch exchange

5.31
PAN
personal area network

5.32

PLMN
'Public Land Mobile Network'

5.33
PSAP
'Public Safety Answering Point'

5.34
SIM
subscriber identity module (GSM/3GPP)

5.35
TPS`
third party service

5.36
TPSP
third party service provider`

5.37
TS [1]
technical specification

5.38
TS [2]
teleservice

5.39
TS12
Teleservice 12 [Ref.12]

5.40
UML
Unified Modeling Language (ISO 15901)

5.41
UMTS
universal mobile telecommunication service

5.42
USIM
user service identity module

5.43
WGS
world geodetic system

5.44
WGS 84
world geodetic system ;issue 1984 (last revised 2004]

6 General overview of the eCall transaction

In the introduction to this document, eCall was described as "an emergency call generated either automatically via activation of in-vehicle sensors or manually by the vehicle occupants (the eCall generator);

when activated, to provide notification and relevant location information to the most appropriate 'Public Safety Answering Points', by means of *mobile wireless communications networks* and carries a defined standardised *Minimum Set of Data*, notifying that there has been an incident that requires response from the emergency services and establishes a voice channel between the occupants of the vehicle and the most appropriate *'Public Safety Answering Point'* .

Pan European eCall effects this service using a 'Circuit Teleservice' supported by a 'Public Land Mobile Network' (PLMN) (Teleservice 12/TS12) [Ref.13]

NOTE Should the MSD not be sent or received for any reason then the eCall continues as a normal 112/E112 emergency call and is afforded the same protection and priority as a Teleservice 12 [Ref.13] emergency voice call.

Figure 2 shows an illustrative view of the Pan European eCall Service, as defined in Ref.4,

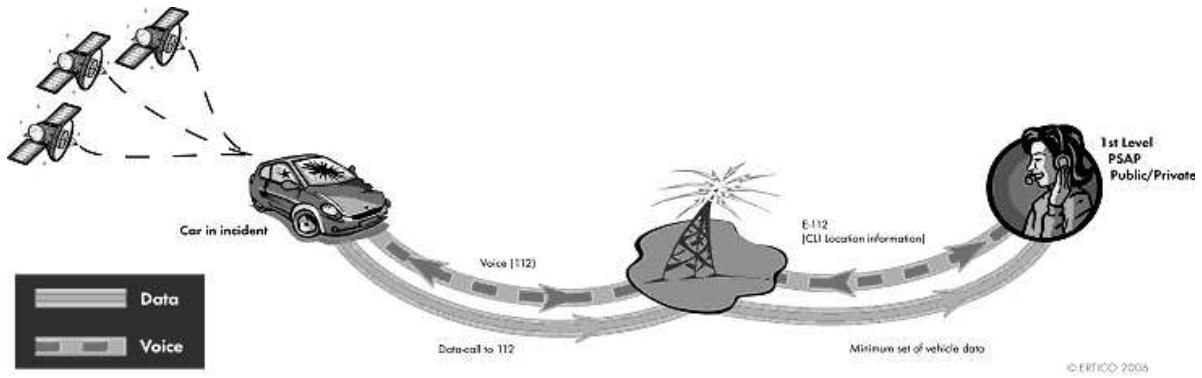

Figure 2 : eCall overview

Figure 3 shows the relationship of the eCall process to European Standards.

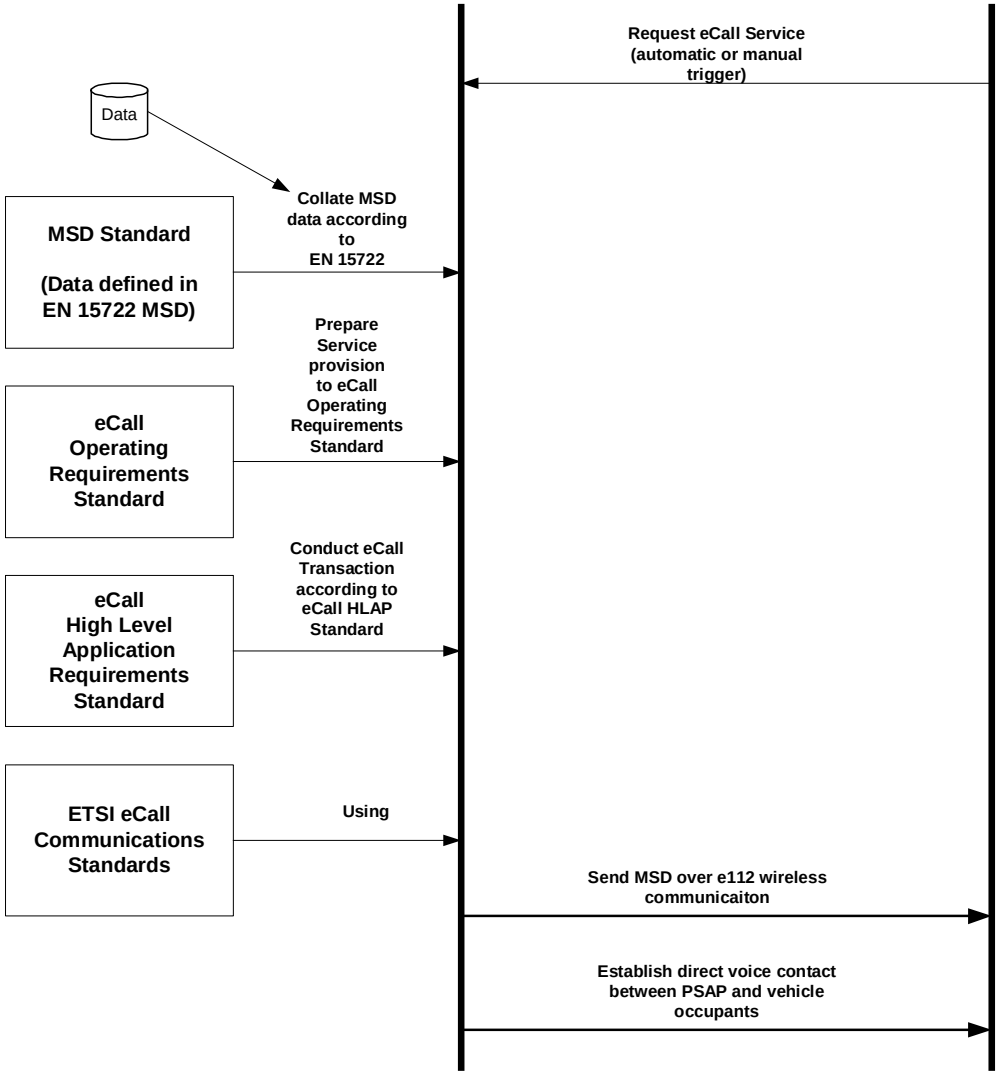

Figure 3 : Relationship of eCall transaction to Standards

After the establishment of an emergency voice call (112/E112) between a vehicle and a 'Public Safety Answering Point' (PSAP) the audio equipment comprising the microphone and loudspeaker in the vehicle is disconnected from the line whilst the MSD is transmitted, within the voice band, to the PSAP data processing equipment. On completion of the MSD transfer the in-vehicle audio system is reconnected to the line and a voice communication is established between the vehicle occupants and a PSAP operator. The incident related information associated with the 112 / E112 voice call, contained within the MSD, is displayed on the PSAP operator's terminal.

Following the initial resolution of the incident by the PSAP operator e.g. the dispatching of emergency services to the scene of an accident, the PSAP operator may clear-down the call, however, the 'In-Vehicle System' (IVS) remains registered on the mobile network, for the period specified in Ref 4,, to enable the PSAP or rescue services to recall the vehicle occupants.

The eCall service technical requirements, as they apply to the establishment of the TS12 emergency call and the transfer of the in-band data, are as specified in ETSI TS 122 101 [Ref.6] and ETSI TS 124 008 [Ref.7]. These specifications also include the use, by the mobile network, of the eCall 'flag' identifier, which is required in order to claim conformance with this European Standard (and may be mandated in some countries). The

eCall in-band modem, used to transfer the MSD, is specified in ETSI TS 126 267 [Ref.8] and ETSI TS 126 268 [Ref.9].

Figure 4 provides a general overview of the process of sending an MSD from the IVS to the PSAP.

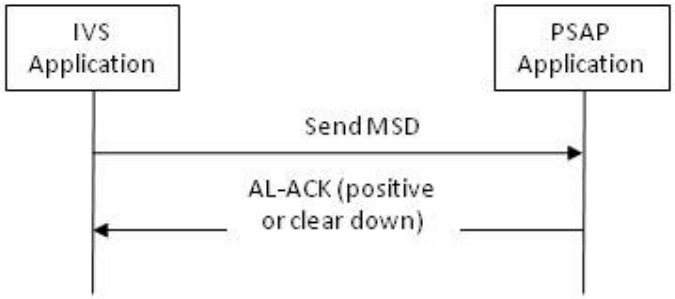

Figure 4: General overview - MSD sent from IVS to PSAP – successful case

A more detailed explanation of the eCall transaction is contained within the following clauses together with specific high level application requirements.

Under normal circumstances, the stages of the Pan European eCall transaction that provide the service can be described as comprising 10 steps :

Step 1 – Procedures following power-up of the in-vehicle system
Step 2 – Activation (of system)
Step 3 – Call set-up (including identifying call type, make call, network selection and registration, authentication ('Home Location Registry'), cell localisation (by network), establish voice connection to PSAP modem server)
Step 4 – MSD transfer (including disconnect microphone and speaker in vehicle from the line, send call tone, synchronise, request MSD, send MSD, error check), and link layer ACK (including stop MSD transmissions)
Step 5 – Application layer ACK
Step 6 – Establish Audio link (including check audio link to vehicle occupants, MSD visualisation, rerouting to another PSAP)
Step 7 – PSAP informs vehicle verbally that help is coming
Step 8 – Incident resolution
Step 9 – Call clear-down
Step 10 – PSAP or rescue service call back (voice only) or 'Send MSD'

Circumstances are not always normal, and the event of failure has also to be dealt with, procedures need to be defined for failure causes such as :

- MSD not transmitted correctly
- False generation of eCalls
- Network registration fails
- Call failure
- Network not capable to support eCall flag
- eCall routed to a non equipped PSAP
- PSAP modem failure
- PSAP network/ICT failure
- PSAP application failure
- PSAP Operator does not respond
- MSD not sent

- MSD not received
- Audio link not established
- Audio link established but subsequently fails
- Re-attempt in case of interrupted call
- Automatic repeat attempts
- IVS NAD does not receive cleardown

- Etc.

Procedures/protocols for other process features need also to be specified, such as :

- Manual termination of eCall by vehicle occupants
- Activation/deactivation of eCall equipment in the vehicle

This European Standard provides high level application protocols and procedures to enact the eCall service provision in Clause 7 of this document. It specifies at 'High Level', because it is not the intention to determine how the manufacturers detailed product design is effected, only the steps that need to be effected in order to provide a consistent system in an interoperable open environment.

NOTE Third party support for eCall provides the same end service (MSD + voice link between the occupants of the vehicle and the PSAP), but by different means.

Transitional arrangements for non equipped MNOs and PSAPs are also described.

7 Requirements

7.1 Procedures following power-up of the in-vehicle system

The IVS network access device (NAD) shall conform in all respects to the applicable ETSI specifications and in particular to the requirements specified in ETSI TS 122 101 [Ref.6] and ETSI TS 124 008 [Ref.7] with regard to this initial power-up procedure.

7.1.1 Enabled IVS

The following requirements apply to an IVS that has not been disabled for reasons of privacy.

As specified in ETSI TS 122 101 [Ref:6] an eCall IVS NAD shall have a valid SIM/USIM. The SIM/USIM enables the provision of the eCall service, The SIM/USIM can be configured only for eCall (in this document referred to as 'eCall only'), or a combination of eCall and other commercial service provision.

7.1.2 Enabled PSAP

To be “eCall enabled”, a PSAP needs to be equipped with the necessary hardware and a software application that can receive, process and display the MSD contents to its operators. This could either be a dedicated eCall application or integration in the existing PSAP application. An eCall enabled PSAP shall conform in all respects to the high-level application protocols as specified herein.

The eCall flag makes possible that the eCalls are routed to a dedicated number which shall be created. This way, the PSAP can distinguish the eCalls from the e112 calls. Figure 5 provides an illustration.

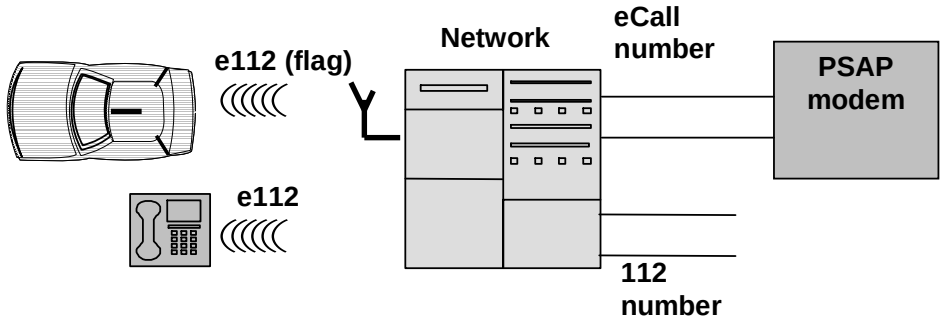

Figure 5: Use of the eCall flag

Human resources are a crucial factor for the management of the eCalls. PSAP operators shall receive the necessary training.

7.1.3 IVS configured only for eCall

If the IVS is configured to make only eCalls then, in accordance with ETSI TS 122 101 [Ref.6] (Release 8 onwards);

The IVS NAD shall not systematically perform mobility management procedures, including registration on a PLMN, except when attempting to initiate an eCall and during an emergency call, or to initiate a test or reconfiguration of the terminal during a maintenance operation.

NOTE: The purpose of this restriction is to avoid network congestion due to large volumes of unnecessary network registration, de-registration and location update signalling from terminals configured only to make eCalls.

NOTE ETSI TS 122 101 [Ref.6] requires that 'It shall be possible for the user equipment upon request from the user to initiate a call to an operator designated non-emergency MSISDN for the purpose of accessing test and terminal reconfiguration services.'

The ETSI/3GPP definition of a user is 'an entity, not part of the 3GPP system, which uses 3GPP services'.

Within the context of Pan European eCall, there are several classes of 'user' which include the operators of the eCall system, the equipment manufacturers and the vehicle occupants.

The access and use of test functions are left to the vehicle manufacturers / equipment suppliers to fulfil their conformance testing / interoperability obligations and their own quality control procedures. Implementations, at the manufacturers discretion may or may not provide access to the test functions to the occupants of the vehicle.

7.1.4 Self test

When power is applied the IVS shall normally perform a self test without attempting to connect to the network. In the event of a system failure during or following the self test, a warning shall be given to the occupants of the vehicle. The nature of such warning is a feature of product design and is not standardised in this document.

Ref.6 enables the test of the system, and equipment designers may use these provisions from time to time to test registration to PLMN to validate that the IVS is not affected by "repairable" causes such as antenna failure, (U)SIM failure, blacklisting etc.)

