Final agreed KPIs, test specification and methodology

Version number:	1.2
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Dissemination level:	PU
Lead contractor:	
Due date:	31/12/2013
Delivery date:	6/05/2014
Delivery date updated document	06/05/2014

ICT PSP

Grant agreement no.: 325075
Pilot type A co-funded by the European Union under the Competitiveness and Innovation Programme
ICT Policy Support Programme
DG Communications Networks, Content and Technology

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CONTROL SHEET

Version history			
Version	**Date**	**Main author**	**Summary of changes**
0.1	2013-09-27	Monika Hentschinski	Generate template
0.2	2013-10-28 to 29	Monika Hentschinski	Including input from pilot sites
0.3	2013-11-04	Martin Grzebellus	internal review
0.4	2013-11-05	Monika Hentschinski	Including Greek input, Handle comments of internal review
0.5	2013-11-14	Monika Hentschinski	Including changes from team review (LUX, TR,GR, ES)
0.6	2013-11-29	Martin Grzebellus, Monika Hentschinski	including comments from peer review
1.0	2013-12-03	Andy Rooke	Review
1.1	2014-04-22	Monika Hentschinski	Recommendations from annual review
1.2	2014-05-06	Andy Rooke	Review
	Name		**Date**
Prepared	Monika Hentschinski		2013-11-14 and 2014-04-22
Reviewed	Jean-François Gaillet, Harold Linke		2013-11-23/27
Authorized	Andy Rooke		2013-12-03 and 2014-05-06

Circulation	
Recipient	**Date of submission**
Project partners	2013-12-03 and 2014-05-06
European Commission	2013-12-03 and 2014-05-06

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1 Management summary

This document presents the KPIs, test specification and methodology for the HeERO 2 project to enable a common evaluation of the results of all pilot sites independent of being part of HeERO 1 and 2 as the same key performance indicators are used. Well defined KPIs have been agreed to measure all aspects of the eCall communication in HeERO I which were reviewed, revised and extended with respect to Large Goods Vehicles, Transport of Dangerous Goods and Powered 2 Wheelers, which now form HeERO 2.

The document is structured in three parts.

1. Describes the KPIs with the respective definitions and specifications to allow adjustment of the operational phase to provide the required data for the specified test cases.
2. Describes the evaluation of the collected data and the respective statistical procedures are described detailed enough to allow immediate evaluation without need for additional information from respective standards.
3. Describes the pilot sites describe their specific implementations and reasons for it.

All pilot sites proposed in the preparation phase individual KPIs, so that in total nearly 40 KPIs have been defined. Although the pilot sites in principle decide upon their own discretion how and what to contribute, a subset of KPIs are recommend which should be evaluated by all pilot sites. This applies especially to time until an MSD is presented to operator (KPI 005) and the voice channel blocking time (KPI 007a). During the transmission time of the MSD the passenger in the vehicle cannot communicate with the call handler. Even worse as the passengers do not know the technical aspects and reasons for the “dead line” of the call, every second of silence is perceived as too much. And, if possible, passengers want to leave the car quickly, so voice contact has to be established as fast as possible. It is therefore important to measure this KPI. The KPIs defined in this report are measurable and comparable and in the scope of the project. They cover different aspects covered by the standards.

As the quantitative analysis shall be complemented by a qualitative assessment of special aspects, the definition of KPIs was complemented by questionnaires. These questionnaires shall identify issues, concerns and improvements within the stakeholders. These questionnaires have been developed for their areas: P2W, HGV and hazardous goods transport. The evaluation of the questionnaires will be done in parallel to the quantitative evaluation.

2 Terms and abbreviations

Abbreviation/Term	Definition
3GPP TS	3rd Generation Partnership Project; Technical Specification
CEN EN	Comité Européen de Normalisation – European Committee for Normalisation – European Norm
CIP	Competitiveness and Innovation Programme
CITA	Contrôle et information du trafic sur les autoroutes - Luxembourg Traffic Management Centre
DGT	Dirección General de Tráfico - Madrid
DG	Dangerous Goods
DG-Trac	ESA project : Dangerous Goods tracking and tracing in the medical sector
DOP	Dilution of Precision
Dormant SIM	SIM card that is sleeping and not connected to the network until an eCall is issued
DoW	Description of Work
EC	European Commission
ECC	eCall Call Centre
ETSI	European Telecommunication Standards Institute
EUCARIS	European CAR and driving licence Information System
GDOP	Geometric dilution of precision
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HGV	Heavy Goods Vehicle
ISO	International Organization for Standardization

Abbreviation/Term	Definition
IVR	Intelligent Voice Response
IVS	in vehicle system
KPI	Key Performance Indicator
MNO	Mobile Network Operator
MSD	Minimum Set of Data
OBU	On Board Unit
P2W	Powered Two-Wheeled vehicles
PABX	Private Automatic Branch Exchange
PLMN	Public land mobile network
PSAP	Public Safety Answering Point
RACC	Spanish automobile club
SIM-card	Subscriber identity module for mobile networks
SMS	Short Message Service
TCC/TIC	
TMC	Traffic Management Centres
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
VIN	Vehicle Identification Number

3 Introduction

3.1 Purpose of Document

The purpose of this document is to define the Methodology and Evaluation plan to ensure a common base for an effective evaluation of all data from all participating pilot sites. Therefore the Key Performance Indicators developed during HeERO1 were reviewed, revised and extended with respect to Large Goods Vehicles and Powered 2 Wheelers.

3.2 Intended audience of this document

This document is aimed at the following audiences and respectively at the fulfilment of the following objectives:

- European Commission: for information
- WP4 partners: to coordinate the test activities and get comparable results for the evaluations ;
- WP3 partners: to specify measurement techniques that need to be included in the system design;
- HeERO Management Team:
  - To monitor implementation and progress achieved in relation to timeline and DoW
  - To identify elements that could impact overall system performance

3.3 HeERO2 Contractual References

HeERO2 is a Pilot type A of the ICT Policy Support Programme (ICT PSP), Competitiveness and Innovation Framework Programme (CIP). It stands for Harmonised eCall European Pilot.

The Grant Agreement number is 325075 and project duration is 24 months, effective from 01 January 2013 until 31 December 2014. It is a contract with the European Commission, DG CONNECT.

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Any communication or request concerning the grant agreement shall identify the grant agreement number, the nature and details of the request or communication and be submitted to the following addresses:

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4 Definition of Key Performance Indicators

4.1 General requirements for the KPIs

4.1.1 Requirements from standards

Within the HeERO projects, several standards have to be taken into account, to build up a running and compatible system in every country without having difficulties caused by non-interoperability of different components. As the Standards are still being revised, it is inappropriate to publish the standards as reference, as they may be subject to change. In all instances readers should be directed to both the CEN and ETSI websites, as the technical bodies responsible for the publication of standards.

These standards form the basis of the KPIs' that have to be developed, to evaluate the capabilities of the eCall system components in order to fulfil the requirements of these standards. In particular the following elements are of prime importance:

- the timings within the communication process between IVS and PSAP
- the use of the eCall flag (Service Category) in the emergency call setup procedure
- the correct generation coding, transmission of the MSD
- decoding and presentation of the MSD

On one hand this may lead to further development activities in terms of non-conformant system components, on the other hand, the results of this pilot project may lead to refinement/changes within the specifications if it is obvious that a requirement cannot be fulfilled at all or is contradicting another standard.

4.1.2 Requirements from Description of Work

The objectives of HeERO, as written in the Description of Work, for the definition and selection of KPIs are to:

- Validate requirements of the newest eCall standards and specifications
- Identify measurable parameters for P2W, HGV and dangerous goods
- Evaluate in all participating member states independent of being part of HeERO 1 and 2 the results based on the same key performance indicators
- Analyse the complete process chain from initiation of a call to dispatch of rescue forces and identify critical performance issues that need to be addressed

To analyse the suitability of eCall for a Pan European deployment, it is necessary, to define KPIs measuring the above mentioned objectives.

4.2 General definitions

4.2.1 Definition of phases and significant instants within the eCall process

Due to the fact, that many of the defined KPIs are based on timing issues and a clear common understanding within the project is essential, the following was defined:

- The point of time, where the IVS starts the process to get in contact with the PSAP is called “call connection initiation”,
- the corresponding phase is called “call establishment”
- where the transmission of the MSD happens is called “data transmission”
- where the voice communication happens is called “voice transmission”

In addition, the following significant instants are defined with respect to the module where the measurement takes place (IVS, PSAP, emergency service)

- $T_{0\text{-}IVS}$: IVS initiated the eCall (“call connection initiation”, start of phase “call establishment”)
- $T_{1\text{-}IVS}$: IVS starts the MSD transmission (start of phase “data transmission”)
- $T_{2\text{-}IVS}$: End of phase “data transmission”

- $T_{0\text{-}PSAP}$: Initiated eCall is indicated at PSAP
- $T_{1\text{-}PSAP}$: Start of MSD reception at PSAP
- $T_{2\text{-}PSAP}$: Start of phase “voice transmission”
- $T_{3\text{-}PSAP}$: Start of dispatching information about incident to emergency services
- $T_{4\text{-}PSAP}$: Start of dispatching information about incident to TMC

- $T_{3\text{-}ES}$: Start of confirmation about incident handling to PSAP
- $T_{4\text{-}ES}$: Start of dispatching rescue forces

The next page depicts a diagram showing the relationship between the timing issues specified here