If the IVS system cannot locate a network the IVS shall inform the occupants of the vehicle. . The nature of such warning is a feature of product design and is not standardised in this document.

7.1.5 Standby mode applicable to IVS configured for eCall only

Following the power-up, an IVS configured for 'eCall only' shall not attempt to register on a PLMN except as permitted in Clause 7.2. The IVS shall go to standby mode and adopt the eCall 'Idle State' in accordance with the eCall terminal state machine procedures specified in ETSI TS 124 008 [Ref: 7].

An IVS configured for 'eCall only' may periodically perform background scans to identify available PLMNs, whilst in idle state, so as to reduce the network selection and registration time in accordance with ETSI TS 122 011 [Ref 14] when the IVS needs to initiate an eCall.

7.2 Activation

7.2.1 Activation of Pan European eCall

Once the in-vehicle system is made aware by the eCall generator of a triggering event that fulfils the requirement described in [Ref.4], and provided that there is no ongoing eCall in progress, the activation sequence shall start. In order to meet the objectives of the provision of the service defined in Ref.4, additional application protocols are required to successfully effect an activation sequence.

The in-vehicle system shall :

- Interrupt immediately any ongoing communication using the communication channel required for eCall
- Disconnect the in-vehicle microphone from the line
- Disconnect the in-vehicle loudspeaker from the line
- Activate the IVS to start the eCall transaction
- Except for retrofit eCall systems, other installed in-vehicle audio equipment shall also be muted for the duration of the eCall.

The in-vehicle system shall also provide a way to make vehicle's occupants aware of the progress of the ongoing eCall transaction.

NOTE It is recommended that instruction manuals advise vehicle users of the advantages of remaining in the vehicle to have voice contact with the PSAP if it is safe to do so.

7.2.2 Activation of a test eCall

The in-vehicle equipment shall provide a way to activate a test eCall, simulating the eCall triggering event, in order to test the IVS.

NOTE Such an activation may be made via specific equipment and procedure(s) which may not accessible to the end user, but for example only by manufacturer authorised facilities or vehicle repair shops. (e.g. via a specific request on the CAN interface for a line fitted equipment),.

The IVS shall set the test bit of the MSD according to [Ref.1]

7.3 Call set-up

On activation of the eCall process, either manually by the user or automatically as the result of an incident, the MSD fields are populated or updated in accordance with EN 15722 [Ref.1] and an emergency call set-up command is sent from the IVS 'Activation Function' to the IVS 'Network Access Device' (NAD).

A clear-down fallback timer, with a value of [120] minutes, shall be started.

NOTE The purpose of the clear-down fallback timer is to ensure that the IVS NAD clears-down the call correctly if an application layer acknowledgement clear-down instruction (AL-ACK) is not received, or if the IVS fails to receive a network clear-down message

The means by which the in-vehicle equipment provider populates and updates the MSD data is a matter for product design and outside the scope of this European Standard.

7.3.1 IVS network access device (NAD) already registered on PLMN

If the IVS NAD has the necessary capability, and a valid SIM/USIM for commercial services, then the IVS NAD may already be registered on the home PLMN (HPLMN), or on a visited PLMN (VPLMN) if roaming. In this case the IVS NAD shall commence an emergency call set-up in accordance with ETSI TS 124 008 [Ref.7] and include in the TS12 service category request message the 'eCall Flag' as specified in ETSI TS 122 101 [Ref.6] and ETSI TS 124 008 [Ref.7].

7.3.2 eCall in progress

If an eCall is ongoing while the ignition is being switched to off that call shall not be terminated automatically. The system shall disarm only after the eCall has been terminated. No other equipment in the vehicle shall interrupt or terminate an eCall that is in progress.

7.3.3 Network selection and registration

Before an eCall only IVS, as defined in ETSI TS 122 101 [Ref.6] is able to register on a PLMN to make an eCall, or to perform a test call to a network operator specified non-emergency number, it shall transition from the eCall 'Idle State' as previously described in clause [7.2.2]. The IVS NAD shall then perform the network selection and registration procedures, using the highest priority PLMN found during the most recent background scan, as specified in ETSI TS 122.011 [Ref.14].

7.3.4 Authentication of the subscriber

As part of the network registration process, and before call set-up, the identity of the subscriber – 'International Mobile Subscriber Identity' (IMSI) stored on the SIM/USIM - is sent to the subscriber's PLMN Home Location Registry (HLR) for authentication. Should the IMSI authentication fail for any reason then, subject to network operator and national regulatory policies, it may not be possible establish an eCall.

During the network registration and authentication process the location of the IVS NAD is determined from the identity of the cell on which the NAD is camped and this is stored as a location update in the both the HLR and VLR.

7.3.5 eCall establishment

To initiate an eCall the IVS eCall activation function shall use the mandatory emergency number 112 specified in ETSI TS 122 101 [Ref.6], in the dialling command (AT command) sent to the IVS NAD. On recognising the digits as an emergency number, the NAD shall, following registration on the PLMN, initiate a call set-up to the network with a request for a Teleservice 12.

In the call set-up message the IVS NAD shall set the 'Service Category Request' message information element (IE) in accordance to Ref.6. This is known as the 'eCall Flag'. ETSI TS 122 101 [Ref.6] provides a

description of the 'eCall Flag' and specifies the mandatory inclusion of the manually initiated eCall (MIeC) and automatically initiated eCall (AIeC) identifiers in the call set-up message.

On receipt of the TS12 emergency call request, the 'Mobile Switching Centre' (MSC) in the network routes the call to the responsible PSAP. The MSC shall make use of the 'eCall Flag' in the call set-up message to route the eCall to a designated eCall capable PSAP.

7.3.6 Cell localisation (by network)

When the IVS NAD selects a PLMN and commences network registration, the identity of the serving cell on which the NAD is ‘camped’ is stored in both the subscriber’s 'Home Location Register' (HLR) and locally in a 'Visited Location Register' (VLR). As part of the TS12 emergency call set-up signalling protocol, the 'Mobile Switching Centre' (MSC) handling the emergency is included in the serving cell’s identity in the ISUP SS7 IAM ('Immediate Alerting Message') sent to the PSAP in accordance with ETSI TS 102 164 [Ref.22]. The PSAP may, depending upon both national policy and PSAP capability, be able to map the received cell ID to a geographical location, or else they may request this information from the mobile network operator. If the cell ID is not provided by the network operator then the PSAP may optionally request the geographic location of the caller using the received NAD’s mobile number (MSISDN). Service level requirements for the provision of emergency service location information are specified in ETSI TS 122.071 [Ref.16].

NOTE In the event that it is necessary to call back the IVS NAD, then the mobile network makes use of the most recent location information stored in the HLR and VLR

An improvement in accuracy is achieved by the position information contained in the MSD.

Requirements for accuracy for emergency services are provided in [Ref.19] Directive 00/183, Universal Service Directive.

7.3.7 Manual termination of eCall by vehicle occupants

In the case of an automatic eCall, the eCall transaction shall not be terminated by the vehicle occupants.

Vehicle occupants may manually terminate an eCall in order to cancel a false triggering of a manually initiated eCall (as described in Ref.4), during the early phase of the eCall transaction.

EXAMPLE Child presses eCall button.

The period of time during which such cancellation may occur and indications that a call is being initiated is a matter for product design, however, once the network has registered the emergency call it shall be too late terminate the call.

7.4 MSD transfer

Figure 6 provides a data flow description of the MSD transfer

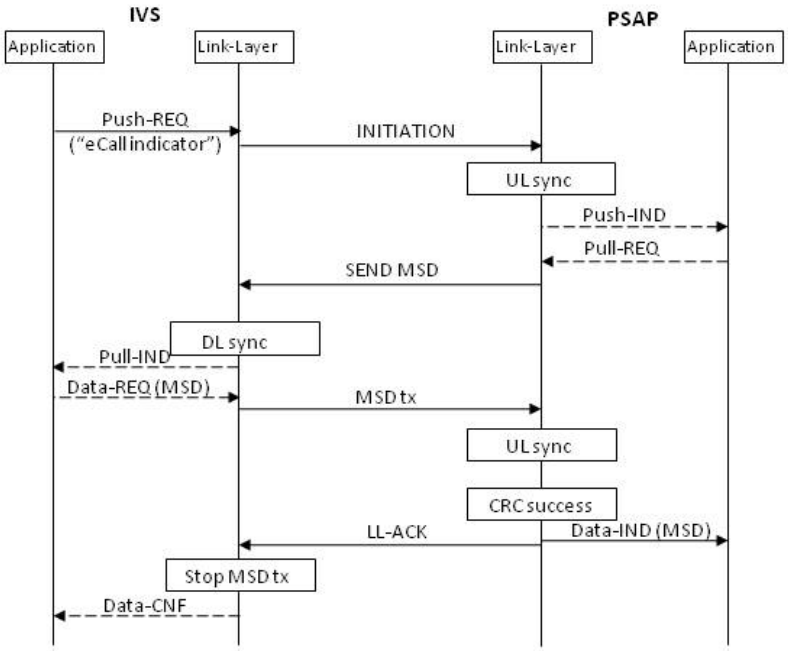

Figure 6 MSD transfer - successful case

7.4.1 Send initiation signal from IVS eCall modem to PSAP

After the call has been picked-up by the PSAP telephone system it is routed to the PSAP in-band modem which listens for and evaluates the 'INITIATION' message (signal) sent by the IVS. The 'INITIATION' message (signal) shall persist for not less than 1 second and not more than 2 seconds after the call is answered. If a valid 'INITIATION' message is not received by the PSAP eCall modem within 2 seconds then the call shall be routed to a PSAP operator.

The IVS eCall Modem INITIATION signalling procedure shall be in accordance with ETSI TS 126 267 [Ref.8] and ETSI TS 126 268 [Ref.9].

7.4.2 eCall Modem synchronisation

Following receipt of a valid INITIATION signal from the IVS eCall Modem, the PSAP and IVS modems shall synchronise in accordance with ETSI TS 126 267 [Ref. 8].

7.4.3 Request MSD by PSAP eCall modem to IVS eCall modem

When the PSAP modem has verified the received "INITIATION' message it shall immediately send a 'SEND MSD' response to the calling IVS, indicating that the MSD is to be transmitted by the IVS to the PSAP in accordance with ETSI TS 126 267 [Ref.8].

If the PSAP eCall modem does not send a link layer ACK (LL-ACK) within 20 seconds after having sent the 'SEND MSD' message to the IVS eCall modem, it shall route the voice call to a PSAP operator.

If the IVS eCall modem does not receive or recognise a valid 'SEND MSD' message from the PSAP eCall modem within 2 seconds, it shall reconnect the IVS loudspeaker and microphone in the vehicle.

7.4.4 Send MSD from vehicle IVS to PSAP eCall modem

The MSD, as defined in EN 15722 [Ref.1], shall be sent by the IVS eCall modem to the PSAP eCall modem as defined in ETSI TS 126 267 [Ref. 8].

7.4.5 Link layer error check

The PSAP eCall modem shall perform a link layer 'Cyclic Redundancy Check' (CRC) as described in ETSI TS 126 267 [Ref.8].

7.4.6 Link layer ACK from PSAP eCall modem to IVS eCall modem

After a successful link layer check, the PSAP eCall modem shall send a link layer ACK to the IVS eCall modem as described in ETSI TS 126 267 [Ref.8].

On receipt of the initial link layer acknowledgement from the PSAP eCall modem, the IVS modem shall stop transmitting / re-transmitting the MSD and await an application layer acknowledgement (as defined in clause 7.5), confirming that the PSAP eCall application has validated the information contained in the MSD.

If the MSD is found to be incomplete or in error, then the IVS modem shall continue to transmit the MSD for a period not exceeding 20 seconds or until an acknowledgment is received. If the link layer acknowledgement is not received within 20 seconds, then the IVS shall re-connect its loudspeaker and microphone to the line enabling voice communication between the vehicle occupants and the PSAP operator.

If the PSAP eCall modem does not send a link layer ACK within 20 seconds after having sent the ‘SEND MSD’ message to the IVS eCall modem, it shall route the voice call to a PSAP operator.

7.5 Application layer acknowledgement (AL- ACK)

7.5.1 Following transmission of the MSD to the eCall PSAP application

After successful MSD transfer, the MSD content is sent to the PSAP application which can either proceed automatically to the application layer ACK or wait for a PSAP operator decision to send or not the application layer ACK.

Whether in automatic or manual mode the PSAP may acknowledge the MSD (AL-ACK), request a new MSD, or clear-down the call.

When the IVS receives the AL-ACK it shall connect the IVS loudspeaker and microphone to the line.

The IVS shall not attempt to re-send the MSD unless requested by the PSAP.

If, during a manually generated eCall, an event happens that will automatically trigger an eCall (for example, the driver has called the emergency services because he/she is having a heart attack, and the vehicle crashes) then the existing eCall shall take priority. The means by which the equipment manufacturer achieves this is a matter for product design .

7.5.2 PSAP acknowledges the MSD

7.5.2.1 Automatic acknowledgement

In the case of an automatically generated application layer ACK, the PSAP prepares the AL-ACK as defined in EN15722 with message identifier the same number as in the received MSD and Block 2 value = “1”.

The PSAP application sends an REQ primitive to the PSAP modem and the AL-ACK shall then be transmitted to the IVS. The method by which the AL-ACK is sent is defined below.

This acknowledgement shall be stored within the IVS. The location of such storage shall be an issue of product design.

NOTE In case of automatic sending of the application layer ACK, should the content of the MSD displayed to the PSAP operator not be satisfactory, the operator can request a new MSD.

7.5.2.2 Manual acknowledgement

In the case of a PSAP operator manually generated application layer ACK, the PSAP operator determines the value to be entered for Block 2, and the message is subsequently sent as described above. See also subClause 7.5.4.

7.5.3 No receipt of application layer ACK

If an AL-ACK is not received within 10 seconds from receipt of the link layer ACK, the speaker and microphone in the vehicle shall be reconnected to the line in order to enable the call to revert to an e112 voice call.

7.5.4 PSAP requests a new MSD

The PSAP operator may at any time request that a new MSD is sent.

NOTE This may be, for example because the data appears corrupted or inconsistent, or the PSAP operator believes that the data may have changed.

The procedure to request a new MSD is defined in subClause 7.6 below.

7.5.5 PSAP clears down the call

The PSAP operator may instruct the clear-down of the call at any time.

NOTE For example in the case of a test call the PSAP operator may elect to reject or ignore it, or in the case of a major incident the PSAP operator may already have multiple calls from one incident.

If at any stage the PSAP application layer ACK with Block 2 = “2” is received at the IVS then the behaviour shall be as specified in clause 7.9. Call clear-down.

7.5.6 Form of presentation of the AL-ACK

The data content of the application layer ACK is defined in EN 15722 [Ref.1]

The application layer ACK shall be compressed into 4 bits for transport across the link layer [3] [4] according to the following mapping:

Table 1: Form of presentation of the AL- ACK

Data field of application layer ACK	Byte position of application layer ACK	Handling
Format version	1	Compressed to 1 bit to distinguish between version 1 and 0 and regenerated at IVS
Message identifier	2	Stored and regenerated at IVS
Status	3	Compressed to 1 bit and regenerated at IVS

The use of the additional bit supported by the link layer is reserved for future use.