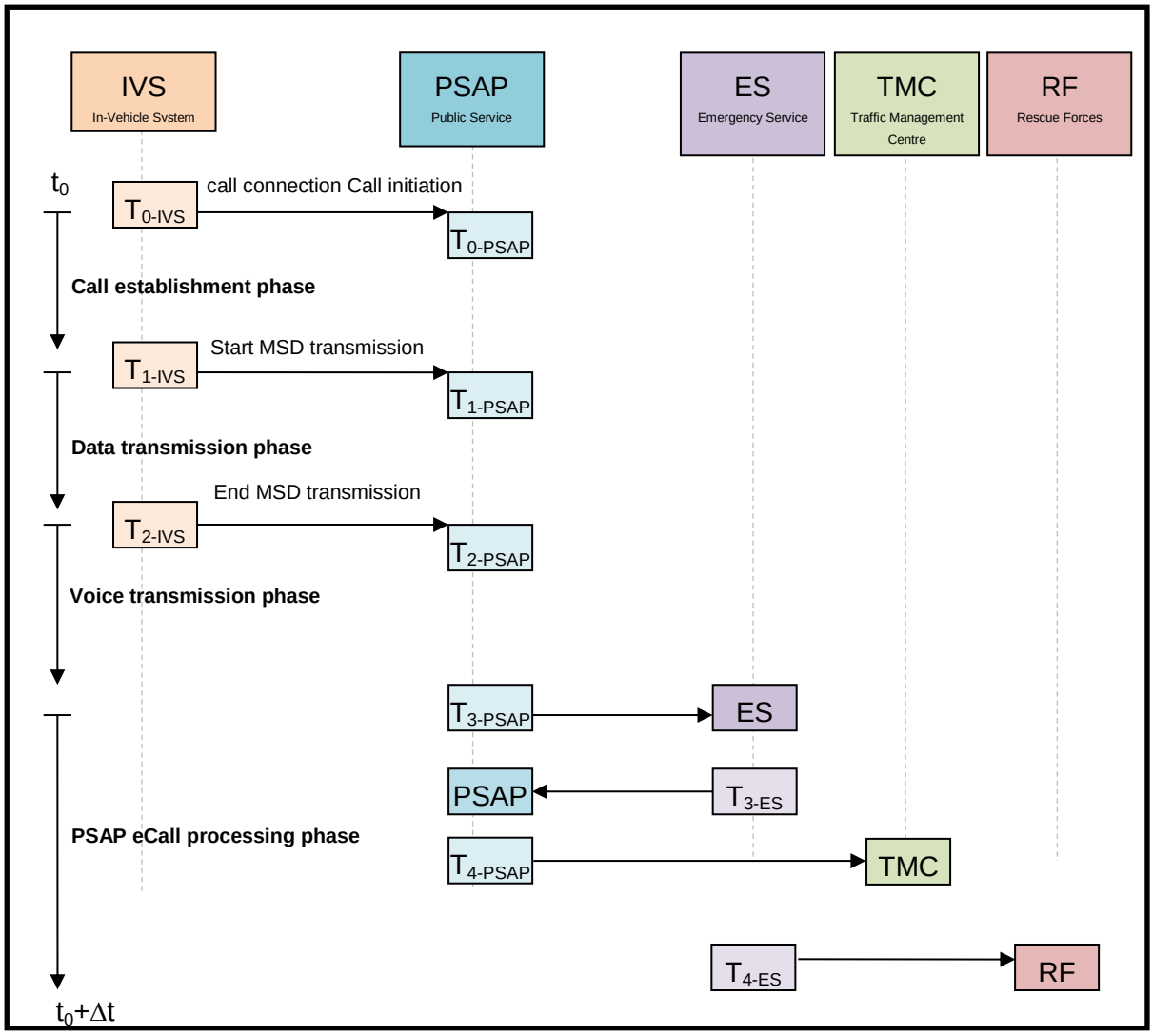

Figure 1: Overview of significant instants

4.2.2 Key Performance Indicators

A KPI measures the quality of specified services during a period of time. In order to allow a qualification of the achieved results thresholds are defined to indicate what is regarded as poor, acceptable, good or excellent achievement. Within the HeERO projects however the goal is not to measure the quality of the implementation or operation of eCall in the pilot sites. Instead the KPIs will provide guidance on the suitability of eCall (protocol, procedures, parameters, etc.) for later deployment. In addition achieved performances of the individual implementation will be used to identify best practise to derive recommendations. For this reason there is no necessity to allocate thresholds to the KPIs to allow measurement of success.

4.3 Definition and description of the KPIs

4.3.1 Overview of KPIs committed to evaluate

The following table gives an overview which part of the eCall-system will be evaluated via a KPI in which country as committed by the Pilot Sites. The meaning of colours and symbols is explained in Table 2 below.

The table describes all KPIs which are applicable in any of the participating pilot sites. Every pilot site has selected those KPIs which are appropriate for each single pilot site to be evaluated according to their original planning and resource calculation for the HeERO project.

To get reasonable results and meaningful statistics some KPIs were strongly recommended to be measured by all pilot sites. As interoperability is one of the two major conditions on which the successful operation of eCall will depend, this KPI is obligatory for all pilot sites. The reasoning for the selection of the recommended KPIs is pointed out with the definition of the single KPIs.

KPI_XX	Name of KPI	Belgium	Bulgaria	Denmark	Luxembourg	Spain	Turkey	Greece
01a	Number of automatically initiated eCalls	x	x	--	x	x	--	x
01b	Number of manually initiated eCalls	x	x	x	x	x	x	x

02a	Success rate of completed eCalls using 112 [%]	x	(x)[1]	x	(x)[1]	--[2]	x	--[2]
02b	Success rate of completed eCalls using long number [%]	--	x	--	x	x	--	x
03	Success rate of received MSDs [%]	x	x	x	x	x	x	x
04	Success rate of correct MSDs [%]	x	x	x	x	x	x	x
05	Duration until MSD is presented in PSAP [s]	x	x	x	x	x	x	x
06	Success rate of established voice transmissions [%]	x	x	x	x	x	x	x
07a	Duration of voice channel blocking [s]	x	x	x	x	x	x	x
07b	Duration of voice channel blocking: automatic retransmission of MSD [s]	x	x	--	--	x	--	x
08	Time for call establishment [s]	x	x	--	--	x	--	x
09	Accuracy of position [m]	--	x	--	--	x	--	--
10	Number of usable satellites	--	x	--	--	x	--	--
11	Geometric Dilution of Precision (GDOP)	--	x	--	--	x	--	--
12	Time between successful positioning fixes [s]	--	x	--	--	x	--	--
13	Success rate of heading information [%]		x	x	x	x	x	--
14	Success rate of VIN decoding without EUCARIS [%]	--	x	--	--	x	--	x

15	Success rate of VIN decoding with EUCARIS [%]	--	(x)[3]	--	(x) [3]	--	--	--
16	Time for VIN decoding with EUCARIS [%]	--	(x)[3]	--	(x) [3]	--	--	--
17	Dispatch time of incident data to rescue forces [s]	x	x[4]	--	--	--	--	--
18	Time to activate rescue forces [s/min]	--	x[4]	--	--	--	--	--
19	Dispatch time of incident data to TMC [s]	--	--	--	--	x	--	--
20	Success rate of presented incident data in TMC [%]	--	--	--	--	x	--	--
21	Number of successful call-backs	x	x	--	--	--	--	x
22	Success rate of call-backs [%]	x	x	--	--	--	--	x
23	GSM network latency [s]	--	x	--	--	x	--	--
24	112 National network latency [s]	x	x	--	--	--	--	--
25	112 Operator reaction time	x	x[4]	--	--	--	--	--
26	Time for acknowledgment of emergency services [s]	--	x[4]	--	--	--	--	x
27	Total response time [s]	--	x[4]	--	--	--	--	(x)
28a	Number of cross border tests	x	x[4]	x	x	x	--	(x)
28b	Number of interoperability tests	x	x	x	x	x	x	x
28c	Number of cross regional tests	--	--	--	--	x	--	--

29	Dispatch time of Intermediate PSAP	x	x	--	--	x	--	--
30	Number of calls flagged as dangerous good	--	--	--	(x)[5]	--	--	--
31	Number of successful access of dangerous goods information	--	--	--	(x)[5]	--	--	--
32	Number of Dormant SIM card tests	--	--	--	(x)[6]	--	--	--

Table 1: Table of KPIs committed to be tested

	recommended to be evaluated by all pilot sites
	Obligatory to be evaluated by all pilot sites
x	will be tested
(x)	will be tested if possible
--	won't be tested
[1]	After/if eCall-flag will be implemented by MNO
[2]	eCall flag won't be implemented by MNO
[3]	Depending on access to EUCARIS.
[4]	after integration within PSAP
[5]	after implementation of Dangerous Goods Tracking Service
[6]	after availability of dormant SIM-card support in IVS

Table 2: Description to Table 2

4.3.2 KPI_01a: Number of automatically initiated eCalls

This KPI measures the total number of automatically initiated eCalls

Unit: unit-less

Definition: Every automatic initiation of an eCall is counted up to get an overview of the total number of automatically initiated eCalls. Automatic means initiating without pushing the eCall button on the IVS.

Remark: This KPI measures mainly coverage of GSM network but not eCall specific aspects, as typically vehicle is driving, no voice communication

4.3.3 KPI_01b: Number of manually initiated eCalls

This KPI measures the total number of manually initiated eCalls

Unit: unit-less

Definition: Every manual initiation of an eCall is counted up to get an overview of the total number of manually initiated eCalls.

Remark: **Recommended;** Describes number of “real” eCall scenarios with vehicle not moving and voice communication

4.3.4 KPI_02a: Success rate of completed eCalls using 112

This KPI describes the relation between the numbers of initiated eCalls at a given period of time versus the number of successful completed eCalls while the 112 is used as telephone number for the emergency call.

Unit: [%]

Definition: eCall success rate = successful eCalls / all initiated eCalls * 100 %

Successful eCalls = initiated eCalls - failed eCalls

General definition of successful eCall: Voice call path was established, MSD data transfer was done and MSD content was shown at operator’s desk.

Initiated eCall: eCall triggered by IVS

Failed eCall: Either no establishment of a voice path connection at all, or no stable connection at all, or no voice call possible or no MSD transmission or faulty MSD transmitted

Remark: **Recommended;** It is recommended to use eCall flag for call establishment with 112

4.3.5 KPI_02b: Success rate of completed eCalls using long number

This KPI describes the relationship between the numbers of initiated eCalls at a given period of time versus the number of successful completed eCalls while the long number of a PSAP is used as telephone number for the emergency call.

Detailed description: See KPI_002a.

Remark: Only if eCall via 112 is not possible as eCall flag not supported in member state or due to other technical restrictions

4.3.6 KPI_03: Success rate of received MSDs

This KPI describes the relationship between the numbers of initiated MSD transmissions versus the number of successfully presented MSD content at the operator's desk. This is not an arbitrary assessment, if the content itself is correct or not for those cases where the eCall was not successfully completed e g. voice communication not established or not possible.

Unit: [%]

Definition: MSD success rate = successful MSDs / all initiated MSDs * 100 %

Successful MSDs = initiated MSDs - failed MSDs

General definition of successful MSD: Content is presented at operator's desk in PSAP

Initiated MSD: Start of MSD-transmission in push mode (comes from IVS)

Failed MSD: No MSD data transmission or faulty transmission: voice call started without content of MSD is presented at operator's desk in PSAP or MSD transmission is not successfully completed.

Remark: **Recommended;** Measures exactly the difference of eCall from 112 calls

4.3.7 KPI_04: Success rate of correct MSDs

This KPI describes the correctness of the coding, transmission, decoding and presentation of the MSD.

Unit: [%]

Definition: MSD correctness rate = correct MSDs / all received MSDs * 100 %

Correct MSDs = received MSDs - incorrect MSDs

General definition of correct MSD: The decoded MSD presented to the operator in PSAP has the same content as the one sent by the IVS.

Incorrect MSD: The content decoded and presented in PSAP is not the same sent by IVS.

Remark: **Recommended;** Measures proper en-/de-coding of MSD

4.3.8 KPI_05: Duration until MSD is presented in PSAP

This KPI describes the duration from the initiation (automatically or manually) of an eCall to the presentation of the MSD content in the PSAP.

Unit: [s]

Definition: MSD presentation time = point of time of presentation of MSD at operator's desk in PSAP ($T_{2\text{-}PSAP}$) - point of time for IVS initiated the eCall ($T_{0\text{-}IVS}$)

Remark: **Recommended**; Measures time until information is available to operator

4.3.9 KPI_06: Success rate of established voice transmissions

This KPI describes the relation between the number of initiated voice transmissions versus the number of successfully established of voice transmissions between the vehicle and the PSAP.

Unit: [%]

Definition: Voice transmission success rate = successful voice transmissions / all initiated voice transmissions * 100 %

General definition of successful voice transmission: operator in PSAP and passenger in vehicle can talk, which means speaking to and hearing from each other is possible at both sites.

Remark: **Recommended;** Measures basics of eCall, MSD and voice transmission

4.3.10 KPI_07a: Duration of voice channel blocking

This KPI represents the time the transmission of MSD blocks the voice channel. The time the voice channel is blocked can be defined as a time between successful call setup ("connected" is reported by the network) and the opening of voice communication in both

directions after the MSD has been transmitted successfully or the MSD transmission has been abandoned (after time out) and the voice communication has been opened on both sides in both directions.

Unit: [s]

Definition: Duration of voice channel blocking = start of phase “voice transmission” ($T_{2\text{-}PSAP}$) - IVS starts MSD transmission ($T_{1\text{-}IVS}$)

The "voice connection established" signal can be defined as the point of time when the IVS and the PSAP have both opened the voice communication channel after the transmission of MSD.

Completion of call setup can be defined as a point of time when the IVS attached to a GSM or UMTS PLMN moves from state "alerting" to state "call established" or “connected”.

Remark: **Recommended;** Most important to minimize, as during this time passengers in the vehicle do not know if eCall does work or not

4.3.11 KPI_07b: Duration of voice channel blocking: automatic retransmission of MSD

Referring to KPI_008, this KPI evaluates the duration of the voice channel blocking if an automatic retransmission of the MSD is initiated by the IVS.

Remark: If for some reason the transmission of MSD was not successful, operator may require retransmission of MSD, after voice communication has been established.

4.3.12 KPI_08: Time for call establishment

This KPI refers to the observed time difference between the time of the eCall initiation (automatic and manual) and the time of the eCall reception at PSAP. The value of this KPI is to be determined by the two event logs comparison, as follows:

Unit: [s]

Definition: Time for call establishment = start of eCall reception at PSAP ($T_{0\text{-}PSAP}$) - point of time for IVS initiated the eCall ($T_{0\text{-}IVS}$)

Remark: Allows calibration between timer in PSAP and IVS if for some KPIs only one and not the other is available; if all timers are available not required

4.3.13 KPI_09: Accuracy of position

This KPI describes the differences between the reported position by IVS and the actual position of the vehicle. As it can happen under difficult environmental conditions, that the amount of visible satellites in not sufficient for a proper fix of the position, this KPI should give also an impression if the usage of only GPS is enough to get a correct position information or if further GNSS (like Galileo) are needed.

Unit: [m] if reference system with reliable accuracy is used. Otherwise “acceptable”, “not acceptable” depending on the distance

Definition: Accuracy of position = reported position - actual position measured by reference system or “acceptable”, if reported position is close to reported position in voice communication / “non-acceptable”, if reported position is more than 100 m away from communicated position

Remark: Measures usability of eCall if passengers cannot communicate for what reason so ever

4.3.14 KPI_10: Number of usable satellites

This KPI collects the number of actually visible satellites in operation in every particular case of position estimation.

Unit: unit-less

Definition: Number of visible and operational satellites, as reported by the satellite navigation (GPS) receiver

Remark: Provides additional information on good or bad accuracy

4.3.15 KPI_11: Geometric dilution of precision (GDOP)

This KPI refers to the estimate of position estimation error due to spatial distribution of satellites used for position estimation.

Unit: unit-less

Definition: GDOP, as reported by satellite navigation (GPS) receiver

Remark: Provides additional information on good or bad accuracy

4.3.16 KPI_12: Time between successful positioning fixes

This KPI refers to duration of time interval between two consecutive successful positioning fixes, thus defining the estimation of position estimation uncertainty at the certain vehicle velocity due to the age of position estimates.

Unit: [s]

Definition: Time between successful positioning fixes = time stamp of n^{th} position estimation - time stamp of n^{th-1} position estimation

Remark: Typically within IVS not varying too much

4.3.17 KPI_13: Success rate of heading information

This KPI describes the accuracy of the heading information of the vehicle. To get this value, the last three positions are evaluated and integrated in the IVS. This information is especially needed if the vehicle has a collision on the motorway and the rescue forces need to know in which direction the vehicle drove to take the correct ramp onto the motorway.

Furthermore, it has to be evaluated, if the last three positions can give a more reliable statement about the direction of the car than the MSD data concerning “vehicle direction” (Direction of travel in 2°-degrees steps from magnetic north (0 - 358, clockwise)).

Unit: [%]

Definition: Heading information success rate = correct heading information / all reported heading information * 100 %;

“Correct” if degree is within 75 degree concerning the direction of the vehicle on the road, or compass point is between neighbouring directions of N, NE, E, SE, S, SW, W, NW.

“Incorrect”, if above mentioned parameters do not fit at all.

Remark: This value is calculated by IVS and is critical to identify right side on highways.

4.3.18 KPI_14: Success rate of VIN decoding without EUCARIS

This KPI will show the correct encoding and decoding of the vehicle identification. The information about the vehicle having a collision can be very important for the rescue forces as they will know beforehand, which type of car has a collision and which tools might be useful to take with.

Unit: [%]

Definition: VIN success rate = correct reported information about vehicle by database / all requests at database * 100 %;

"Correct" if provided VIN is identical and presented data fits to type of vehicle (interface to database is correctly implemented), otherwise "Incorrect".

Remark: It is critical that VIN is properly encoded and transmitted via MSD. VIN decoding is not eCall specific

4.3.19 KPI_15: Success rate of VIN decoding with EUCARIS

Another possibility to get information about a vehicle is from the EUCARIS database. This database is used in the EU for the exchanges data concerning vehicles and driving licenses between Member States. After the decoding of the VIN by the PSAP, a connection to EUCARIS will be established, to secure information about the vehicle. This KPI describes how many requests at this database lead to the correct information provided by EUCARIS.

Unit: [%]

Definition: VIN EUCARIS success rate = correct reported information about vehicle by EUCARIS / all requests from PSAP for information at EUCARIS * 100 %

Remark: It is critical that VIN is properly encoded and transmitted via MSD. EUCARIS is not eCall specific.

4.3.20 KPI_16: Time for VIN decoding with EUCARIS

This KPI describes the time required for a successfully established connection and the transfer of data and will provide an overview about the duration of the complete process.

Unit: [s]

Definition: EUCARIS decoding time = point of time the decoded VIN is presented on operator's desk - point of time the request was initiated by PSAP

Remark: It is critical that VIN is properly encoded and transmitted via MSD. EUCARIS is not eCall specific

4.3.21 KPI_17: Dispatch time of incident data to rescue forces

This KPI represents the time required, until the PSAP starts to dispatch all necessary information to associated emergency services.

Unit: [s]

Definition: Needed time until information dispatch = start of dispatching information to rescue services ($T_{3\text{-}PSAP}$) - point of time for IVS initiated the eCall ($T_{0\text{-}IVS}$)

The “information dispatched” signal has to be defined before data collection or evaluation can start. One possible definition for “information dispatched” signal is the moment when PSAP has sent information about the event to relevant field units.

Remark: Typically this value might not be available as no real PSAP is used but only “test PSAP”. In case of unique alarms not enough values for statistical analysis

4.3.22 KPI_18: Time to activate rescue forces

This KPI represents the mean time required for activation of rescue forces for sufficient number of processed tests. Time is measured from the reception of the eCall by the PSAP until the rescue forces are dispatched (exit the garage etc.).