Editor's note – in EN15722 the block 3 value is currently "2" but will be changed to "1"

Figure 7 provides a flow chart for the AL-ACK transmission sequence.

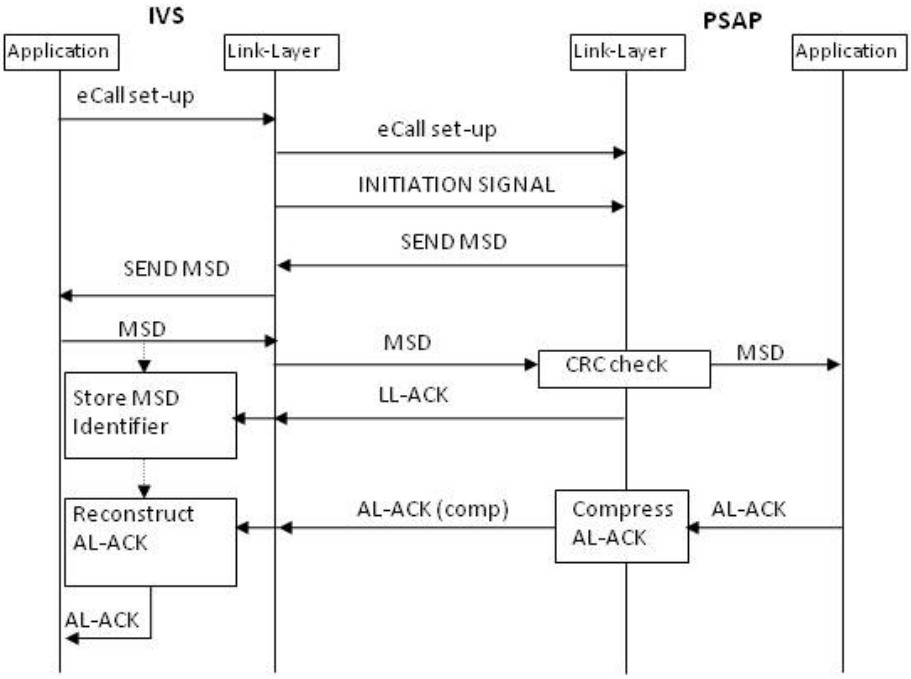

Figure 7: AL-ACK transmission sequence for send MSD case

7.6 Request 'Send MSD'

The IVS shall not attempt to send a new or re-send the MSD unless requested by the PSAP.

The PSAP application shall have the capability to instruct the PSAP modem to request the IVS to send the latest version of the MSD at any time during an ongoing eCall session and the IVS shall be ready to proceed as long as it remains registered on the network.

Figure 8 provides a flow chart for a send/resend request sequence.

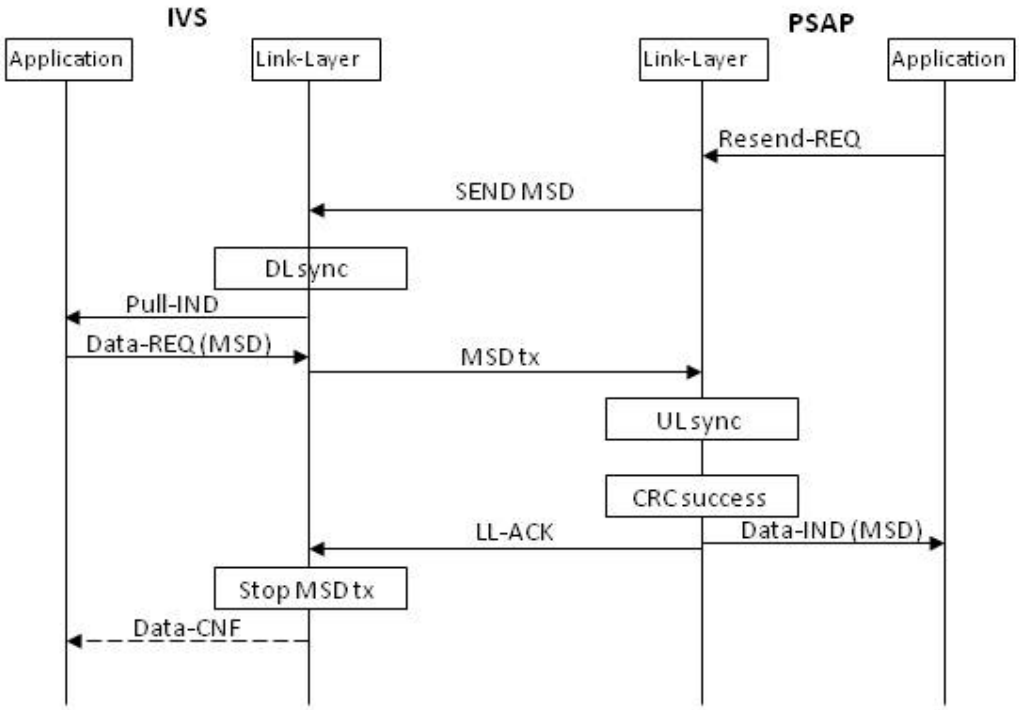

Fig 8: Request 'Send MSD' – successful case

7.6.1 Before call clear-down

When the PSAP operator decides during the conversation with the vehicle occupants that he/she requires that the latest version of the MSD is sent/re-sent by the IVS to the PSAP, he/she shall first inform the occupants of the vehicle that they will hear a short data transmission sound and the loudspeaker and microphone will be disconnected from the line during a few seconds to allow the data transmission. (This is designed to prevent the victims to panic). The PSAP operator shall activate the "send MSD" application user interface of his PSAP eCall application. Since this process may take several seconds, it is advisable to have a progress indicator implemented in the PSAP application. The 'Send MSD' request is sent by the PSAP eCall application to the PSAP eCall modem which sends the "Start "message to the IVS eCall modem. When receiving the "start" message, the IVS shall first disconnect the audio channels in the vehicle from the call and then proceed to the MSD send sequence as described in 7.4. Ideally a progress indication shall be provided to the vehicle occupants to ensure they stay calm.

7.6.2 After call clear-down

During the last registration period of nn minutes (nn as determined in Ref.4), in the event that the PSAP operator decides that he/she requires that the latest version of the MSD is sent/re-sent by the IVS to the PSAP, he/she shall first select the vehicle from which he/she needs that MSD in the active vehicle list of the PSAP application. This active vehicle list shall be populated with all vehicles having called the PSAP in the last x hours.

The number of hours during which a vehicle appears in an active vehicle list shall be a local decision to be made by a PSAP.

Once a vehicle is selected, the “Send MSD” application user interface becomes active in the PSAP eCall application. By clicking on the “Send MSD” application user interface, the PSAP application sends instruction

to the PSAP telephone system to dial the MSISDN of the IVS of the selected vehicle. It is advisable to implement a progress indicator in the PSAP application. When receiving the incoming call, the IVS shall automatically pick it up, disconnect the audio channels of the vehicle (microphone and speaker) from the line and listen for the initiation signal from the PSAP modem as described in clause 7.4. An in-vehicle feed-back mechanism and progress indicator shall be available for the vehicle occupants.

7.7 PSAP application features

7.7.1 General requirements

In order to be able to claim it can support eCall, a PSAP is required to be equipped with a software application that can receive, validate and display the MSD contents to its operator(s). This could either be a special eCall application or integrated in the PSAP's interface software.

Each PSAP should be able to decide which data it will display to its operators.
However, this software/system should at least:

(a) Warn the operator about a new eCall arrival
(b) Show the data included in the MSD in an understandable way as described in subClause 7.7.2
(c) Warn the operator about the availability of the voice call
(d) Provide a call-back capability
(e) Provide a new MSD requirement application user interface

NOTE PSAP systems may find it useful to display both the new and old MSD, but this is not a requirement.

7.7.2 MSD display to the PSAP operator

A PSAP can decide in which graphical way the MSD will be displayed to its operators but the eCall case page shall show the data included in the MSD in a clear and understandable way.
In respect of interpreting the VIN content of the MSD a VIN decoder shall be made available to PSAPs.

7.7.3 MSD validation/PSAP operator user interface

In order to allow the PSAP operator to establish the audio link as soon as possible ensuring this way the shortest possible processing time, the IVS shall never attempt to re-send the MSD unless it has been requested to do so. The user interface shall be displayed in the eCall case page to allow the PSAP operator interaction with IVS while observing the eCall handling process flow. This interface can be designed at the convenience of the PSAP but shall allow at minimum to:

(for the event that the MSD is successfully received and/or that the PSAP operator wishes to move directly to voice contact with the occupants of the vehicle)

“Acknowledge and connect voicelink to vehicle”, sends the application ACK to the IVS as described in subClause 7.5.

(for the event that the PSAP is not satisfied with the MSD received and wishes that the latest version of the MSD is sent/re-sent by the IVS to the PSAP), he/she shall click on the on the “Send MSD” application user interface, as described in clause 7.6.1

(for the event that the PSAP wishes to terminate the call)
“Cleardown eCall”, proceeds to call clear-down as described in subClause 7.9.

(for the event that the PSAP wishes to make a new voice connection with the occupants of the vehicle)
“Call Back”, proceeds to call back of a vehicle as described in subClause 7.10.

NOTE It is recommended to implement an MSD history feature allowing to toggle between the last 5 MSDs received for a same vehicle in the PSAP eCall application

7.8 Check audio link to vehicle occupants

The operator shall initiate the conversation informing the caller that he/she is talking to an emergency coordination centre.

If the caller is able to speak, the call will be handled as a normal 112 call.

If the operator can hear only ambient sound he/she may conclude that the vehicle occupants are not able to speak. (Depending of the content of MSD data it may be considered immediately as a real emergency).

If the operator does not hear anything he/she could decide to request 'Send MSD' or call back and try to find-out what is happening.

7.9 Call clear-down

On receipt of the MSD and/or completion of the telephone conversation with the vehicle occupants, the PSAP operator shall clear-down the eCall. Depending on the context (see below), the call may be cleared down by either hanging up in the normal way or by sending a clear-down instruction to the IVS.

If the original eCall has been made to a PSAP that supports eCall then upon receipt of the AL-ACK, if Block 2 value = “1”, the IVS shall clear-down the call.

The IVS NAD shall not attempt an automatic redial if the IVS has previously received an AL-ACK with Block 2 value = “0”.

If the IVS NAD has not received an AL-ACK with Block 2 value = “0”, prior to the call being cleared down , then it shall attempt to redial and initiate a new eCall.

If the original eCall has been made to a PSAP that does not support eCall (no 'Send MSD' will have been requested within 2 seconds of the call being answered) then the IVS shall not attempt to redial following call clear-down.

Following call clear-down by the PSAP the IVS NAD shall remain registered on the serving network and available to receive calls from the PSAP and rescue workers for a minimum period as defined in Ref.4.

The eCall-only-IVS network de-registration fallback timer (DFT) shall be reset following call clear-down.

NOTE The purpose of the DFT is to de-register eCall-only-IVS NADs from the network after a predetermined period. Following network de-registration the IVS shall go to standby mode and adopt the eCall 'Idle State' in accordance with the eCall terminal state machine procedures specified in ETSI TS 124 008 [Ref: 7].

7.10 PSAP call back

The call back feature is crucial for the PSAPs.

The PSAP operator shall be able to initiate a call back using the PSAP application system (e.g. call back application user interface) or directly dialling the number using a conventional phone as defined in Ref. 4.

NOTE This clause relates to the abilities of the system located at the PSAP. Following an accident there is no guarantee the IVS will be in a position to respond

The sequence shall be that:

(a) The operator activates the call back application user interface / dials the number

(b) The telephone system processes the call

(c) The IVS automatically answers the call and provides an audio (and optionally visual) feedback both to PSAP and vehicle occupants that the call has been successfully established.

(d) The operator tries to speak to the occupants

(e) The operator clears down the call as defined in subClause 7.9.

.

7.11 Rerouting to another PSAP

The PSAP who initially receives the eCall should process the data included in the MSD, establish the voice communication and handle the call. If required, it may reroute the call to another PSAP.

Different eCall architectures are foreseen and in some architectures the rerouting to another PSAP may be necessary.

The PSAP who initially receives the eCall should process the data included in the MSD, establish the voice communication and handle the call. If appropriate, it may reroute the call to another PSAP. This could be made via data or voice connection.

The eCalls present the same routing difficulties across borders as any other 112 emergency calls. It may occur that the MSD and the voice call are received by a PSAP which is not responsible for handling this emergency. Effective rerouting of the emergency data and voice is the responsibility of border PSAPs.

7.12 Handling non equipped situations / error cases

7.12.1 MSD not transmitted correctly

If the MSD is not transmitted correctly or is not received correctly by the PSAP, then the eCall shall, when possible, continue as a normal speech only TS12 (E112) emergency call.

NOTE ETSI specifies a number of 'Bearer Services' (BS) and 'Tele Services' (TS) in ETSI TS 122 002 [Ref.17] that are characterised by the nature of the services they support and their assigned QoS values. Voice calls are classed as TS11 calls and emergency calls are designated TS12.

NOTE Dialled emergency call numbers are recognised as such by the IVS NAD, which then makes a request to the network in the call set-up message to establish a TS12 emergency call. By utilising a TS12 emergency call for the carriage of speech and in-band data, an eCall is afforded the same radio access and call priority as a 112 / E112 call to a PSAP.

7.12.2 False generation of eCalls

All user equipment designed to access a PLMN, including eCall IVS NADs, shall have a valid Subscriber Identification Module (SIM or USIM) and a unique 'International Mobile Equipment Identity' (IMEI). The IMEI is stored in a tamper proof way on the equipment and not on the SIM/USIM. In the event that the IVS malfunctions e.g. generates repeated false eCalls, thus causing interference to the mobile network and the PSAP, then the PLMN operator has the capability to deregister the IVS and deny further access the network.

The NAD's IMEI may also be used to blacklist the device, for end of life management, or if the vehicle is taken off the road for any reason.

NOTE During the IVS NAD network registration process, both the SIM's IMSI (subscriber ID) and the IMEI (unique equipment identifier/ serial number) are authenticated and checked by the network operator. An emergency call from blacklisted eCall IVS IMEI would not normally be accepted by a PLMN that has access to the central PLMN IMEI database.

7.12.3 Network registration fails

If network registration fails then the procedures in Ref.14 shall be followed. The number of re-attempts is specified in subClause 7.15.3.

If network registration with all alternative present networks fails then the NAD may be reset and further attempts made to register.

NOTE Network registration failures will be mitigated by the periodic test call.

7.12.4 Call failure

In the event that the initial eCall attempt fails to connect, or the call is dropped for any reason other than by the PSAP operator clearing the call down, then the IVS NAD shall attempt to redial the call. The interval between the first repeat attempt and subsequent repeat attempts shall be in accordance with ETSI TS 122 001 Annex E [Ref.20] and ETSI TS 123 018 [Ref.21].

Should the MSD not be sent, is lost for any reason, and cannot be resent by the IVS on request from the PSAP, then the eCall shall proceed as a normal speech only TS12 (112) emergency call.