Unit: [s]

Definition: Rescue forces activation time = point of time the rescue forces are dispatched ($T_{4\text{-}ES}$) - point of time the eCall was indicated at PSAP ($T_{0\text{-}PSAP}$)

Remark: Typically this value might not be available as no real PSAP is used but only “test PSAP”. In case of unique alarms not enough values for statistical analysis

4.3.23 KPI_19: Dispatch time of incident data to TMC

This KPI refers to the time it takes to inform the TMC operators after the collision

Unit: [s]

Definition: Required time until incident data is presented = point of time of presentation of incident data at operator’s desk in TMC - point of time for IVS initiated the eCall ($T_{0\text{-}IVS}$)

Remark: Potential value added Service for eCall but critical part is more when to provide information

4.3.24 KPI_20: Success rate of presented incident data in TMC

This KPI refers to the relation between the numbers of initiated eCalls versus the number of successful received cases in the TMC

Unit: [%]

Definition: Successful presented incidents in TMC = received incidents in TMC / all initiated eCalls * 100 %

Remark: Potential value added Service for eCall but critical part is more when to provide information

4.3.25 KPI_21: Number of successful call-backs

This KPI refers to the number of successful call-backs from PSAP to IVS.

Unit: unit-less

Definition: Every successful call-back is recorded, to get an overview of the total number of successful call-backs.

Note: A Call-Back is only possible, if the IVS has established (or attempted to establish) an eCall to the PSAP. Between the termination of the initial eCall and the initiation of a call-back the PSAP shall wait at least [20] sec to allow the network to perform “housekeeping”, otherwise the IVS may be reported as “not reachable”.

Remark: In case of errors, operator may request call back to vehicle; mainly question of proper implementation of dormant eCalls (validated by certification)

4.3.26 KPI_22: Success rate of call-backs

This KPI refers to the number of successful call-backs from PSAP to IVS, compared with the number of attempted call-backs.

Unit: [%]

Definition: call-back success rate = successful call-back / all initiated call-backs * 100 %

Successful call-backs = initiated call-backs - failed call-backs

Failed call-back = The PSAP Operator cannot confirm bi-directional voice connection during call-back.

Initiated call-back = The PSAP Operator has confirmed bi-directional voice connection for the initial call and has initiated a call-back after sending CLEARDOWN to the IVS.

Remark: In case of errors, operator may request call back to vehicle; mainly question of proper implementation of dormant eCalls (validated by certification)

4.3.27 KPI_23: GSM network latency

This KPI will measure the time it will take a call to pass through the GSM network before reaching the 112 national networks.

Unit: [s]

Definition: GSM network latency = point in time when the call enters the 112 national network - point of time for IVS initiated the eCall ($T_{0\text{-}IVS}$)

Remark: Depends on network implementation and no significance on eCall timers (units are measured in seconds not fraction of seconds)

4.3.28 KPI_24: 112 National network latency

This KPI will measure the time it will take a call to pass through the 112 national networks before reaching the PSAP.

Unit: [s]

Definition: 112 network latency = point in time the call reaches the PSAP - point in time the call reaches the 112 network

Remark: Depends on network implementation and no significance on eCall timers (units are measured in seconds not fraction of seconds)

4.3.29 KPI_25: 112 Operator reaction time

This KPI will measure the time it takes an operator to answer a call once it is presented with a visual or audio notification.

Unit: [s]

Definition: 112 operator reaction time = point in time the operator answers the call - point in time the operator is notified about a call

Remark: Depending on loads in PSAP, no influence to eCall

4.3.30 KPI_26: Time for acknowledgement of emergency services

This KPI will measure the time it takes the emergency services to acknowledge the information sent by the 112 PSAP.

Unit: [s]

Definition: Emergency services availability = point in time the emergency services acknowledge the call ($T_{3\text{-}ES}$) - point in time the 112 PSAP dispatches the necessary information ($T_{3\text{-}PSAP}$)

This KPI should be measured separately for every emergency service alerted by the 112 PSAP operators.

Remark: Typically this value might not be available as no real PSAP is used but only "test PSAP". In case of unique alarms not enough values for statistical analysis

4.3.31 KPI_27: Total response time

This KPI will measure the total response time for the whole operational flow from the time of the collision until the emergency resources reach the incident scene.

Unit: [s]

Definition: Total response time = point in time the emergency resources reach the incident scene - point of time for IVS initiated the eCall ($T_{0\text{-}IVS}$)

Remark: Typically this value might not be available as no real PSAP is used but only "test PSAP". In case of unique alarms not enough values for statistical analysis

4.3.32 KPI_028a: Number of cross-border tests

This KPI will measure the number of tests near or crossing the border to another country where eCall is implemented.

Unit: unit-less

Definition: Every test is counted up to get an overview of the total number of tests done.

The result will have an informal character how the calls are handled which reach the PSAP on "the wrong side" of the border

Remark: **Recommended;** Required tests and should be specified per member site with which cross border was performed

4.3.33 KPI_028b: Number of interoperability tests

This KPI will measure the number of tests that have been carried out with a foreign PSAP.

Unit: unit-less

Definition: Every test carried out with a foreign PSAP is counted up to get an overview of the total number of tests done with foreign equipment.

These tests can be done in different levels:

- Dialling the long number of the foreign PSAP from the IVS located in its own country
- Sending the IVS/ travelling with the IVS to the other country and execute the tests with 112 (strongly recommended for pilot sites without implemented eCall-flag)

Note: This KPI includes evaluating the values of other KPIs for these tests (at least the basic ones).

Remark: **Obligatory**; Required tests and should be specified per member site with which interoperability was performed.

4.3.34 KPI_028c: Number of cross regional tests

This KPI will measure the number of tests near or crossing the border to another region where another PSAP is in charge.

Unit: unit-less

Definition: Every test is counted up to get an overview of the total number of tests done.

The result will have an informal character how the calls are handled which reach the PSAP on “the wrong side” of the border

Remark: only recommended for pilot sites with strictly divided regional organisation

4.3.35 KPI_029: Dispatch time of intermediate PSAP

This KPI represents the time required to manage the eCalls in an intermediate PSAP or a filtering centre before transferring them to the local PSAPs.

Unit: [s]

Definition: Point of time the eCall is received in the local PSAP minus Point of time the eCall is received in the Intermediate PSAP

Remark: only recommend for pilot sites where an intermediate PSAP respectively filtering centre distributes the calls to the single PSAPs

4.3.36 KPI_30: Number of calls flagged as dangerous good

This KPI will measure the number of tests that have been done using the dangerous goods flag and the dangerous goods information in the MSD.

Unit: unit-less

Definition: Every test executed with dangerous goods information is counted up to get an overview of the total number of tests done.

The result will have an informal character how the calls are handled which reach the PSAP with dangerous goods flag set.

Remark: The tests will only simulate the dangerous goods information by manipulating the MSD in the IVS.

4.3.37 KPI_31: Number of successful access of dangerous goods information

This KPI will measure the number of tests that have been done using the dangerous goods flag and the dangerous goods information in the MSD where the information about the dangerous goods could be successfully read.

Unit: unit-less

Definition: Every successful test executed with dangerous goods information is counted up.

Remark: The tests will only simulate the dangerous goods information by manipulating the MSD in the IVS. The MSD will be checked on The PSAP side to check if the dangerous goods information can be read correctly according to the standards

4.3.38 KPI_32: Number of Dormant SIM card tests

For this KPI not only the number of tests is important but the time for waking-up of the SIM. So for example the time when the eCall is triggered until the time the call is established should be measured or until the eCall is received in the PSAP. The countries which have available dormant SIM should define convenient time stamps.

5 Test specification and methodology

5.1 General requirements for the test specifications and methodologies

All tests are performed in test sets. A set is differentiated from the other one by modified prerequisites. Typically a new set will be initiated with the installation of a new version of software, hardware and/or firmware or by setting new parameters. It will not be necessary to specify all these conditions per test but only per set of tests. This allows later on a detailed evaluation based on specific issues like dependency from 3GPP version and MSD transmission time.

5.2 Requirements from Description of Work

The main target of the HeERO projects is the validation that the defined eCall standards are mature enough for deployment.

In the evaluation of the system it is essential to compare the implemented solutions of the eCall pilot systems during the different test phases in such a way that the achieved results are comparable across all participating member states. This comparison makes only sense, if the test methodologies used will provide comparable results. The test scenarios will be defined in such a way that they can be executed by every project partner with a common understanding of the underlying requirements and challenges.

Furthermore, all recorded data have to be evaluated in the same way using the same statistical evaluation procedures e. g. to identify outliers or to determine a standard deviation.

In addition, all preconditions have to be defined to assure, that the different tests are based on the same test requirements, for example in terms of analysing specific timings, that the clocks of IVS and PSAP are synchronized in a proper way. The synchronization can be achieved by using the same reference clock from the GPS or by manual adjustments prior or after the tests.

5.3 Validation procedure

To get comparable results the examination of each pilot site shall consist of the following:

- Time series diagrams of the values of relevant KPIs
- Fundamental KPI statistical description for every time series (mean, median, variance, standard deviation, skewness, kurtosis and histogram with normal probability)
- Discussion

Procedures for creation of the KPI time series diagrams and for fundamental KPI statistical description are described in [2], and conducted in accordance to [1] and [3].