7.12.5 Mobile network not capable to support eCall flag

If the PLMN does not support the eCall flag, the PLMN operator cannot identify the difference between an eCall and an TS12(112) emergency call, and consequently cannot filter eCalls from normal TS12 (112) emergency calls, and select the most appropriate PSAP.

The PSAP will not be able to identify whether the call being received is an eCall or e112 call, and it will not be able to identify if it is an automatic or manual eCall, before it is processed.

The PLMN will then :

7.12.5.1 Route both eCalls and e112 voice calls to a PSAP that is equipped to support the eCall service:

The infrastructure requirement (capacity of incoming calls in the PSAP in-band modem) has consequently to be oversized to be capable to process all the incoming calls (both eCall and e112 calls).

As a consequence of the IVS Initiation signal procedure all eCalls and non-eCalls (both 112 speech only emergency calls) will be delayed of up to 2 seconds before e112 voice calls are connected to a human operator.
The eCall procedures described in the current specification shall apply.

7.12.5.2 Route both eCalls and e112 voice calls to a PSAP not equipped to support the eCall service:

If the eCall is routed to a non eCall equipped PSAP it will be answered like a regular TS12 (112) call by the PSAP telephone system which will route it to the first available operator.

The PSAP operator will hear a common eCall 1-2 second signalling signal that may be recognised as such and used to differentiate eCalls from other emergency calls.

NOTE Regular e112 calls will be unaffected.

7.12.6 eCall routed to a non equipped PSAP

7.12.6.1 If the eCall is routed to a non eCall equipped PSAP it will be answered like a regular TS12 (112) call by the PSAP telephone system which will route it to the first available operator.

7.12.6.2 The MNO shall route the 112 call with eCall flag to the most appropriate PSAP.

7.12.6.3 The eCall enters to the telephone system through the special eCall lines.

7.12.6.4 The call is routed to the operator knowing that it is an eCall.

7.12.6.5 The operator hears the eCall sounds.

7.12.6.6 Voice call is established.

7.12.7 PSAP modem failure

7.12.7.1 Before link layer ACK is sent

As subClause 7.13.5.

7.12.7.2 After link layer ACK is sent

The IVS waits for application AL-ACK for a maximum of 10 seconds. After this the loudspeaker and microphone in the car are reconnected to the line.

The PSAP application timer arrives to its maximum (10 seconds), establish the audio link and the call is routed to the operator.

If a "Send MSD" request is triggered while the IVS is waiting for the AL-ACK a new MSD shall be sent and the link layer and AL-ACK sequence is repeated.

7.12.7.3 After application ACK is sent

The voice call and the MSD have already been rerouted to an operator, and the MSD content verified and acknowledged.

7.12.8 PSAP network/ICT failure

As subClause 7.13.5

7.12.9 PSAP application failure

Voice is available. As subClause 7.13.5

7.12.10 PSAP Operator does not respond

The PSAP shall apply their standard procedure to resolve this situation.

7.12.11 MSD not sent

If the IVS does not receive a response from the PSAP modem server within 2 seconds from the call being answered by the PSAP operator or PSAP eCall modem then the IVS shall reconnect its loudspeaker and microphoe to the line and the call shall continue as a speech only TS12 (112) emergency call.

Should the IVS be unable to send the MSD error free to the PSAP within [20] seconds then the IVS shall reconnect its audio communications equipment to the line and the call shall continue as a speech only TS12 (112) emergency call.

7.12.12 MSD not received

An eCall MSD may not be received for several reasons including:

- The eCall has been routed to a PSAP that is not equipped for the eCall service

- The MSD has not been compiled due to partial IVS equipment failure

- The MSD as sent by the IVS NAD is or has become corrupted

- The PSAP has re-requested but not received an error free copy of the MSD

- The IVS MSD transmission attempt has timed out due e.g. to impaired radio access conditions

In the event of the above and similar MSD reception failure cases the eCall shall continue as a speech only TS12 (112) emergency call.

Should the PSAP not receive a an INITIATION signal within 2 seconds from answering the call, or if the MSD is not received error free as determined by the link layer CRC within 20 seconds, then the eCall shall continue as a speech only TS12 (112) emergency call.

If the PSAP has the capability, and the PSAP operator having spoken with vehicle occupants determines that emergency call is an eCall, then the PSAP may initiate a request to the IVS to re-attempt to send the MSD. If this fails again then the call reverts to a speech only call.

7.12.13 Audio link not established

If the initial call attempt to the PSAP does not connect for any reason then the IVS shall make automatic repeat attempt in accordance with the procedures described in clauses 7.5.3 and 7.15.3.

If a satisfactory audio link cannot be established between the PSAP operator and the vehicle occupants then this could be for any of the following reasons:

- Access network radio conditions cannot sustain a speech call to the PSAP and the network will normally clear-down such calls. In this event the IVS NAD shall initiate the repeat attempt procedure.

- The audio equipment in the vehicle is malfunctioning or has been damaged. The PSAP may still have received the MSD and the MSD application layer acknowledgment may be used to provide a visual indication to the vehicle occupants that the PSAP has received the MSD and is being acted upon.

- The vehicle occupants may be incapacitated and unable to respond to the PSAP operator. PSAP will use the information in the MSD to despatch rescue service personnel.

7.12.14 Audio link established but subsequently fails

Should the call drop for any reason other than having been cleared down by PSAP, then the IVS shall reattempt to establish a new connection to the PSAP in accordance with clauses 7.5.3 and 7.15.3. If the

PSAP has received the MSD and no longer needs to communicate with the vehicle occupants then the PSAP operator may clear-down the call.

When the PSAP initiates the call clear-down procedure the IVS shall not attempt to automatically reCall the PSAP, but the IVS shall allow manually initiated eCall attempts at any time.

7.12.15 Re-attempt in case of interrupted call

See clauses 7.1.3, 7.1.5, 7.5.3, 7.15.3 and 7.15.15.

7.12.16 Automatic repeat attempts

In the event that the initial eCall attempt fails to connect, or the call is dropped for any reason other than by the PSAP operator clearing the call down, then the IVS NAD shall attempt to redial the call. The interval between the first repeat attempt and subsequent repeat attempts shall be in accordance with ETSI TS 122 001 Annex E [Ref.20] and ETSI TS 123 018 [Ref.21].

7.12.17 IVS NAD does not receive clear-down

If the IVS NAD does not receive a clear-down indication from the mobile network, or an application layer clear-down message from the PSAP and the clear-down fall-back timer has reached 12 hours, the call shall be cleared down..

7.12.18 IVS NAD configured for eCalls only

An IVS NAD configured to make eCalls and test calls only shall, following call clear-down and expiration of the De-registration Fallback Timer (DFT) 12 hour period, de-register from the serving network.

8 Third party support for eCall

8.1 Overview

The core focus of this Standard is the provision of high level application protocols for Pan European eCall. Clause 7 has determined these protocols. As described in Clause 6, the situation for 'Third Party eCall Support' [Ref.5] is somewhat different, because the detail of how TPS operator communicates to/from the vehicle is service provider specific.

However, the basic service to be received by the PSAP has to remain the same and the eCall shall be received by the most appropriate PSAP in the same way as Pan European eCall. It means that the PSAP operator must have access to at least the same set of functionalities whether the eCall comes from a pan-European implementation or from a TPS implementation.

Therefore, in this Standard, in respect of 'Third Party Support for eCall', only the common requirements set of functionalities and service provided to the PSAP are determined herein.

Figure 9 illustrates the 'TPS eCall' service

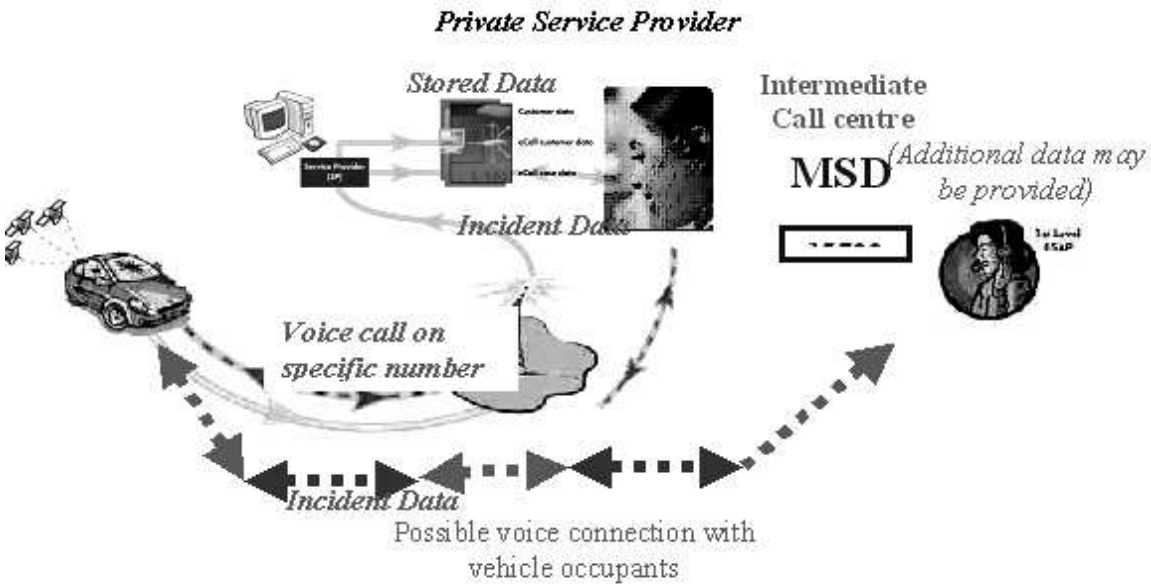

Figure 9: Third Party Support for eCall

8.2 Principles of TPS-eCall data transmission

It may be quicker and more efficient to transmit all the information available at the TPSP to the most appropriate PSAP through a data transmission protocol. This way implies

- that the destination PSAP can manage the protocol,
- that the TPS-eCall TPSP manages a list of the PSAPs able to receive this protocol, with, for each PSAP, the necessary contact details of that PSAP.

This solution involves a separate electronic transfer of the emergency call details to supplement the voice call, and is described below. Note that although the requirements below refer to the transfer of a TPS-eCall Set of Data (TSD), this inherently includes the transfer of a Minimum Set of Data (MSD).

This method assumes that the TPSP has communicated a data reference to the PSAP via the voice call (TPS-eCall-SID) so that the PSAP operator can access the relevant received data-set to match this voice call, or that the TPSP provides a reliable caller-ID which can be used to reference the relevant data set.

8.2.1 Push of TSD to PSAP

When using this TPS-eCall data transfer variant, the PSAP shall provide a restricted-access TSD-server which shall allow a TPSP to post a TSD in a standardised machine-readable format.

The TPSP shall post the TSD to the PSAP emergency TSD-Push address.

The PSAP's operator shall access the received TSD, by reference to a unique TPS-eCall identifier received via the voiceCall.

Figure 10 illustrates the end-to-end Pan-European eCall and TPS eCall systems connected to an eCall enabled PSAP

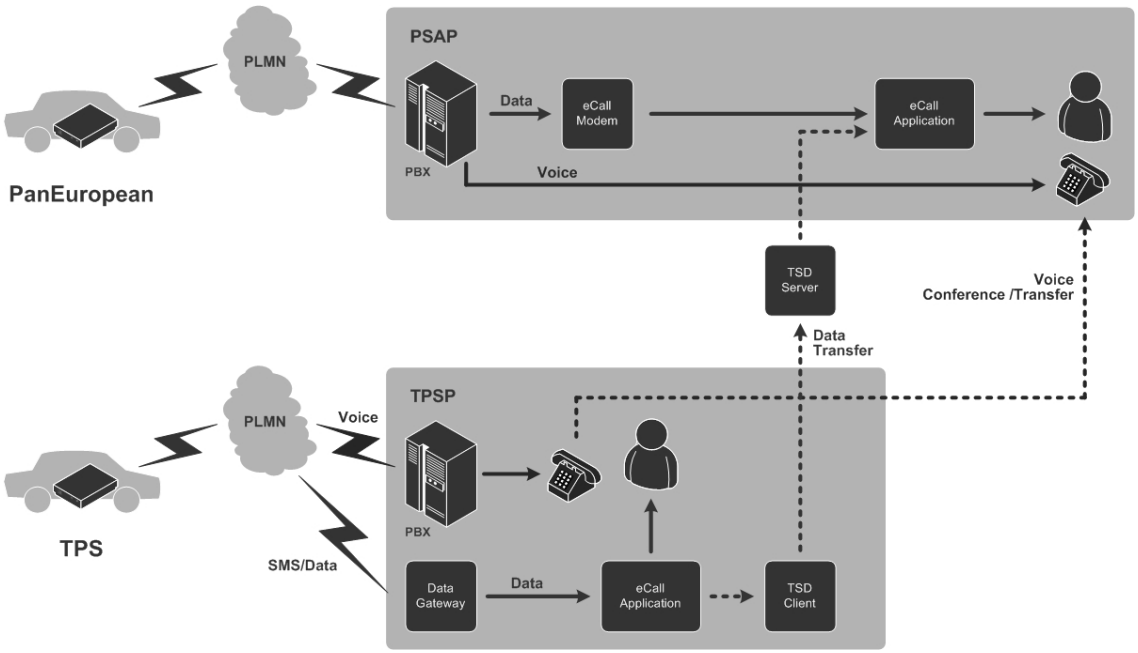

Figure 10: end-to-end Pan-European eCall and TPS eCall systems connected to an eCall enabled PSAP

8.3 Reception of TPS eCall by the TPSP

TPSP receives TPS eCall case (voice and data) from the vehicle as described in TPS eCall Operating requirements [Ref.5].

8.4 Qualification (filtering) of the TPS eCall by the TPSP operator

TPSP operator qualifies the TPS eCall case by visualizing the TPS eCall data in its TPSP eCall application and speaking with the vehicle occupants through the voice link.

8.5 Sending the TSD data to the PSAP

If the TPS eCall case is confirmed to be an emergency, i.e. a real emergency situation likely to require assistance from the emergency services so that there is a need to contact a PSAP, the TPSP operator (or an automated feature of the TPSP eCall application) shall select the most appropriate PSAP from the PSAP database embedded in his TPSP eCall application and post the TPS eCall data set (TSD) to the PSAP TSD server.

8.6 Link layer ACK to the TPSP

After successful reception of the TSD, the PSAP TSD server shall send a link layer ACK to the TPSP TSD client as described in TPS eCall Operating requirements [Ref.5].

The TSD data received by the PSAP TSD server shall be sent to the PSAP eCall application which shall create a new eCall case and place it in the queue of the PSAP eCall application.

The TPS eCall cases shall be displayed to the PSAP operators in a distinctive manner to identify that this eCall is handled via a TPSP.

8.7 Application layer ACK from PSAP to TPSP

When opening the eCall case from the PSAP application eCall queue, the PSAP operator shall instruct the PSAP eCall application to send an application layer ACK to the TPSP eCall application confirming to the TPSP operator the opening of the TPS eCall case by the PSAP operator.

8.8 Establishing voice link between PSAP operator and vehicle occupants

When visualizing the TPS eCall data displayed to him, the PSAP operator shall decide whether a conversation is necessary with the occupants of the vehicle in which he/she shall instruct the TPSP operator to establish a voice connection with the vehicle occupants.

8.9 Request Send TSD

At any time, the PSAP operator can ask the TPSP operator to provide a new TSD and have it pushed to him using the process described above.

8.10 Call clear-down

The PSAP operator shall clear-down the call to the TPSP by clicking the call clear-down user interface of his PSAP eCall application. By doing so, the PSAP eCall application shall send a clear-down message to the TPSP application confirming closure of this TPS eCall case.

Note : the clear-down message can be used by the TPSP eCall application to notify the TPSP operator visually or provide record of the end of the case.

9 Defences against attack

9.1 Call line security

ECall is afforded the same level of protection as any 112 call.

ETSI 121 133 [Re.25] provides detail of security provisions on the mobile telephone network and provides guidance to threat management.

ECall uses a SIM card, so all transactions are encrypted.

The threat of call line security is therefore less than that for normal e112 calls

The window of opportunity is in any event limited to 2 seconds by the protocols, or in the event of deference to a 112 call, 10 seconds.

9.2 Hoax calls

The threat of hoax calls is a continual problem for PSAPs. However, unlike a hoax voice call the potential hoaxer would have to simulate the protocols and create a false MSD, otherwise the eCall will fail, and will transfer to an operator, or the identity of the calling vehicle will be identified, unless, of course the call is generated from a 'faked' SIM.

The use of an in-band modem makes it more difficult to spoof than a voice call SMS call or standard modem. Security in these respects is therefore significantly better than normal 112 calls.

At end of life of a vehicle, the SIM is disabled, limiting the threat of using a real IVS for a fake call to stolen vehicles or vehicles purchased specifically for such purpose

9.3 Denial of service attack

Assuming the use of the eCall flag, the call will be directed to the eCall modem, thus minimising the demand on PSAP voice lines. Denial of service attacks through system overload is therefore much less likely than, for example a direct attack using 112 calls from mobile telephones.

9.4 Malicious attack on PSAP

This is a constant risk to PSAPs. The possibility that a malicious caller/terrorist will attempt to lure emergency resources to, or away from, a target is always present. This threat is more probable with a mobile phone 112 call than an eCall.

eCall could however potentially be used in the same way. The probability of threat to 'fake' the ID of a genuine emergency vehicle is small enough (because of SIM security) that no specific additional provisions are made.

In the event that an MSD is simulated, assuming that the MSD is comprehensible, both the vehicle location from the MSD and the location of the phone cell will be available for comparison.

The faking of an MSD in this circumstance would be more complicated than simply triggering an eCall at the designated location, or making a 112 call from this location, so is not seen as a probable event.

However, PSAP procedures for handling such threats are already determined by PSAPs. It is not the intention of this Standard to propose or suggest such procedures (and Ref.25 is available to provide guidance if needed). However it is important to show that eCall does not increase these risks, and indeed carries less risk than an e112 voice call.

10 Quality of service requirements

This European Standard determines the high level application protocols and sequences required to effect the eCall service.

The quality of service requirements of 'Pan European eCall' are defined in Ref.4, Ref.6, Ref.7, Ref.8, Ref.9, Ref.10, Ref.11, Ref.12, and Ref.13.

The quality of service requirements of 'Third Party Support for eCall' are defined in Ref.5, Ref.11, and Ref.12.

11 Test and conformance requirements

This chapter defines the test and conformance requirements for the high level application protocols. This is consistent with the Pan-European Operating Requirements [Ref 4]. The IVS NAD test and conformance requirements are specified in ETSI Ref.23 and Ref.24.. The eCall modems are tested in conformance with Ref.10. This Clause does not provide test and conformance requirements for TPS eCall.

The interactions between the application layer (AL) and the link layer (LL) are achieved between 'Application Service Access Point' (ASAP) and 'Link Service Access Point' (LSAP) such as represented on Figure 11.1 below.

This Clause determines procedures, but does not determine the occasions on which such tests should be made, nor the frequency of such testing. Ref 4 and/or EU and/or National regulations will make such determinations.

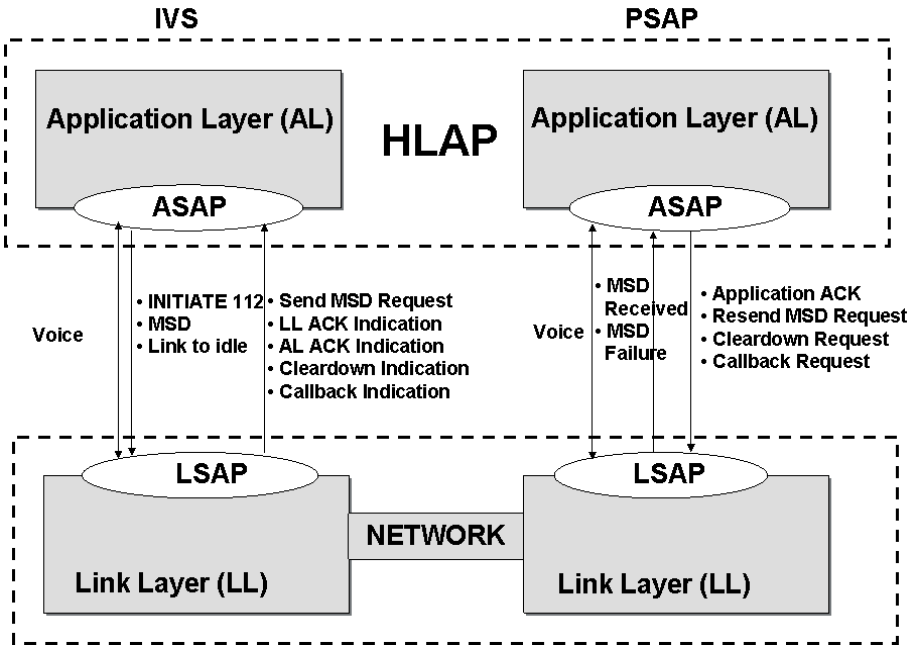

Figure 11: Interactions between application layer and link layer

The OSI conformance testing procedure is defined in the international ISO / IEC Standard 9646 'Conformance testing methodology and framework' and is a well established methodology. Conformance testing is useful when the implementation interfaces are clear and unambiguous conformance requirements are set.

Conformance testing is based on a testing methodology. This methodology covers the following four phases:

- Selection of conformance points: 'Conformance Points' (CP) are reference points selected for testing and, where conformance criteria has been defined. A reference point is a potential interaction to be tested.

- Production of a conformance requirement catalogue and / or PICS proforma: Gather the collection of requirements and develop either a requirements catalogue or the PICS ('Protocol Implementation Conformance Statement') proforma.

- Decision on the testing strategy and development of the TSS&TP ('Test Suite Structure and Test Purpose') document. From the PICS or alternatively the Conformance Criteria, the TSS&TP

should be produced. The TPs provides a short description of each test objective using words, not specifying means of testing. The TSS is the grouping of test cases in blocks based on the tested functionality. Normally TSS and TP are collected in the same document, the TSS&TP. Production of the ATS (Abstract Test Suites) or detailed specification: From this document, the ATS document is developed. The ATS provides a set of complete and independent specifications of the steps required to achieve a certain test purpose. For protocol testing an ATS collects all test cases and is written in a standardized language such as TTCN.

This clause covers the two first phases, proposes a testing strategy in appendix C and a set of test purpose.

11.1 Test and conformance requirements for the IVS

This European Standard provides only the test and conformance requirements for the 'High Level Application Protocols' for Pan European eCall. The conformance requirements for the ETSI standardized eCall in-band modem are specified in ETSI TS 126 269 [Ref. 10]. Conformance test requirements for the eCall IVS 'Network Access Device' (NAD) are in accordance with ETSI harmonized GSM / UMTS specifications and the R&TTE Directive.

11.1.1 Selection of conformance points for the IVS

Table 2 summarizes the conformance points for the in-vehicle system.

Table 2: Conformance points for the in-vehicle system

Main object	Composed of:	Conformance points
In-vehicle system - Normal operating mode	Activation of Pan European eCall	Conforming to sub-Clause 7.2 of this document.
	Call set-up	Conforming to sub-Clause 7.3 of this document only for the clauses relative to IVS application layer..
	MSD transfer	Conformance to sub-Clause 7.4 of this document only for the clauses relative to IVS application layer.
	Application layer ACK	Conforming to sub-Clause 7.5 of this document only for the clauses relative to IVS application layer.
	No receipt of application ACK	Conforming to sub-Clause 7.5.3 of this document.
	Request “Send MSD”	Conforming to sub-Clauses 7.5.4 and 7.6 of this document only for the clauses relative to the IVS application layer.
	Check audio link to vehicle occupants	Conforming to sub-Clause 7.8 of this document.

	Call clear-down	Conforming to sub-Clause 7.5.5 and 7.9 of this document only for clauses relative to IVS application layer.
	eCall session termination	Conforming to sub-Clause 7.9 of this document.
	PSAP Call back	Conforming to sub-Clause 7.10 of this document only for the clauses relative to IVS application layer.
In-vehicle system – Handling non equipped situations / error cases	MSD not transmitted correctly	Conforming to 7.12.1 of this document.
	PSAP Modem failure before link layer LL-ACK is sent	Conforming to 7.12.7.1 of this document.
	PSAP Modem failure after link layer LL-ACK is sent	Conforming to 7.12.7.2 of this document.
	IVS does not receive a clear-down.	Conforming to 7.12.16 of this document

11.1.2 Test purpose for the IVS

IVSTP01: To verify that the eCall equipped IVS has the capability to be initiated via an external interface with the fix data values required for the building of the MSD.

IVSTP02: To verify that upon vehicle ignition, the IVS has the capability to achieve some self test and activate a pan European eCall in both test and operating mode (RIVS 01, 02, 03).

IVSTP03: To verify that the eCall equipped IVS has the capability to switch from operating mode to test mode and vice versa via some mechanism inaccessible to the user (RIVS 02, 03).

IVSTP04: To verify that the eCall equipped IVS has the capability to activate a pan European eCall in conformity to Ref 4 (RIVS 04, 05).

IVSTP05: To verify that the eCall equipped IVS has the capability to start a call set-up (RIVS 06).

IVSTP06: To verify that the eCall equipped IVS has the capability to send the latest MSD version under a PSAP request during any phase of an eCall session (RIVS 07, 12).

IVSTP07: To verify that the eCall equipped IVS has the capability to connect its audio system to the line both after receiving an (application layer) AL-ACK or in the case of not receiving it (RIVS 08, 09, 14, 15, 16).

IVSTP08: To verify that the eCall equipped IVS has the capability to maintain an audio link of sufficient quality between the PSAP and the vehicle occupants (RIVS 09).

IVSTP09: To verify that the eCall equipped IVS has the capability to terminate the 112 link when receiving a clear-down indication from the PSAP (RIVS 10).

IVSTP10: To verify that the eCall equipped IVS has the capability to terminate an eCall session after timer of nn minutes (nn as determined in Ref .4) following the last received clear-down from the PSAP (RIVS 11).

IVSTP11: To verify that, following the reception of a PSAP call back, the IVS has the capability to reconnect its audio equipment to the line and ensure audio exchange between vehicle occupants and PSAP / rescue team operator (RIVS 13).

IVSTP12: To verify that if the MSD can not be transferred to the PSAP, the IVS has the capability to connect its audio system to the line (RIVS 14, 15, 16).

IVSTP13: To verify that that the eCall equipped IVS has the capability to return to an idle mode in case of no reception of a PSAP clear-down (RIVS 17).

11.1.3 Conformance requirements catalogue for the IVS

Based on identified conformance points, the identified conformance requirements are the following:

- **RIVS 01**: Upon vehicle ignition and providing that:
  - The eCall service has been enabled
  - The eCall service is not in a test mode

;test the IVS application layer capability of executing a self test and be switching to eCall service idle state ready to activate a pan European eCall.

- **RIVS 02**: Test that upon vehicle ignition and providing that the test indicator is set, the IVS application layer has the capability of switching to test mode and be ready to activate a pan European eCall for test purpose.

- **RIVS 03**: Test that when the eCall service is in a test mode, the IVS application layer behaviour is the same as being in an operating mode. However, in test mode, the IVS application layer shall use its given E164 number. In a test mode, the eCall generation can be either automatically or manually triggered. At the end of the test, the IVS application layer has the capability to be switched back to the operating mode.

- **RIVS 04**: Test that upon the automatic detection of a crash such as defined in Ref. 4, the IVS application layer has the capability to activate a pan European eCall with the e-Call flag set to the right value.

- **RIVS 05**: Test that upon detection of a manual triggering such as defined in CEN standard Ref. 4, the IVS application layer has the capability to activate a pan European eCall with the eCall flag set to the right value.

- **RIVS 06**: Test that when activating a pan European eCall, the IVS application layer has the capability to:
  - Interrupt immediately any ongoing communication using the communication channel required for eCall.
  - Initiate the 112 liaison setting-up through an 'initiate 112' request sent to its link layer. At that time, the IVS application layer shall indicate to the IVS link layer the type of eCall triggering (automatic or manual), for the link layer be capable of selecting properly the flag value to be associated to the eCall.

- Ensures that the IVS audio system is disconnected from the telephone line
- Build the MSD according to the TS 15722 standard. Each MSD field shall contain consistent values
- Mute other installed in-vehicle audio equipment for the duration of the eCall.
- Start a “clear-down fallback” timer with a value of 12 hours.

▪ **RIVS 07**: Test that once an MSD message has been properly formatted, the IVS application has the capability to:

- Wait for a link layer “Send MSD” request.
- Upon reception of a link layer “Send MSD” request, transfer the last MSD version to the link layer.
- Start a 20 seconds timer and wait for a link layer LL-ACK indication.

▪ **RIVS 08**: Test that upon reception of a “link layer LL-ACK” indication, the IVS application layer has the capability to:

- Stop the 20 seconds MSD “LL-ACK” timer.
- Start a 10 second MSD “AL- ACK” timer
- Wait for a link layer “Application AL-ACK” indication.

▪ **RIVS 09**: Test that upon reception of a link layer “AL-ACK” indication before the 10 seconds timer timeout, the IVS application layer has the capability to:

- Stop the 10 second MSD “AL-ACK” timer,
- Reconnect the IVS audio system to the line and maintain it so enabling voice communication between the vehicle occupants and the PSAP operator.

▪ **RIVS 10**: Test that upon reception of a link layer “clear-down” indication, the IVS application layer has the capability to:

- Enter its clear-down state,
- Start a “termination” timer of nn minutes (nn as determined in Ref .4)
- Stay registered to the current MNO.
- Wait for any request originated by the PSAP and communicated by its link layer (“call-back request” or “MSD send” request),

NOTE In this state, if the IVS supports some other telematics services, it can then initiate new telephone calls providing that the current registered MNO be the 'Home' PLMN or a 'Visited' PLMN.