Statistical parameter	Definition	Comments
Time series diagram of KPI	-	Graphical representation of time series values v measurement time stamps
Mean	$\bar{x}=\frac{1}{n}\sum_{i=1}^{n} x_i$	A numerical measure of the central location of the data values
Median		The value at the middle when the data is sorted in ascending order
Variance	$s^2=\frac{1}{n-1}\sum_{i=1}^{n}(x_i-\bar{x})^2$	A numerical measure of data values dispersion around the mean
Standard deviation	$\sigma=\frac{s}{\sqrt{n}}$	An observation variable proportional to the square root of its variance
Skewness	$\gamma_1=\frac{\mu_3}{\mu_2^{3/2}}$	A measure of the symmetry of the data distribution
Kurtosis	$\gamma_2=\frac{\mu_4}{\mu_2^2}-3$	A measure of the peakedness of the data distribution
Histogram with normal probability diagram	-	A graphical representation of the frequency distribution of a KPI values
Correlogram	Sample auto covariance $s_{xx}=\frac{1}{n-1}\sum_{i=1}^{n}(x_i-\bar{x})(x'_i-\overline{x'})$ Autocorrelation coefficient $r_{xx}=\frac{s_{xx}}{(s_x s_x)}$	A graphic representation of the values of the autocorrelation coefficient r(τ) between the original and τ-delayed time series of the same KPI
Correlation between the time series of different KPIs	Sample covariance: $s_{xy}=\frac{1}{n-1}\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})$ Correlation coefficient: $r_{xy}=\frac{s_{xy}}{s_x s_y}$	A graphic representation of the values of the correlation coefficient r(τ) between two KPIs' time series with their individual variances sx and sy, their covariance s xy, and the time lag τ
Correlation between KPI time series and geospatial	-	A qualitative evaluation of correlation between KPI value

environment		extremes and geospatial conditions

Table 3: Statistical parameters definition

6 Pilot Sites characteristics

6.1 Belgium

6.1.1 In General

The main scenario for the processing of emergency calls is described in the functional specification HeERO2_WP2_DEL_D2_2_Functional_specification_V1.0 on pages 16 and 17.

The steps in the scenario are:

1. The car initiates an eCall (manual or automatic).
2. The Mobistar network (pilot GSM network in HeERO2 Belgium) will distinguish the eCall flag and will deliver the call to a special number of the filtering entity.
3. The PABX of the filtering entity routes the call to the eCall modem, which will decode the MSD and file it in a database.
4. After finishing the decoding, the call is transferred by modem, via the PABX to an operator at the filtering entity.
5. The operator of the filtering entity (*Touring Club Royal de Belgique* for the HeERO2 pilot) will receive the call and determines if the call is genuine and worthy of being transferred to the PSAP. If so, he enriches the data, puts it in the database and transfers the call to the PSAP.
6. The XML is pushed to the database at ASTRID (Service provider of PSAP).
7. The operator in the PSAP takes the call and talks to operator of the filtering entity
8. In a pick list, the PSAP operator can see which eCalls have been sent electronically in the last 15 minutes, talking with the filtering entity, the PSAP picks the right event.
9. The Call is transferred and the PSAP talks to the caller in the car. The PSAP has the MSD info and the intake of the filtering entity available.
10. The PSAP further handles the call like any normal emergency 112 call and uses the extra information available in the eCall system provided by the minimum set of data

The scenario is schematically outlined below:

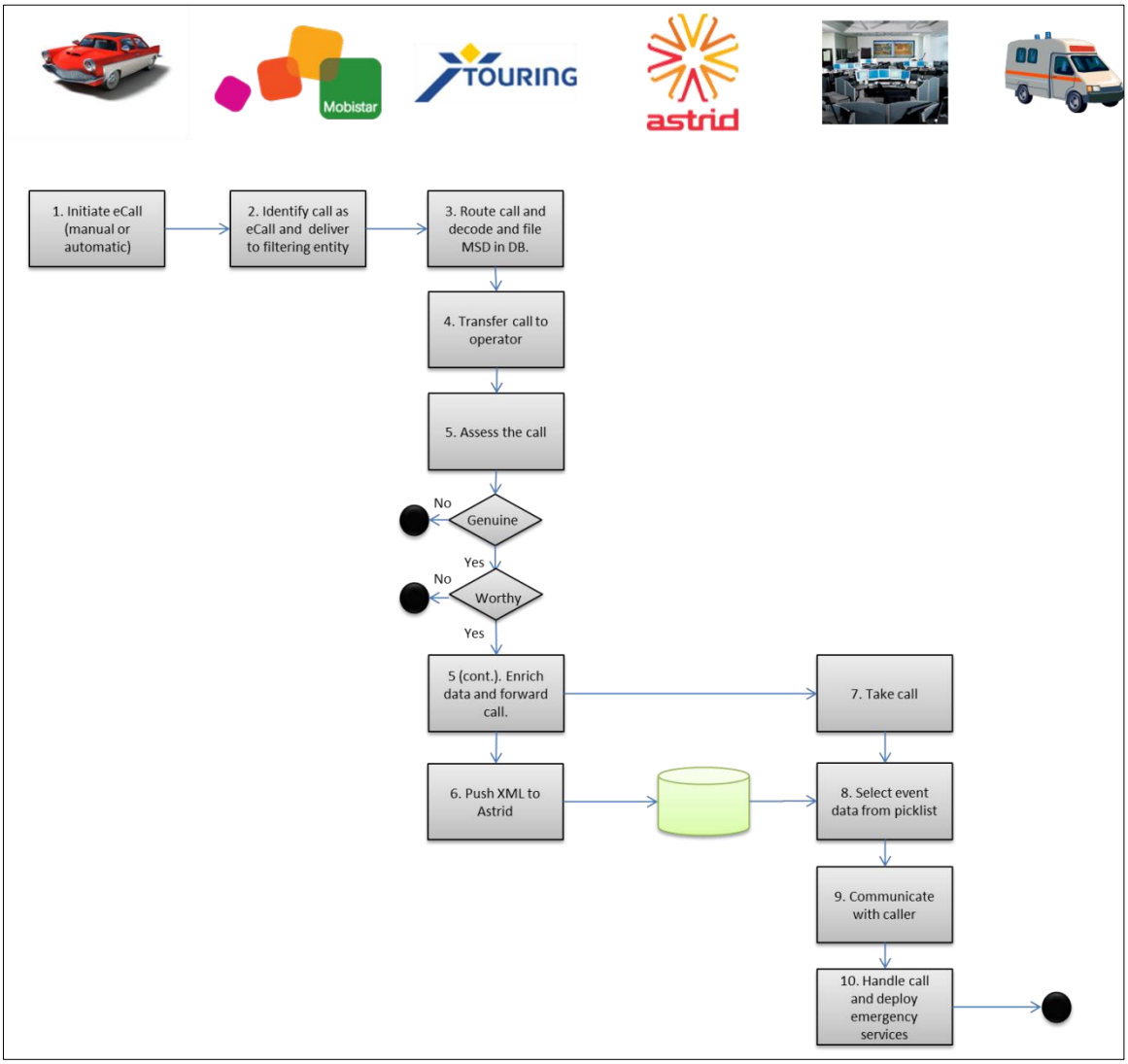

Figure 2: Schematic representation of the eCall E2E scenario

6.1.2 Testing environment

The testing environment that will be used in order to perform these tests is an end-2-end integration environment. In such a way, testing can be done throughout the entire chain. This test environment will also make use of actual operators and will have a strong focus on the filtering instance since this is particular for Belgium. For the setup of the test environment please refer to Figure 2 of the previous section.

6.1.3 Country specific matters

In Belgium, we will be working with a filtering instance. This will of course be taken up into the KPI's and the test scenarios. The following list of KPI's will be used:

BE Pilot-site – List of KPI's

ID of KPI	Name of KPI	Supported in BE	Rec.	Method of testing	Reqs on system	Remark
KPI_001a	Number of automatically initiated eCalls	Y	N	Logging in IVS	IVS: keep logging	
KPI_001b	Number of manually initiated eCalls	Y	Y	Logging in IVS	IVS: keep logging	
KPI_002a	Success rate of completed eCalls using 112	Y	Y	Logging in Filtering instance and PSAP	Filtering instance: keep logging PSAP: keep logging	General definition of successful eCall: Voice call path was established, MSD data transfer was done and MSD content was shown at operator's desk. Initiated eCall: eCall triggered by IVS Failed eCall: Either no establishment of a voice path connection at all, or no stable connection at all, or no voice call possible or no MSD transmission or faulty MSD transmitted
KPI_003	Success rate of received MSDs	Y	Y	Logging in Filtering instance and PSAP	Filtering instance: keep logging PSAP: keep logging	MSD must be presented at operator's desk
KPI_004	Success rate of correct	Y	Y	Comparison of data	IVS: keep logging Filtering	Corrections of the coding, transmission

ID of KPI	Name of KPI	Supported in BE	Rec.	Method of testing	Reqs on system	Remark
	MSDs			IVS-send – Filtering-receive Filtering send – PSAP-receive	Instance: keep logging PSAP: keep logging	and decoding
KPI_005	Duration until MSD is presented in PSAP	Y	Y	Time: IVS – Filtering instance Time: Filtering instance - PSAP	IVS: keep timestamp Filtering Instance: keep timestamp PSAP: keep timestamp	Note: this is a technical test (how long to transmit MSD) Interesting to benchmark value against other countries, bearing in mind that PSAP operator must do an operation to retrieve the MSD
KPI_006	Success rate of established voice transmissions	Y	Y	Voice transmission to filtering centre, correct and transfer to PSAP correct?	Filtering Instance: keep logging PSAP: keep logging	
KPI_007a	Duration of voice channel blocking	Y	Y	Calculate time based on timestamps	IVS: keep timestamp Filtering Instance: keep timestamp	
KPI_007b	voice channel blocking: automatic retransmission of MSD	Y	N	Calculate time based on timestamps	IVS: keep timestamp Filtering Instance: keep timestamp; enable error injection (simulate bad reception)	This happens when the IVS initiates an automatic retransmission
KPI_008	Time for call establishment	Y	N	Call establishment to filtering centre and establishment from filtering to PSAP	Filtering Instance: log timestamps PSAP: log timestamps	Call establishment to filtering service Yes. Mainly defined to defined time IVS and PSAP.
KPI_017	Dispatch time of	Y	N	Measurements:	Stopwatch measurement using	

ID of KPI	Name of KPI	Supported in BE	Rec.	Method of testing	Reqs on system	Remark
	incident data to rescue forces			Time Push button to Filtering operator has MSD and in voice-comm with car Time push button to PSAP-operator has MSD and in voice-comm with car To have realistic scenarios, simulation of typical scenarios to be written (action for Bob/112)	the Test-tetra system of Astrid	
KPI_021	Number of successful call-backs	Y	N	Operator to call back	Filtering Instance: keep logging PSAP: keep logging	
KPI_022	Success rate of call-backs	Y	N	Operator to call back	Covered at filtering : should be in Oecon	
KPI_024	112 National network latency	Y	N	Mobistar &NXP to check	IVS MNO	
KPI_025	112 Operator reaction time	Y	N	Stopwatch measurement using the Test-tetra system of Astrid	Filtering Instance: keep logging PSAP: keep logging	
KPI_028a	Number of cross border tests	Y	Y	To be defined together with NL and LUX	IVS; MNO: roaming and routing tables; Filtering instance	

Table 4: KPIs measured in Belgium Pilot

6.2 Bulgaria

6.2.1 In General

The Bulgarian National pilot realization is divided in two stages - before and after eCall Flag implementation, eCall test environment – PSAP application integration and connection to EUCARIS or local VIN database. The data collection and consolidation – phase 1 is going to be generated on the 1st realization stage as it is shown in the Figure 3 below.