▪ **RIVS 11**: Test that upon its “termination” timer timeout, the IVS application layer has the capability to:

- Terminate the eCall session
- Reset the link layer (deregister from the MNO)
- Return to eCall idle state.

- **RIVS 12**: Test that upon reception of a link layer “Send MSD” indication during an eCall session, the IVS application layer has the capability to:
  - Transfer the latest version of the MSD to its link layer
  - Start a 20 seconds timer and wait for a “lLL-ACK” indication.
- **RIVS 13**: Test that upon reception of a link layer “call back” indication, the IVS application layer has the capability to:
  - Connect the IVS audio equipment to the telephone line
  - Wait for a link layer “clear-down” indication while maintaining the audio exchange between the vehicle occupants and the PSAP operator / emergency vehicle.
- **RIVS 14**: Test that if two seconds after sending an “INITIATION" message to its link layer, the IVS application layer has not received a “Send MSD” request, the IVS application layer has the capability to re-connect is audio system to the line and maintain the audio communication between the vehicle occupants and the PSAP operator as long as not receiving a “clear-down” indication from its link layer.
- **RIVS 15**: Test that if 20 seconds after sending the MSD to its link layer, the IVS application layer has not received a “LL-ACK” indication, the IVS application layer has the capability to re-connect is audio system to the line and maintain the audio communication between the vehicle occupants and the PSAP operator as long as not receiving a “clear-down” indication from its link layer.
- **RIVS 16**: Test that if 10 seconds after receiving a ”LL-ACK” indication the IVS application layer has not received an “AL-ACK” from its link layer, the IVS application layer has the capability to re-connect its audio system to the line and maintain the audio communication between the vehicle occupants and the PSAP operator as long as not receiving a “clear-down” indication from its link layer.
- **RIVS 17**: test that when the “clear-down fallback” timer times out, the IVS application layer has the capability to return in an idle state and request its NAD to deregister from the line.

11.2 Test and conformance requirements for the PSAP equipment

This European Standard provides only the test and conformance requirements for the 'High Level Application Protocols'. The conformance requirements for the ETSI standardized eCall in-band modem are specified in ETSI TS 126 269 [ref. 10]. Conformance test requirements for the eCall IVS 'Network Access Device' (NAD) are in accordance with ETSI harmonized GSM / UMTS specifications and the R&TTE Directive.

11.2.1 Selection of conformance points for the PSAP equipment

Table 3: Selection of conformance points for the PSAP equipment

Main object	Composed of:	Conformance points
PSAP station Normal operating mode	E112 call management	Specified by ETSI TS [Ref.23] and [Ref.24]
	Cell position and caller ID presentation.	Specified by ETSI TS [Ref 22], ETSI TS [16]. See the ETSI standard to refer to get the Caller ID?

	Test call received by PSAP	Conforming to sub-Clause 7.5.5.
	Received MSD management ▪ Automatic processing ▪ Operator decision	Conforming to sub-Clause 7.5, clauses 7.5.1 and 7.5.2.
	PSAP operator HMI	Conforming to sub-Clause 7.7.
	Audio exchange	Conforming to sub-Clause 7.8.
	Calling back the vehicle	Conforming to sub-Clause 7.10
	Request send MSD	Conforming to sub-Clauses 7.5.4, 7.6.
	PSAP call clear-down	Conforming to sub-Clauses 7.5.5, 7.9.
PSAP Station Exception cases	PSAP unable to receive MSD	Conforming to sub-Clause 7.12

11.2.2 Test purpose for the PSAP equipment

In the following test purpose description, no assumption is made on the nature of the test system being used e.g. real IVS or specialised test system simulating an IVS.

In the following test purpose description, no assumption is made on the nature of the test system being used e.g. real IVS or specialised test system simulating an IVS.

PSAPSTP01: To verify that the eCall equipped PSAP application layer has the capability to receive an MSD, decode it, check its error free and verify its conformity to Ref.1 (RPSAP01, 02).

PSAPSTP02: To verify that the PSAP application layer has the capability to display the MSD content and some other elements, e.g. caller ID, cell position, decoded VIN to the PSAP operator as required in sub-Clause 7.7 of this document (RPSAP03).

PSAPSTP03: To verify that the eCall equipped PSAP application layer has the capability to automatically or manually request to its link layer the transmission of an “AL-ACK” response to the IVS (RPSAP02, 03).

PSAPSTP04: To verify that the eCall equipped PSAP application layer has the capability to request its link layer to transmit a “Send MSD” request to the IVS at any time during the eCall session (RPSAP 08).

PSAPSTP05: To verify that the eCall equipped PSAP application layer has the capability to request its link layer to transmit a “clear-down” request to the IVS at any time after the reception of an MSD while the e112 call stays present (RPSAP 07).

PSAPSTP06: To verify that the eCall equipped PSAP application layer has the capability to connect the audio system of the PSAP operator to the receiving line. Then verify that a bi-directional audio communication is achievable between the PSAP operator and the vehicle occupants. This shall be possible in the following conditions:

- After the request to its link layer to transmit an “application" ACK” to the IVS.
- After the signalling by its link layer of an MSD failure.

(RPSAP 06)

PSAPSTP07: To verify that the eCall equipped PSAP application layer is behaving as expected when receiving a test call, e.g. generating a “clear-down” request to its link layer or forwarding the call to a test PSAP (RPSAP 05).

PSAPSTP08: To verify that the eCall equipped PSAP application layer has the capability to send a “call back” request to its link layer for the purpose of re-establishing an audio liaison between the PSAP operator / rescue team and the occupants of the vehicle (RPSAP 09).

11.2.3 Conformance requirements catalogue for the PSAP equipment

Based on identified conformance points, the conformance requirements are the following:

- **RPSAP01**: Test that when receiving an “MSD Receive” indication from its link layer, the PSAP application layer has the capability to process immediately the MSD or present it to the PSAP operator for acknowledgement.
- **RPSAP02**: Test that if the received MSD is processed automatically and accepted by the PSAP application layer according to its MSD acceptance rules, then the PSAP application layer has the capability to issue an “AL-ACK” response to its link layer in less than 10 seconds after the reception of the MSD.
- **RPSAP03**: Test that if the received MSD is processed by the PSAP operator:
  - The PSAP application layer has the capability to display the MSD content and some other associated data to the PSAP operator,
  - The operator has the possibility to request the application layer to accept the MSD ask for a new MSD, or clear-down the call (e.g. if it is a test).
  - The application layer has the capability to transfer the PSAP operator response to its link layer and route the call to the operator so establishing the audio liaison with the vehicle occupants.
- **RPSAP04**: Test that if a MSD message is not properly received (invalid CRC, invalid data etc.), the PSAP application layer / operator may issue a “Send MSD” request to its link layer. Test that the PSAP application layer has also the capability to directly connect the PSAP audio system to the line without responding to the link layer.
- **RPSAP05**: Test that if the MSD message is a test message, the PSAP application layer has the capability to automatically execute one of the two following actions such as programmed by the PSAP:
  - Issue a “clear-down” request to its link layer to terminate the test.
  - Transfer the eCall session to a test PSAP, e.g. accredited test laboratory, having the capabilities to execute standard test suites.

- **RPSAP06**: Test that when an “AL-ACK” response is sent by PSAP application layer to the PSAP link layer, the PSAP application layer has the capability to establish the audio liaison with the PSAP operator.

- **RPSAP07**: Test that at any time, the PSAP operator has the capability to request to its application layer to issue a call clear-down to the IVS. In such case, the PSAP application layer shall issue a “clear-down request" to its link layer.

- **RPSAP08**: Test that at any time during an eCall session, when a PSAP operator / rescue team is requesting an MSD resend to its application layer, this one has the capability to issue to its link layer a resend MSD request.

- **RPSAP09**: Test that during a period of nn minutes (nn as determined in Ref.4) if a PSAP operator / rescue team issues a call-back request to its application layer, this one has the capability to issue to its link layer a call back request. This is achieved using the Caller ID stored when receiving the call.

- **RPSAP10**: Test that if the PSAP application layer receives a “MSD failure” indication from its link layer, the PSAP application layer has the capability to request a “Send MSD” or to directly establish a voice liaison between the PSAP operator and the vehicle occupants.

12 Marking, labelling and packaging

Marking, labelling and packaging shall be in accordance with Ref.4 or Ref.5 as appropriate, and Ref.11 and Ref.12.

Annex A
(normative)

Table of timings

Description	Requirement	Value
Manually Initiated eCall (MIeC) false triggering cancellation period	Vehicle occupants may cancel a false triggering of a manually initiated eCall before call set-up.	Specified by manufacturer.
IVS Clear-down Fallback Timer (CFT)	If the IVS NAD does not receive a clear-down indication from the mobile network, or an application layer clear-down message from the PSAP and the clear-down call back timer has reached 12 hours, the call shall be cleared down.	12 hours
IVS INITIATION signal duration	The IVS INITIATION signal shall not persist for longer than 2 seconds from when the UE receives notification that the call is first answered[WD1].	2 seconds
PSAP wait for INITIATION signal period	If a valid INITIATION message is not received by the PSAP modem within 2 seconds then the call shall be routed to a PSAP operator.	2 seconds
IVS wait for SEND MSD period	If the IVS eCall modem, whilst sending the INITIATION message, does not receive or recognise a valid 'SEND MSD' message from the PSAP eCall modem within 2 seconds, from the time that the IVS receives an indication that the PSAP has answered the call, it shall reconnect the IVS loudspeaker and microphone in the vehicle."[JMW2]	2 seconds
IVS wait for AL-ACK period	If an AL-ACK is not received within 10 seconds from receipt of the link layer ACK, the speaker and microphone in the vehicle shall be reconnected to the line in order to enable the call to revert to an e112 voice call.	10 seconds
IVS MSD maximum transmission time	If the IVS does not receive a link layer ACK (LL-ACK) within 20 seconds from the start of MSD transmission, it shall cease transmission and the IVS audio	20 seconds

	system shall be re-connected.	
PSAP MSD maximum reception time	If the PSAP eCall modem does not send a link layer ACK (LL-ACK) within 20 seconds after having sent the 'SEND MSD' message to the IVS eCall modem, it shall route the voice call to a PSAP operator.	20 seconds
IVS NAD (eCall only configuration) minimum network registration period	Following call clear-down by the PSAP the IVS NAD shall remain registered on the serving network and available to receive calls from the PSAP and rescue workers for a minimum period as defined in Ref.4.	[>120 minutes]
IVS NAD (eCall only configuration) network De-registration Fallback Timer (DFT)	An IVS NAD configured to make eCalls and test calls only shall, following call clear-down and expiration of the De-registration Fallback Timer (DFT) 12 hour period, de-register from the serving network.	[12 hours]

Annex B
(informative)

Summary abstracts of normative referenced documents

Objective

There are many standards and Directives referenced in this Standard. For ease of use, this informative Annex contains the scope statements (or equivalents) of referenced Standards and Directives used in this standard:

[Ref.1] EN/TS 15722 Road transport and traffic telematics — ESafety — ECall minimum set of data

This European Standard defines the standard data concepts that comprise the "Minimum Set of Data" to be transferred from a vehicle to a 'Public Safety Answering Point' (PSAP) in the event of a crash or emergency via an 'eCall' communication session.

NOTE 1. The communications media protocols and methods for the transmission of the eCall message are not specified in this Standard.

NOTE 2. Additional data concepts may also be transferred, and any such data concepts should be registered using a data registry as defined in ISO 24978 (Intelligent transport systems, Emergency and safety messages, Data registry)

[Ref.2] ISO 24978 Intelligent transport systems — ITS Safety and emergency messages using any available wireless media — Data registry procedures

A Standardized set of protocols, parameters, and a method of management of an updateable "Data Registry" to provide application layers for "ITS Safety messages" via any available wireless media.

[Ref.3] WGS84 World Geodetic System 84 (last revised 2004)

The World Geodetic System is a standard for use in cartography, geodesy, and navigation. It comprises a standard coordinate frame for the Earth, a standard spheroidal reference surface (the datum or reference ellipsoid) for raw altitude data, and a gravitational equipotential surface (the geoid) that defines the nominal sea level.

The latest revision is WGS 84 (dating from 1984 and last revised in 2004), which will be valid up to about 2010. Earlier schemes included WGS 72, WGS 66, and WGS 60. WGS 84 is the reference coordinate system used by the Global Positioning System.

[Ref.4] in vote Intelligent transport systems — ESafety — Pan European eCall- Operating requirements

The objective of implementing the pan-European in-vehicle emergency call system (eCall) is to automate the notification of a traffic accident, wherever in Europe, with the same technical standards and the same Quality of Services objectives by using the Mobile Telecommunication network (e.g. GSM) and the European pre-assigned emergency destination address (112), and to provide a means of manually triggering the notification of an incident.

This European Standard defines the general operating requirements and intrinsic procedures for in-vehicle emergency call (eCall) services in order to transfer an emergency message from a vehicle to a 'Public Safety Answering Point' (PSAP) in the event of a crash or emergency, via an 'eCall' communication session and to establish a voice channel between the in-vehicle equipment and the PSAP.

Third party eCall supportive services, including private in-vehicle emergency services, are outside the scope of this document.

NOTE 1. The communications protocols and methods for the transmission of the 'eCall' message are not specified in this Standard.

NOTE 2. This European Standard determines the operating requirements for an 'eCall' service. An important part of the 'eCall' Service is a "Minimum Set of Data" (MSD). The operating requirements for the MSD are determined in this European Standard, but the form and data content of the MSD is not defined herein. A common European MSD is determined in EN 15722.

Ref.5 ***in vote*** **Intelligent transport systems — ESafety — Third party supporting eCall - Operating requirements**

The objective of implementing a 'Third Party' emergency call is to provide emergency assistance and an automated notification of a traffic accident, using 'Third Party Supported' service packages where such services are supported between the vehicle and a 'Third Party Service Provider' in countries where such services are supported by PSAPs.

The first objective of this 'TPS-eCall' is to transfer an emergency message from a vehicle to a 'Third Party Service Provider' (TPSP) in the event of a crash or an emergency situation, and to establish a voice channel between the in-vehicle equipment and the TPSP.

The second objective of this 'TPS-eCall' is, in case of an emergency situation likely to require emergency assistance, for the TPSP to transfer an emergency message including the 'Minimum Set of Data' (MSD) (as defined in [Ref 1]) from the TPSP to the most appropriate PSAP and to make best efforts to establish a direct voice contact between that PSAP and the occupants of the vehicle if required by the PSAP.

An equipment manufacturer remains free to choose the kind of service supported (e.g. Paneuropean or TPS eCall,) provided that it guarantees interoperability in each of the EU 27 countries which have implemented the Pan-European or the TPS eCall infrastructure

This European Standard defines the general operating requirements and intrinsic procedures for an in-vehicle eCall via the services of a third party service provider.

This Standard also provides definition of the service(s) provided to the PSAP and the method and form of service delivery.

NOTE An important part of the TPS-eCall is the "Minimum Set of Data" (MSD). The operating requirements for the MSD are determined in this European Standard, but the form and data content of the MSD is not defined herein. The common European MSD for eCall is determined in [Ref 1].. Additional data concepts may also be transferred, and it is recommended that any such data concepts be registered using a data registry as defined in ISO/EN 24978 (Intelligent transport systems - Emergency and safety messages - Data registry) to ensure that they can be understood by the recipient.

[Ref.6] ETSI TS 122 101 **TSG Services and system aspects: service aspects; service principles (Release 8)**

This document specifies network requirements in terms of service-related capabilities for TISPAN NGN. This document places requirements for all TISPAN NGN subsystems.

This document provides generic requirements for services and interoperability in TISPAN NGN in terms of the capabilities for a network or networks. Requirements on service-related subsystems provide sufficient details for architecture, networking requirements and protocols to be specified. Requirements on service independent subsystems are contained within the service-related subsystem requirements.

Specific service requirements may be contained in other documents, as identified in this document, and by other documents referencing this document.

This document does not define services, only capabilities and requirements. This document does not place requirements on terminals or other customer-owned equipment. This document specifies the service-related requirements that are used to determine the network architecture, requirements and control protocols for a network interface to a customer environment.

NOTE This document uses the term "NGN" only in the context of TISPAN.

[Ref.7] ETSI TS 124 008 TSG core network and terminals: mobile radio interface layer 3 specification; core network protocols; stage 3 [Release 8)

This document specifies the procedures used at the radio interface core network protocols within the 3rd generation mobile telecommunications system and the digital cellular telecommunications system.

It specifies the procedures used at the radio interface (Reference Point Um or Uu, see 3GPP TS 24.002 [15] or 3GPP TS 23.002 [127]) for Call Control (CC), Mobility Management (MM), and Session Management (SM).

When the notations for "further study" or "FS" or "FFS" are present in this TS they mean that the indicated text is not a normative portion of this document.

These procedures are defined in terms of messages exchanged over the control channels of the radio interface. The control channels are described in 3GPP TS 44.003 [16] and 3GPP TS 25.301 [128].

The structured functions and procedures of this protocol and the relationship with other layers and entities are described in general terms in 3GPP TS 24.007 [20].

[Ref.8] ETSI TS 126 267 TSG services and system aspects; eCall data transfer – in-band modem solution; general description [Release 8)

This document specifies the eCall In-band Modem, which is used for reliable transmission of the eCall Minimum Set of Data (MSD) from an In-Vehicle System (IVS) to the Public Safety Answering Point (PSAP) via the voice channel of cellular and PSTN networks.

The European Union eCall requirements, recommendations and guidelines were developed by eSafety Forum [10] and [11], with important additional work produced by ETSI MSG, GSME, 3GPP, and CEN.

Previous work in 3GPP TR 22.967 [3] "Transfer of Emergency Call Data", examined the issues associated with the transmission of emergency call data from a vehicle to a PSAP. This analysis identified that the preferred option be based on an in-band modem solution.

eCall provides reliable full-duplex data communications between IVS and PSAP in addition to emergency voice call (E112) via the cellular network, and can be initiated either automatically or manually [1]. The eCall In-band Modem uses the same voice channel as used for the emergency voice call. eCall allows reliable transmission of MSD alternating with a speech conversation through the existing voice communication paths in cellular mobile phone systems. The expected benefit is that emergency services will be made aware of accidents much more rapidly, will get precise information on location, vehicle type etc. and therefore will be able to reach accident victims faster, with the potential to save many lives annually.

The eCall in-band modem solution described here exceeds the eCall requirements (see Annex A) by means of a combination of innovations in data modulation scheme, synchronization, forward error correction coding, hybrid ARQ (HARQ) and incremental redundancy transmission.

This document provides a general overview and algorithm description of the eCall in-band modems, including IVS modem and PSAP modem, to form the complete full-duplex transmission.

The eCall in-band modems (IVS and PSAP) are fully specified by this TS together with the C-code reference as provided in 3GPP TS 26.268 [2].

3GPP TS 26.269 [13] deals with the conformance testing for eCall modem implementations, and

3GPP TR 26.969 [14] contains a characterization report of the in-band modem.

[Ref.9] ETSI TS 126 268 eCall data transfer – in-band modem solution; ANSI-C reference code [Release 8)

This document contains an electronic copy of the ANSI C code for the eCall in-band modem solution for reliable transmission of MSD data from IVS to PSAP via the speech channel of cellular networks. The ANSII C code is necessary for a bit exact implementation of the IVS modem and PSAP modem described in 3GPP TS 26.267 [1].

[Ref.10] ETSI TS 126 269 eCall data transfer – in-band modem solution; conformance testing [Release 8)

This Technical Specification (TS) specifies minimum performance requirements, test procedures and digital test sequences to be used for conformance testing of implementations of the eCall in-band modem.

The eCall in-band modem PSAP and IVS transmitters and receivers are specified in TS 26.267 [1]. The reference fixed point ANSI-C implementation for the specified eCall modem is provided in TS 26.268 [2].

The eCall in-band modem is a technology that transmits data reliably over the speech channel of the cellular and PSTN networks. It is specifically designed for transmission of the Minimum Set of Data (MSD) from IVS to PSAP for the Pan-European eCall initiative. For the purpose of the present specification, conformance is determined for the transmission of one single MSD of length 140 bytes. Other applications of the eCall in-band modem are out of scope of this document.

[Ref.11] Directive 98/34 Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations

and

Directive 98/48/EC of the European Parliament and of the Council of 20 July 1998 amending Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations

Member States shall take all necessary steps to ensure that their standardisation bodies:

- communicate information in accordance with Articles 2 and 3,
- publish the draft standards in such a way that comments may also be obtained
- from parties established in other Member States,
- grant the other bodies referred to in Annex II the right to be involved passively
- or actively (by sending an observer) in the planned activities,
- do not object to a subject for standardisation in their work programme being
- discussed at European level in accordance with the rules laid down by the
- European standardisation bodies and undertake no action which may prejudice
- a decision in this regard.

Member States shall refrain in particular from any act of recognition, approval or use by reference to a national standard adopted in breach of Articles 2 and 3 and of paragraph 1 of this Article.

Member States shall refrain in particular from any act of recognition, approval or use by reference to a national standard adopted in breach of Articles 2 and 3 and of paragraph 1 of this Article.

Member States shall immediately communicate to the Commission any draft technical regulation, except where it merely transposes the full text of an international or European standard, in which case information regarding the relevant standard shall suffice; they shall also let the Commission have a statement of the grounds which make the enactment of such a technical regulation necessary, where these have not already been made clear in the draft.

When Member States adopt a technical regulation, it shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of its official publication. The methods of making such reference shall be laid down by Member States.

[Ref.12] Directive 99/5 of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity

This Directive establishes a regulatory framework for the placing on the market, free movement and putting into service in the Community of radio equipment and telecommunications terminal equipment.

Where apparatus as defined in Article 2(a) incorporates, as an integral part, or as an accessory:

a) a medical device within the meaning of Article 1 of Council Directive 93/42/EEC of 14 June 1993 concerning medical devices(1), or

b) an active implantable medical device within the meaning of Article 1 of Council Directive 90/385/EEC of 20 June 1990 on the approximation of the laws of the Member States relating to active implantable medical devices(2), the apparatus shall be governed by this Directive, without prejudice to the application of Directives 93/42/EEC and 90/385/EEC to medical devices and active implantable medical devices, respectively.

Where apparatus constitutes a component or a separate technical unit of a vehicle within the meaning of Council Directive 72/245/EEC(3) relating to the radio interference (electromagnetic compatibility) of vehicles or a component or a separate technical unit of a vehicle within the meaning of Article 1 of Council Directive 92/61/EEC of 30 June 1992 relating to the type-approval of two or three-wheel motor vehicles, the apparatus shall be governed by this Directive without prejudice to the application of Directive 72/245/EEC or of Directive 92/61/EEC respectively.

This Directive shall not apply to equipment listed in its Annex I.

This Directive shall not apply to apparatus exclusively used for activities concerning public security, defence, State security (including the economic well being of the State in the case of activities pertaining to State security matters) and the activities of the State in the area of criminal law.

[Ref.13] ETSI TS 122 003 Circuit Teleservices supported by a Public Land Mobile Network (PLMN) (Teleservice 12/TC12) /E12

This Technical Specification (TS) describes and defines a recommended set of Circuit Teleservices to be supported by a PLMN in connection with other networks as a basis for defining the network capabilities required.

[Ref.14] ETSI TS 122 011 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); LTE; Service accessibility

The purpose of this TS is to describe the service access procedures as presented to the user.
Definitions and procedures are provided in this TS for international roaming, national roaming and regionally provided service. These are mandatory in relation to the technical realization of the Mobile Station (UE).

[Ref.15] ETSI TS 127 007 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); AT command set for user equipment

This document specifies a profile of AT commands and recommends that this profile be used for controlling Mobile Termination (MT) functions and GSM/UMTS network services from a Terminal Equipment (TE) through Terminal Adaptor (TA). The command prefix +C is reserved for Digital Cellular in ITU T Recommendation V.250 [14].

This document has also the syntax details used to construct these extended GSM/UMTS commands. Commands from ITU T Recommendation V.250 [14] and existing digital cellular standards (TIA IS 99 [15] and TIA IS 135 [16]) are used whenever applicable. Some of the new commands are defined such way that they can be easily applied to MT of networks other than GSM/UMTS. ITU T T.31 [11] and T.32 [12] fax AT commands may be used for GSM/UMTS fax transmission from TE. GSM/UMTS Short Message Service AT commands are defined in 3GPP TS 27.005 [24]. GPRS AT commands are defined in clause 10 of this specification.

This document assumes an abstract architecture comprising a TE (e.g. a computer) and a MT interfaced by a TA. The span of control of the defined commands should allow to handle any physical implementation that this abstract architecture may lead to:
TA, MT and TE as three separate entities;
TA integrated under the MT cover, and the TE implemented as a separate entity;
TA integrated under the TE cover, and the MT implemented as a separate entity;
TA and MT integrated under the TE cover as a single entity.

The commands described in this document may be observed on the link between the TE and the TA.

However, most of the commands retrieve information about the MT, not about the TA.

Interface between TE and TA is intended to operate over existing serial (ITU T Recommendation V.24) cables, infrared link, and all link types with similar behaviour. For correct operation many of the defined commands require eight bit data and therefore it is recommended that TE TA link is set to eight bits/ byte mode. (For infrared operation implementation refer informative references IrDA. For embedding AT

commands and data during on-line data state refer TIA 617/ITU-T V.80.) Interface between TA and MT is dependent on the interface in the MT.

The functional blocks (shown in Figure 1 of the deliverable), using AT commands, shall follow the principles described in the interactions handling framework 3GPP TS 23.227 [63].

[Ref.16] ETSI TS 122 071 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); LTE; Location services (LCS); Service description; Stage 1

This document provides the Stage One description of Location Services (LCS). A Stage One description provides an overall service description, primarily from the service subscriber's and user's points of view, but not dealing with the details of the Man Machine Interface (MMI). This TS includes information applicable to network operators, service providers and terminal, base station system, switch, and data base manufacturers.

NOTE: Location Services may be considered as a network provided enabling technology consisting of standardized service capabilities which enable the provision of location based applications. These applications may be service provider specific. The description of the numerous and varied possible location applications which are enabled by this technology are outside the scope of this specification. However, clarifying examples of how the functionality being specified may be used to provide specific location services is included in various sub-Clauses of the specification.

This document provides core requirements to an extent sufficient to derive a complete definition of location services at the service level. However, this document also provides additional requirements which may suggest in a non-normative manner certain ways the system may be implemented to support location services. LCS can be offered without subscription to basic telecommunication services. LCS is available to the following categories of LCS clients:

- Value Added Services LCS Clients – use LCS to support various value added services. These clients can include UE subscribers as well as non-subscribers to other services.
- PLMN Operator LCS Clients – use LCS to enhance or support certain O&M related tasks, supplementary services, IN related services and bearer services and teleservices.

LCS is applicable to any target UE whether or not the UE supports LCS, but with restrictions on choice of positioning method or notification of a location request to the UE user when LCS or individual positioning methods, respectively, are not supported by the UE.

LCS is being developed in phases with enhancements added in 3GPP releases.

- Emergency Services LCS Clients – use LCS to enhance support for emergency calls from subscribers.
- Lawful Intercept LCS Clients – use LCS to support various legally required or sanctioned services.

[Ref.17] ETSI TS 122 002 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); Circuit bearer services (BS) supported by a public land mobile network (PLMN)

This document defines a set of Circuit Bearer Services to be provided to PLMN subscribers by a PLMN itself and in connection with other networks.

This TS should also be used as a reference for defining the corresponding required mobile network capabilities.

[Ref.18] ETSI TS 122 004 Digital cellular telecommunications system (phase 2+); Universal mobile telecommunications system (UMTS); General supplementary services

The purpose of this document is to define a recommended set of supplementary services to the Teleservices and Bearer services which will be supported by a PLMN in connection with other networks as a basis for the definition of the network capabilities required.

Supplementary services not covered in 3GPP TS 22.004 cannot be introduced unilaterally in any PLMN if they require modification of the signalling Specifications.

Technical realization of supplementary services is described in 3GPP TS 23.011 [19] and 24.010 [21].

[Ref.19] Directive 00/183 Directive of the European Parliament and of the Council on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive)

Within the framework of Directive 2002/.../EC (Framework Directive), this Directive concerns the provision of electronic communications networks and services to end-users. The aim is to ensure the availability throughout the Community of good quality publicly available services through effective competition and choice and to deal with circumstances in which the needs of end-users are not satisfactorily met by the market.

This Directive establishes the rights of end-users and the corresponding obligations on undertakings providing publicly available electronic communications networks and services. With regard to ensuring provision of universal service within an environment of open and competitive markets, this Directive defines the minimum set of services of specified quality to which all end-users have access, at an affordable price in the light of specific national conditions, without distorting competition. This Directive also sets out obligations with regard to the provision of certain mandatory services such as the retail provision of leased lines.

[Ref.20] ETSI TS 122 001 Digital cellular telecommunications system (Phase 2+); TSG Services and System Aspects; Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN) (Release 8)

This document covers the definition of the circuit telecommunication services supported by a PLMN. The purpose of this document is to provide a method for the characterization and the description of these telecommunication services.

TS 22.101 describes overall service principles of a PLMN.

[Ref.21] ETSI TS 123 018 TSG Core Network and Terminals; Basic call handling; Technical realization (Release 8)

This document specifies the technical realization of the handling of calls originated by a UMTS or GSM mobile subscriber and calls directed to a UMTS or GSM mobile subscriber, up to the point where the call is established. Normal release of the call after establishment is also specified. Trunk Originated call is also modelled.

In this document, the term MS is used to denote a UMTS UE or GSM MS, as appropriate.

The handling of DTMF signalling and Off-Air Call set-up (OACSU) are not described in this document.

The details of the effects of UMTS or GSM supplementary services on the handling of a call are described in the relevant 3GPP TS 23.07x, 3GPP TS 23.08x and 3GPP TS 23.09x series of specifications.

The specification of the handling of a request from the HLR for subscriber information is not part of basic call handling, but is required for both CAMEL (3GPP TS 23.078 [12]) and optimal routeing (3GPP TS 23.079 [13]).