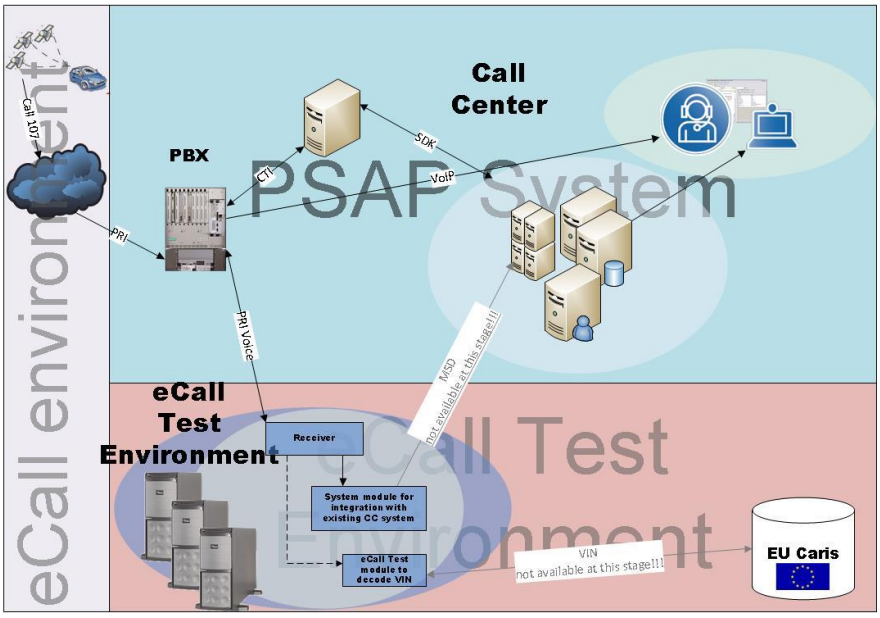

Figure 3: Bulgarian 1st realization stage

1st realization stage: Before eCall Flag implementation, eCall test environment – PSAP application integration and connection to EUCARIS or local VIN database.

Due to the fact that at this stage the eCall Flag is not implemented the workaround with another short number has been implemented.

At the 1st stage handling of eCalls is going to be done by a PSAP administrator/system integrator. During the test phase the incoming calls will be treated as a test calls without further processing to ECC or will be answered automatically without intervention. The test client is used to display MSD data on its screen (incl. GIS location) and the voice channel is activated. During this stage the connection to the EUCARIS or local VIN database will not be available.

The data collection and consolidation – phase 2 is going to be generated on the 2ndrealization stage as it is shown in the Figure 4 below. The eCall test environment will be available in Sofia after May 2014.

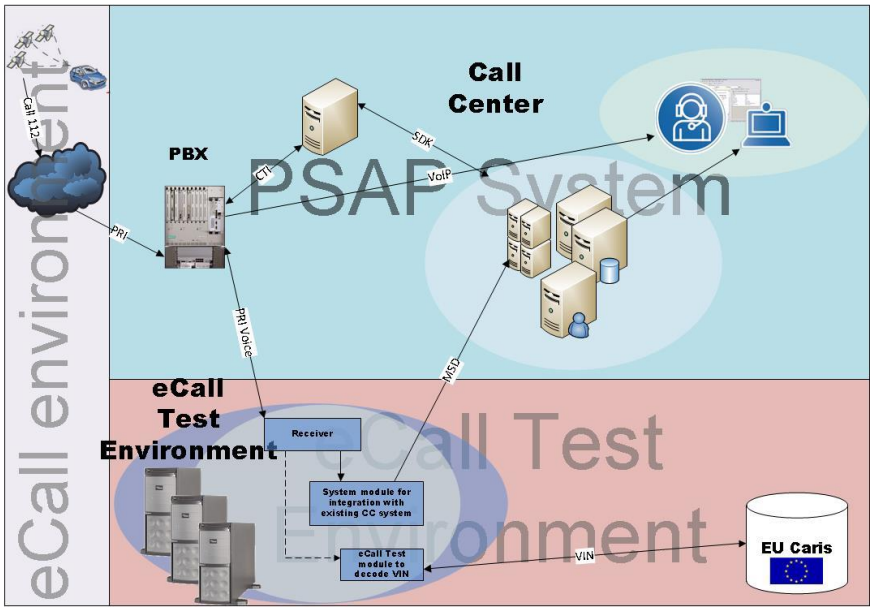

Figure 4: Bulgarian 2ndrealization stage

2nd realization stage: after eCall Flag implementation, eCall test environment – PSAP application integration and connection to EUCARIS or local VIN database

At the 2nd stage handling of eCalls is going to be done by PSAP operator/s. During the test phase the incoming calls will be treated according to the current 112 workflow, including further processing to ECC. MSD data will be displayed on the operator's screen (incl. GIS location). During this stage the connection to the EUCARIS or local VIN database could be available.

6.2.2 Testing environment

6.2.2.1 1st realization stage

Testing the eCall reception

- Test the eCall test environment in PSAP Sofia
    - Without eCall flag - test handling eCalls without eCall flag
    - Standard eCall (IVS calls PSAP) – test normal data flow
    - IVS redial – test case when IVS attempts a redial after connection has been interrupted
    - Call-back (PSAP calls IVS) – test call-back function
- Test the voice connection to the PSAP' administrator/ system integrator – answering and transferring a call

- Test the call-back feature from the PSAP' administrator/ system integrator point of view – min and max time for call-back
- Evaluate the defined KPIs -using the data collected during the tests

Test the MSD reception from the PSAP' administrator/ system integrator point of view

- Test the reception of the MSD in eCall test environment in PSAP Sofia – test if MSD is decoded and presented correctly
- Test the "resend MSD" functionality – resending MSD during a normal call and resend MSD during call-back, consecutive resend MSD during the same call etc.
- Test the automatic position of the incident – test automatic positioning of an incident on a map, based on the GPS coordinates from the MSD
- Evaluate the defined KPIs -using the data collected during the tests

6.2.2.2 2nd realization phase

Testing the eCall reception

- Test the eCall test environment in PSAP Sofia
  - With eCall flag - test handling eCalls with eCall flag
  - Standard eCall (IVS calls PSAP) – test normal data flow
  - IVS redial – test case when IVS attempts a redial after connection has been interrupted
  - Call-back (PSAP calls IVS) – test call-back function
  - Test more calls coming at the same time – analyse PSAP behaviour
- Test the voice connection to the PSAP' operator – answering and transferring a call
- Test the call-back feature from the PSAP' operator - min and max time for call-back
- Evaluate the defined KPIs -using the data collected during the tests

Test the MSD reception from the PSAP' operator point of view

- Test usability of the operator interface
- Test the reception of the MSD in eCall test environment in PSAP Sofia - test if MSD is decoded and presented correctly
- Test the "resend MSD" functionality - resending MSD during a normal call and resend MSD during call-back, consecutive resend MSD during the same call etc.

- Test the automatic position of the incident - test automatic positioning of an incident on a map, based on the GPS coordinates from the MDS
- Evaluate the defined KPIs -using the data collected during the tests

Testing the EUCARIS or local VIN database query

- Test the usability of the operator interface
- Test the EUCARIS or local VIN database query
- Evaluate the need for VIN associated information - determine the most needed information
- Evaluate the defined KPIs - using the data collected during the tests

Testing with the ECC

- Evaluate the information received by the ECC – determine the most needed information
- Evaluate the response time of the ECC based on the defined KPIs

6.2.3 Country specific matters

ID of KPI	Name of KPI	Rec KPIs	Bulgarian remarks	IVS TU	IVS ICOM	MNO	PSAP	Remarks about method of testing
KPI_01a	Number of automatically initiated eCalls		Yes	x	x			Logging in IVS
KPI_01b	Number of manually initiated eCalls	Y	Yes	x	x			Logging in IVS
KPI_02a	Success rate of completed eCalls using 112 [%]	Y	Yes, after eCall implementation at the beginning of 2014			x	x	Logging in PSAP
KPI_02b	Success rate of completed eCalls using long number [%]		Yes, short number is used			x	x	Logging in PSAP
KPI_03	Success rate of received MSDs [%]	Y	Yes				x	Logging in PSAP
KPI_04	Success rate of correct MSDs [%]	Y	Yes				x	Logging in PSAP
KPI_05	Duration until MSD is presented in PSAP [s]	Y	Yes			x	x	Logging in PSAP MNO measures once