The use of the Provide Subscriber Information message flow is shown in 3GPP TS 23.078 [12] and 3GPP TS 23.079 [13].

The logical separation of the MSC and VLR (shown in clauses 4, 5 and 7), and the messages transferred between them (described in clause 8) are the basis of a model used to define the externally visible behaviour of the MSC/VLR, which is a single physical entity. They do not impose any requirement except the definition of the externally visible behaviour.

If there is any conflict between this document and the corresponding stage 3 specifications (3GPP TS 24.008 [26], 3GPP TS 25.413 [27], 3GPP TS 48.008 [2] and 3GPP TS 29.002 [29]), the stage 3 specification shall prevail.

[Ref.22] ETSI TS 102 164 Telecommunications and internet converged services and protocols for advanced networking (TISPAN); Emergency location protocols

This document specifies the protocol that is used by the local emergency operator to obtain the location information that is registered on the operator location server, see figure 1. It endorses and defines a profile of the OMA specification OMA-TS-MLP-V3_2-20051124-C [REF REF_OMATS_MLP_V32_20051124_C * MERGEFORMAT 1] that are applicable to the emergency location information services.

NOTE: The LI Forum has been affiliated and its work subsumed into the OMA; the LIF TS 101 Specification has been succeeded by OMA-TS-MLP-V3_2.

[Ref.23] ETSI TS 151 010 Digital cellular telecommunications system (Phase 2+);Mobile Station (MS) conformance specification; Part 1: Conformance specification (3GPP TS 51.010-1 version 8.1.0 Release 8)

This document describes the technical characteristics and methods of test for Mobile Stations (MS), for the Pan European digital cellular communications system and Personal Communication Systems (PCS) operating in the 400 MHz, 700 MHz, 810 MHz, 850 MHz, 900 MHz, 1 800 MHz and 1 900 MHz band (GSM 450, GSM 480, GSM 710, GSM 750, T-GSM 810, GSM 850, GSM 900, DCS 1 800 and PCS 1 900), standardized by ETSI Special Mobile Group (SMG).

The present document is valid for MS implemented according to GSM Phase2 or Phase2+ R96, or R97, or R98, or R99 or 3GPP Release 4 or 3GPP Release 5 or 3GPP Release 6, 3GPP Release 7 or 3GPP Release 8.

A subset of the tests is referenced in the GSM Common Technical Regulations (CTRs) and is used for regulatory conformance testing according to the EEC procedures for Telecommunications Terminal Equipment (TTE) type approval (EC Directive 91/263/EEC; also known as the "Terminal Directive" or "Second Phase Directive"). The remaining tests can be used to verify conformance with the GSM core technical specifications for those requirements that are not considered "essential" in the sense of the EC Directive 91/263/EEC (Article 4).

The present document covers the minimum characteristics considered necessary in order to provide sufficient performance for mobile equipment and to prevent interference to other services or to other users, and to the PLMNs.

It does not necessarily include all the characteristics which may be required by a user or subscriber, nor does it necessarily represent the optimum performance achievable.

It applies to the public land mobile radio service in the GSM systems named above, using constant envelope modulation and operating on radio frequencies in the frequency bands listed above respectively with a channel separation of 200 kHz and carrying 8 full rate channels or 16 half rate channels per carrier according to the TDMA principle.

The present document is part of the GSM-series of technical specifications. The present document neither replaces any of the other GSM technical specifications or GSM related ETSs or ENs, nor is it created to provide full understanding of (or parts of) GSM systems. The present document lists the requirements, and provides the methods of test for testing a MS for conformance to the GSM standard.

For a full description of the system, reference should be made to all the GSM technical specifications or GSM related ETSs or ENs. Clause 2 provides a complete list of the GSM technical specifications, GSM related ETSs, ENs, and ETRs, on which this conformance test specifications is based.

The present document applies to the unit which includes the hardware to establish a connection across the radio interface.

If there is a difference between this conformance document, and any other GSM technical specification or GSM related ETS or EN, or 3GPP TS, then the other GSM technical specification or GSM related ETS or EN or 3GPP TS shall prevail.

[Ref.24] ETSI TS 124 123 Universal Mobile Telecommunications System (UMTS);User Equipment (UE) conformance specification;Part 1: Protocol conformance specification (3GPP TS 34.123-1 version 8.6.0 Release 8)

This document specifies the protocol conformance testing for the 3rd Generation User Equipment (UE).

This is the first part of a multi-part test specification. The following information can be found in this part:

- the overall test structure;
- the test configurations;
- the conformance requirement and reference to the core specifications;
- the test purposes; and
- a brief description of the test procedure, the specific test requirements and short message exchange table.

The following information relevant to testing can be found in accompanying specifications:

- the default setting of the test parameters [9];
- the applicability of each test case [11].

A detailed description of the expected sequence of messages can be found in the 3rd part of this test specification.

The Implementation Conformance Statement (ICS) pro-forma can be found in the 2nd part of the present document.

The present document is valid for UE implemented according to 3GPP Release 1999, 3GPP Release 4 or 3GPP Release 5.

[Ref.25] ETSI 121 133 Universal Mobile Telecommunications System (UMTS); 3G security; Security threats and requirements (3GPP TS 21.133 version 4.1.0 Release 4)

This specification takes notice of the Security Principles and Objectives as set out in [1]. It contains an evaluation of perceived threats to 3GPP and produces subsequently a list of security requirements to address these threats.

As teleservices and applications will not, in general, be standardised, it is difficult to predict their exact nature. Therefore, this specification considers all security threats and aims at listing generic security requirements that shall be applicable irrespective of the actual services offered. The list of threats and requirements may however need to be updated as the 3GPP system evolves.

The threat analysis performed relies to a large extent on previous experiences with 2G systems, in particular GSM, and takes into account known problems from that area.

The security requirements listed in this specification shall be used as input for the choice of security features and the design of the 3GPP security architecture as specified in [2].

The structure of this technical specification is as follows:

clause 2 lists the references used in this specification;

clause 3 lists the definitions and abbreviations used in this specification;

clause 4 contains a reference to the general objectives for 3G security;

clause 5 contains an overview of the context in which the security architecture of 3G is designed;

clause 6 contains a list of identified security threats to 3G, and gives some results from the threat analyses that have been performed;

clause 7 contains an overview of the risk assessment resulting from the threat analyses performed

clause 8 contains the resulting list of security requirements for 3G and indicates how these requirements relate to the threats and the security objectives .

Finally, Annex A gives some more detailed information on threats and risks connected to so called false base station attacks.

Annex C
(informative)

Test system strategies

C.1 General

Considering that the pan-European eCall service is a safety service which will be available for all European vehicle drivers during the life of the vehicle;

considering that when fully deployed, the number of equipped, in-service' vehicles, can be exceeding several hundred millions in Europe;

considering that the existence of many original equipment manufacturers and different vehicle models will multiply the number of different solutions for the eCall equipment;

a simplified, easily implementable, test strategy is now proposed:

C.2 Vehicle and PSAP equipment life cycle

The vehicle life cycle is represented in figure C.1 below.

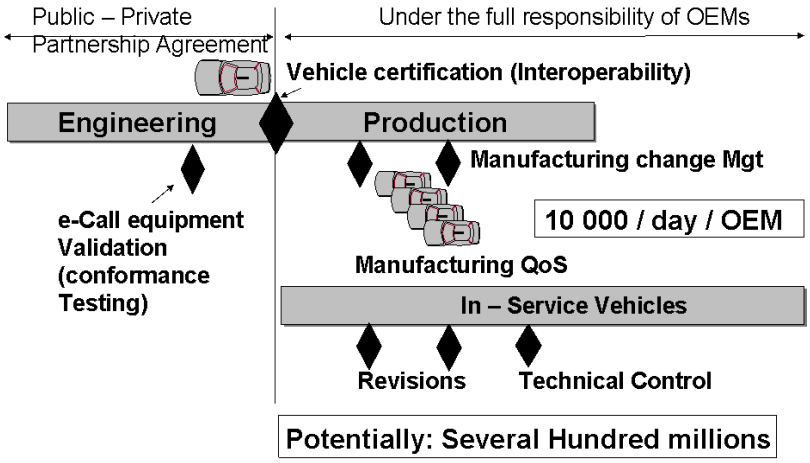

Figure C1: Vehicle life cycle

Conformance testing has to be achieved for all new vehicle models during the engineering phase. This testing may be achieved by the OEM or its eCall equipment supplier. All conformance points and conformance requirements have to be covered during such conformance testing. For this purpose, it is recommended to

achieve such conformance tests in a closed laboratory environment (see C.3 below) thereby avoiding disturbing an operational PSAP.

Eventually however, interoperability tests are required to confirm that a new vehicle model is ready to be operating in a pan-European eCall environment. Limited tests will at this stage have to be achieved with an operational PSAP using the test bit set to “1” value in the MSD. The test period and modalities have to be planned between PSAP and OEM through a 'Private – Public Partnership' agreement.

All other tests necessary during vehicles manufacturing and when vehicles are in service should be achieved using some OEM or third party test systems (see C.4 below). The tests being achieved and the test system being used are to be under the complete responsibility of OEMs.

The PSAP eCall equipment life cycle is represented on the figure C.2 below.

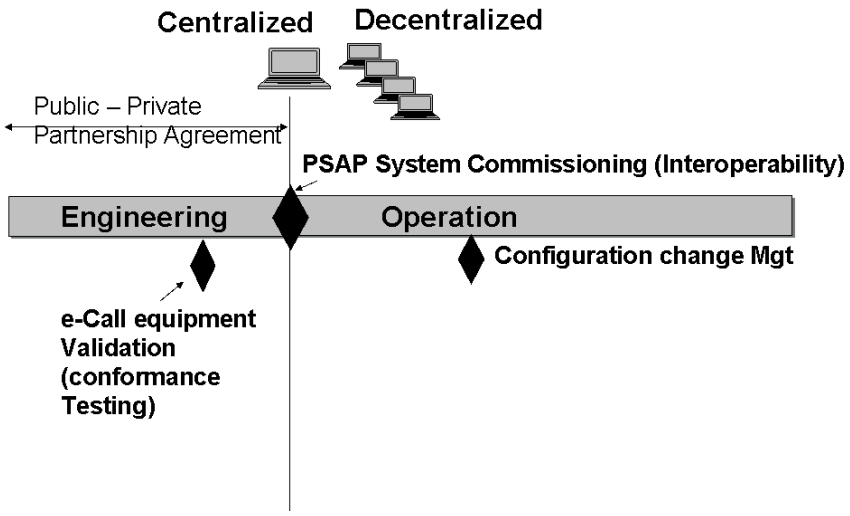

Figure C.2: PSAP eCall equipment life cycle

Conformance testing is to be achieved for all new PSAP eCall equipment during the engineering phase. This testing may be achieved by the PSAP or its eCall equipment supplier. All conformance points and conformance requirements have to be covered during such conformance testing. For this purpose, it is recommended to achieve such conformance tests in a closed laboratory environment (see C.3 below).

Interoperability tests are the ultimate goal to verify that a new PSAP eCall equipment is ready to be operating in a pan-European eCall environment. Limited tests have to be achieved with an operational vehicle using or not the test bit set to “1” value in the MSD. The test period and modalities have to be planed between PSAP and OEM through a 'Private – Public Partnership' agreement.

All other tests are not necessary as long as the PSAP eCall equipment is not upgraded. In case of configuration change management, the PSAP may need to repeat some eCall equipment conformance testing or some interoperability test with an operational vehicle.

C.3 Laboratory environment

The creation of a closed testing environment is needed to avoid the overload of tests in real environment.

An IVS simulator common for all the eCall equipments shall be available for all interested PSAPs. A PSAP reference test system (simulator) needs to be available to the equipment manufacturers and OEMs. These reference test systems have to provide the same features as the real equipment. The scope of the PSAP simulators has to be determined by PSAPs.

Network behaviour (e.g. automatic registration to the best operator, processing of the eCall flag) has also to be simulated to avoid sending a live e112 call to the external world.

For conformance and interoperability testing, an accredited test laboratory needs to be used (see Figure C.3 below), and Ref.11, Ref.12, and Ref.19.

NOTE OEMs may develop this test laboratory and have it accredited or subcontract the test service to some competent, accredited test laboratories.

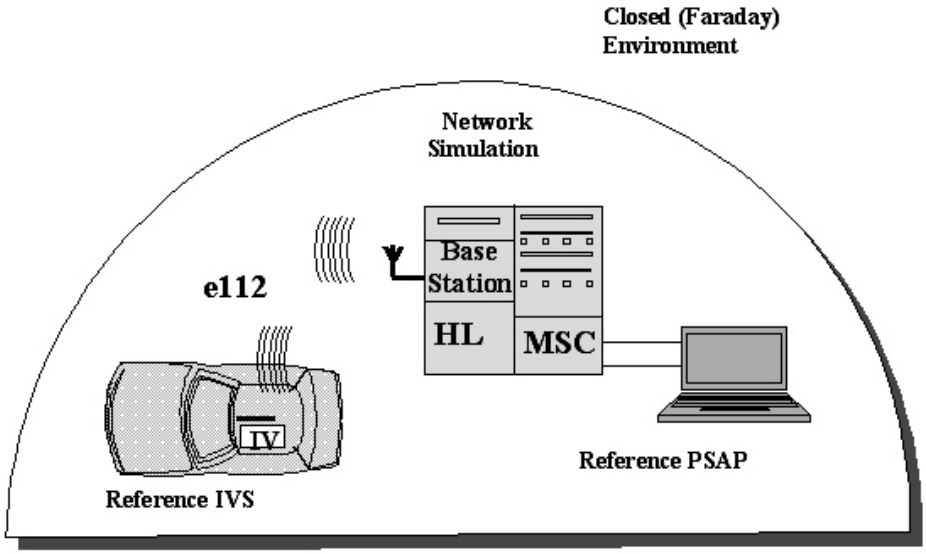

Figure C.3: Example of equipped test laboratory

C.4 OEM or third party test systems

For all tests being necessary during the vehicles manufacturing and for in-service vehicles, an OEM or third party test system such as represented in Figure C.4 below has to be used.

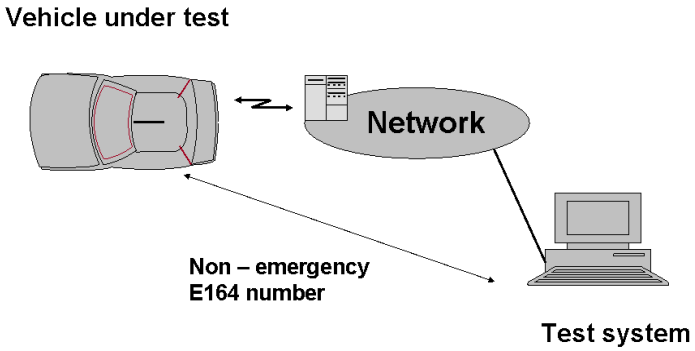

Figure C.4: OEM or third party test system

For this purpose, a common E164 number enabling the access to the test system needs to be provided for each manufactured vehicle by the telecom operator supplying the SIM card. This number is only to be used for the test purpose.

Bibliography