KPI_06	Success rate of established voice transmissions [%]	Y	Yes				x	Logging in PSAP
KPI_07a	Duration of voice channel blocking [s]	Y	Yes	x	x			Logging in IVS
KPI_07b	Duration of voice channel blocking: automatic retransmission of MSD [s]		Yes	x	x			Logging in IVS
KPI_08	Time for call establishment [s]		Yes	x	x	x	x	IVS timestamp Logging in PSAP MNO measures once
KPI_09	Accuracy of position [m]		Yes	x	x			Logging in IVS
KPI_10	Number of usable satellites		Yes	x	x			Logging in IVS
KPI_11	Geometric Dilution of Precision (GDOP)		Yes	x	x			Logging in IVS
KPI_12	Time between successful positioning fixes [s]		Yes	x	x			Logging in IVS
KPI_13	Success rate of heading information [%]	Y	Yes	x	x			Logging in IVS
KPI_14	Success rate of VIN decoding without EUCARIS [%]		Yes	x	x		x	Logging in IVS Logging in PSAP
KPI_15	Success rate of VIN decoding with EUCARIS [%]		Yes, if Bulgaria become a member of.eCall EUCARIS agreement or after connection with Traffic Police vehicle register DB				x	Logging in PSAP
KPI_16	Time for VIN decoding with EUCARIS [%]		Yes, if Bulgaria become a member of.eCall EUCARIS agreement or after connection with Traffic Police vehicle register DB				x	Logging in PSAP
KPI_17	Dispatch time of incident data to rescue forces [s]		Yes, after integration within PSAP				x	Logging in PSAP
KPI_18	Time to activate rescue		Yes,				x	Logging in PSAP

	forces [s/min]		after integration within PSAP					
KPI_19	Dispatch time of incident data to TMC [s]		No					n/a
KPI_20	Success rate of presented incident data in TMC [%]		No					n/a
KPI_21	Number of successful call-backs		Yes, subject of tests				x	Logging in PSAP
KPI_22	Success rate of call-backs [%]		Yes, subject of tests				x	Logging in PSAP
KPI_23	GSM network latency [s]		Yes	x	x	x		IVS timestamp MNO measures once
KPI_24	112 National network latency [s]		Yes	x	x	x		IVS timestamp MNO measures once
KPI_25	112 Operator reaction time [s]		Yes, after integration within PSAP				x	Logging in PSAP
KPI_26	Time for acknowledgment of emergency services [s]		Yes, after integration within PSAP				x	Logging in PSAP
KPI_27	Total response time [s]		Yes, after integration within PSAP	x	x	x	x	Logging in PSAP
KPI_28a	Number of cross border tests	Y	Yes, after eCall implementation at the beginning of 2014				x	Logging in PSAP
KPI_28b	Number of interoperability tests	Y	Yes	x	x		x	BG' IVS with other PSAP/ BG' PSAP with other IVS
KPI_29	Dispatch time of Sofia Center 112 (PSAP) [s]		Yes				x	Logging in PSAP

Table 5: KPI tested in Bulgaria

An additional KPI is presented for Bulgarian pilot site, KPI_29 - dispatch time of Sofia Centre 112 (PSAP). This KPI represents the time required to manage the eCalls in the Sofia Centre 112 (PSAP) before transferring them to the Centre 112 which serves the Region of incident.

6.3 Denmark

The goals of testing and validation of eCall system in Denmark are to:

- Validate that the chain from vehicle to PSAPs is working correctly
- Validate that national interoperability between PSAPs is working correctly
- Validate that international interoperability between PSAPs are working correctly
- Examine the impact of Dormant SIM compared to Normal SIM in the IVS/OBUs

6.3.1 In General

The test activities are divided in to three categories:

1. Lab tests with a single IVS/OBU, and maybe (if needed) other special call initiating equipment. The purpose of tests performed in the lab test is to test single components in a controlled environment.
2. Long number test with 10-15 vehicles driving around Denmark, which in defined periods of time, are testing the whole chain and selected single components in a simulated reality. In Long number test, the vehicles are calling a single PSAP with a long number.
3. 112 tests are conducted as with Long number test, but with call to 112. These tests can only be conducted, if at least one of the four MNOs in Denmark has implemented eCall flag and correct routing (based on geography) in their network before summer 2014.

In Denmark, the first eCall implementation will not affect procedures or systems regarding communication between PSAP and ECC and between PSAP and TMC.

6.3.2 Testing environment

As we have two different authorities operating the three PSAPs with two different systems and setup, we're building two testing environments.

One of the testing environments is the primary testing environment. In this testing environment, all tests are to be conducted.

Some of the tests will also be conducted for the secondary testing environments.

The two testing environments are based on the existing testing environments for the two systems.

In the table below, the test plan is described.

Test suite	*Lab test*		*Long number test*		*112 test*
	Primary test environment	Secondary test environment	Primary test environment	Live environment	Live environment
IVS/OBU	H2 13				H2 14
PSAP	H2 13	H1 14	H2 13	H1 14	H2 14
National interoperability				H1 14	H2 14
International interoperability	H1 14				
Cross border					H2 14
MNO					H2 14
Whole chain				H1 14	H2 14

Table 6: Denmark: test plan

6.3.2.1 Three test phases

The testing will be conducted in three phases. Phase one will only use the primary testing environment. Phase two will use both testing environments, and all three live environments. Phase three will only use the three live environments.

6.3.2.2 Dormant SIM

Regarding the test suite: “IVS/OBU” all tests will be performed a multiple time (up to 10) for both normal SIM and Dormant SIM.

6.3.2.3 Long number test

Long number testing is performed in both the first and second test phase.

High volume testing will be generated during long number test.

For this test, a fleet of up to 15 vehicles with national inspectors who have errands all over Denmark will be driving around and periodically conduct manual eCalls for a long period of time.

During first phase of testing, all the calls will terminate in an Intelligent Voice Response (IVR) (after MSD have been stripped of the call).

During second phase of testing, the calls will terminate at an operator.

Logs

During the manual eCall, the IVS logs everything with time stamps, the receiving eCall router logs everything with timestamp and the PSAP system logs the received MSD.

The driver will register the app. time for the call, app. position (street name) heading, and note if the call has been made in urban area, rural area or on high way.

During first phase of testing, the driver will orally leave a message on the IVR with the same information as written down.

During second phase of testing, the driver will communicate location etc. to the operator, who will make special note, if the communication received from the driver, is in conflict with received data.

6.3.2.4 112 test

112 tests will be conducted in the third test phase only, and only if at least one MNO have implemented the eCall flag and geographical routing.

During 112 tests, the IVS/OBUs in the vehicles will all be switched from longer number call to 112 calls. Before doing this, the impact on normal 112, in case the eCall flag is not recognized correctly, must be assessed. This assessment will be conducted in the second test phase.

6.3.3 Country specific matters

ID of KPI	Name of KPI	Will be part of Danish pilot test	Danish Remarks
KPI_001b	Number of manually initiated eCalls	Y	
KPI_002a	Success rate of completed eCalls using 112	Y	
KPI_003	Success rate of received MSDs	Y	
KPI_004	Success rate of correct MSDs	Y	
KPI_005	Duration until MSD is presented in PSAP	Y	
KPI_006	Success rate of established voice transmissions	Y	

KPI_007a	Duration of voice channel blocking	Y	
KPI_013	Success rate of heading information	Y	will be tested in separate test scenarios as the normal test setup do not leave room for having a digital compass to measure with, at the same time.
KPI_028a	Number of cross border tests	Y	Dialogue with DENSO going on for half of this, and trying to reestablish dialogue with Sweden for other half.
KPI_028b	Number of interoperability tests	Y	

Table 7: KPIs to be tested in Denmark

Denmark's two eCall relevant neighbours are Sweden and Germany who both are HeERO partners. In order to perform cross border testing, at least one MNO must have implemented eCall in Denmark and in Sweden or Germany.

In Denmark, 112-calls can be forwarded automatically to another PSAP if the receiving PSAP have no available operator. This will happen after the MSD have been stripped of the call. In order to secure the first MSD transmitted in this situation, an interoperability solution will be implemented. The testing must also validate and test the timing impact of this interoperability solution.

6.4 Luxembourg

The goal of testing and validation of the eCall system in Luxembourg is to validate technological and functional properties of the system and to detect possible weaknesses or problems due to complex infrastructural conditions. The testing environment to be implemented will cover the whole service chain from the eCall IVS provided by several manufacturers to a real implemented PSAP in Luxembourg. Cross-border tests to be carried out in Luxembourg will be very similar to the other tests and are foreseen at least with Belgium and Germany.

6.4.1 In General

The IVS modules for testing will be placed on the dashboard of cars of HITEC and EPT. 12V power will be arranged by plugging the modules into the cigarette lighter jack. 2 modules per involved IVS manufacturer (Fujitsu TEN, FICOSA, NxP) will be prepared for the testing phase. A possibly needed re-configuration of the modules will be done via SMS-commands or USB connections to the test modules during the test activities.

The IVS support manual and automatic tests. In manual tests the driver issues an eCall by pressing a red button. For automatic tests the IVS issues and eCall every 60 minutes.

6.4.2 Testing environment

The Luxembourg eCall Solution is composed of three distributed main subsystems.

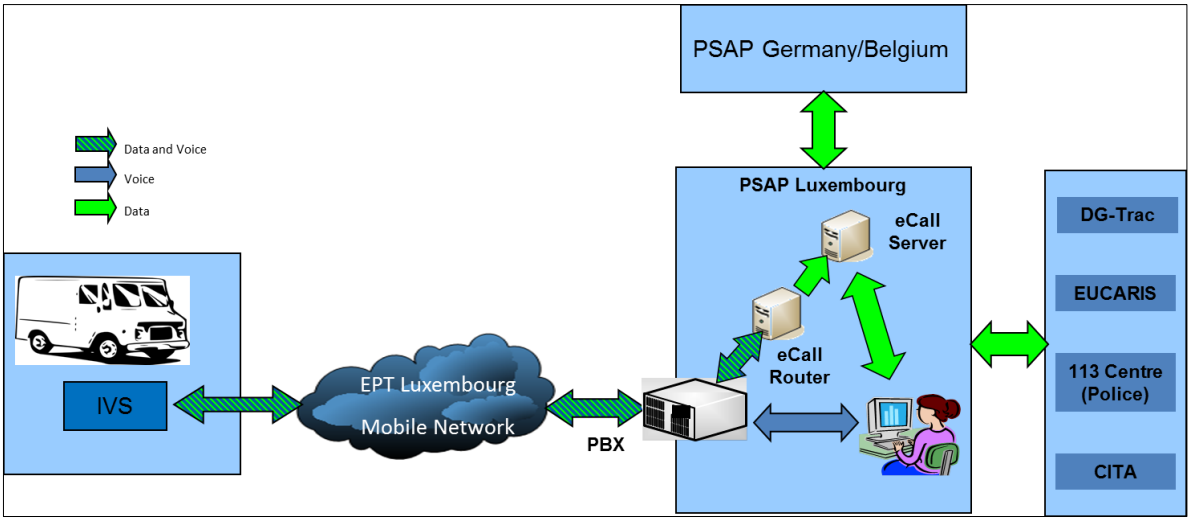

Figure 5: Luxembourg Architecture

- The in-vehicle systems (IVS) are provided by the manufactures FICOSA, NxP and Fujitsu Ten. The IVS are installed in 6 cars from EPT and HITEC.
- The Mobile Network is provided by the Luxembourg Entreprise de Poste et Télécommunications (EPT).
- The Luxembourg PSAP is located in Luxembourg City and is handled by the Administration des Services de Secours (ASS).
- In addition there are interfaces to other services like
    - EUCARIS for decoding the VIN
    - CITA (Luxembourg Traffic Management Centre)
    - 113 Centre (Luxembourg Police call-centre)
    - Dangerous goods tracking centre
    - Interface to German and Belgium PSAPs for handling cross border eCalls

KPIs will extract information about the quality and performance. To reach comparable data it is necessary to know the position of the vehicle initiating an eCall. During the field test phase, eCalls will be performed in determined periods of time without having real collisions. For the HeERO field test the samples will not be integrated into the car. As a result a series production process, performance indicators like shock resistance and backup battery availability without main power supply, will not be available. All parameters necessary for the evaluation of the listed KPIs will be logged in the IVS and the PSAPs.

6.4.3 Country specific matters

The following table gives an overview about the KPIs which shall be evaluated in Luxembourg.

ID of KPI	**Name of KPI**	**Luxembourg**	**Remark**
KPI_01a	Number of automatically initiated eCalls	Y	
KPI_01b	Number of manually initiated eCalls	Y	Describes number of “real” eCall scenarios with vehicle not moving and voice communication

KPI_02a	Success rate of completed eCalls using 112	(Y)	It is recommended to use eCall flag for call establishment with 112 Test will be executed when the eCall Flag is available
KPI_02b	Success rate of completed eCalls using long number	Y	Test will be executed with long number until the eCall Flag is available
KPI_03	Success rate of received MSDs	Y	Measures exactly what differs eCall from 112 call
KPI_04	Success rate of correct MSDs	Y	Measures proper en-/de-coding of MSD
KPI_05	Duration until MSD is presented in PSAP	Y	Measures time until information is available to operator
KPI_06	Success rate of established voice transmissions	Y	Measures basics of eCall, MSD and voice transmission
KPI_07a	Duration of voice channel blocking	Y	Most important to minimize, as during this time passengers in the vehicle do not know if eCall does work or not
KPI_13	Success rate of heading information	Y	This value is calculated by IVS and is critical to identify right side on highways
KPI_15	Success rate of VIN decoding with EUCARIS	(Y)	
KPI_16	Time for VIN decoding with EUCARIS	(Y)	
KPI_28a	Number of cross border tests	(Y)	Required tests and should be specified per member site with which cross border was performed
KPI_28b	Number of interoperability tests	Y	Required tests and should be specified per member site with which interoperability was performed
KPI_30	Number of calls flagged as dangerous good	(Y)	Manual test of dangerous goods flag can only be tested in Q4/2014
KPI_31	Number of successful access of dangerous goods information	(Y)	Manual test of dangerous goods flag and access to dangerous goods database can only be tested in Q4/2014
KPI_32	Number of Dormant SIM card tests	(Y)	

Table 8: KPIs evaluated in Luxembourg

Concerning the (Y) in brackets, the following statements are valid at the moment:

KPI_002a: No eCall-flag is available at the moment in Luxembourg. The eCall Flag will only be available in July 2014.

KPI_015, KPI_016: Depending on access to EUCARIS from Luxembourg. Planned for begin 2014.

KPI_28a: Practical Cross border tests can only be executed when the eCall flag is implemented in Luxembourg and at the borders of Luxembourg in Germany and Belgium. For Germany and Belgium this implementation is not foreseen before the end of the project. Therefore these tests will only be simulated and the operational process be checked.

KPI_30, KPI_31: The tests will cover the 3 methods defined in the standard:

1. Dangerous goods information included directly in the MSD
2. Link to transport papers describing the loaded goods
3. Link to a web service of a dangerous goods tracking service (e.g. DG-Trac)

The DG-Trac service necessary for testing these KPIs will not be available before Q4/2014. Therefore these tests will be executed at the end of the projects and the results may not be on-time for the test reports.

KPI_32: It is not finally decided if dormant SIM cards can be tested in Luxembourg before end of 2014.

Automatic test scenarios

To get a big amount of data for later statistical analyses, to a huge extend automatic tests will be initiated.

At the beginning there will be several manual tests to verify the correct functionality of the system. Later each IVS will initiate eCalls automatically once per hour. All required data to evaluate the above KPIs will be logged both by IVS and PSAP. The caught data is described in the annex of this document. It is planned to increase the frequency of initiated eCalls on the one hand to get more data for statistical analysis and on the other hand to get an impression about the performance of the PSAP system.

Manual test scenarios

Concerning manual test scenarios, two different scenarios are defined:

1) Dedicated test sessions

To verify certain functionalities or to react on erroneous behaviour, dedicated test sessions will be executed. These test sessions will be initiated by the manufacturers of the IVS systems directly to have additional control of the activities within the eCall. This is necessary at least to test the voice communication between driver of test vehicle and PSAP. It might also be necessary at difficult locations, where the environmental conditions are not optimal for GPS or GSM connections. If locations and/or other problems are identified during the automatic test sessions, further manual tests have to be done to clarify the reason for the problem. There will be a close team work between IVS manufacturer, PSAP operator and test fleet manager to coordinate dedicated test sessions.

2) Additional eCalls during test drives

In addition to the automatic tests, the driver of the test vehicle is asked to initiate eCalls whenever he wants. Mainly, these eCalls shall be initiated, when the vehicle is not moving, to get reasonable values concerning the heading and positioning information. These tests must be done to reflect realistic eCall scenarios in the future in which after an incident the vehicle came to a final stop.

6.4.4 Handling of Dangerous Goods

When a truck of vehicle carrying dangerous goods is involved in an incident, emergency services need to know this as soon as possible and not only when they arrive on the scene.

Therefore the Dutch and the Luxembourg Pilot Sites are working on concepts how the necessary information can be provided.

The prerequisite for this work is to know which information is requested by emergency services. The following questionnaire is used to answer this question:

Question for PSAP operators

- Is it useful for the PSAP operator to receive additional information when a dangerous goods transport has an incident?
- Is it useful to receive the UN-Number of the dangerous good s?
- Is it useful to know the volume and/or quantity of DGs loaded?
- Will they rely on the information of DGs provided with the eCall alone?
- Will you adapt your process to deal with the additional information?

- Would it be useful to know the “crash severity index” provided by the vehicle, when available?

Questions for logistic operators

1. How can the information about dangerous goods loaded in a vehicle be maintained correctly?
2. In which cases should the driver, the consignee or the vehicle operator be responsible for the updates?
3. In which cases should the sender be responsible for the updates?
4. Is it realistic to ask the sender to provide the UN number
5. How can this information be associated with the vehicle?

6.5 Spain

6.5.1 In General

The goal of testing and validation of the eCall system in Spain is to validate technological and functional properties of the system and to detect possible weaknesses or problems due to complex infrastructural conditions. The testing environment to be implemented will cover the whole service chain from the eCall IVS provided by a number of manufacturers to several regional PSAPs through an intermediate PSAP. Apart from cross-regional tests, also cross-border tests will be carried out.

6.5.2 Testing environment

Spain has 19 regional 112 emergency centres belonging to Civil Protection. 4 of them will participate in the Spanish pilot (**Galicia, Castilla y León, Madrid and Comunidad Valenciana**). All of them have different hardware and software equipment for E112 calls emergency management. Giving coverage to **4 pilot areas** will ensure both enough sampling of current existing 112 emergency handling centres and assessment and experience (operating procedures and discrimination of eCalls) on what happens in the border area between different 112 emergency centres (Galicia-Castilla y León or Madrid-Castilla y León). Also, an **intermediate PSAP at DGT** headquarters in Madrid will act as an eCall filtering element.

Figure 6: Spain test regions

Information received at the intermediate PSAP will be related to M1 and N1 category equipped vehicles but some activities will also be dealing with a quick attention to motorcycles collisions (Powered Two Wheels vehicles, P2W). For P2W, sensing assessment in helmets and other equipment (GPS, accelerometer, gyroscope, odometer, inclinometer, fall detection) together with solutions linked to the P2W vehicle itself will be carried out (see specific subsection below).

The test vehicles will send eCalls in different scenarios in order to test the system in different environmental conditions that could affect its performance:

- Areas with weak signal (coverage) behaviours (e.g. tunnels)
- Areas with overload of data traffic in the network
- Bad weather conditions
- Cross border areas

The test case scenarios and eCall modes have been considered to perform complete analyses. The scenarios considered are the following ones:

- Standard environmental conditions
  - Description: Normal network coverage, normal satellite visibility, with good weather.
  - Objectives: Test eCall in the most common scenario
- Bad weather conditions
  - Description: Areas with bad weather (rain, cloudy…).
  - Objectives: Test eCall in bad weather conditions (if feasible)
- Weak GSM signal scenario
  - Description: Bad network coverage, for example a tunnel or rural area.
  - Objectives: Test eCall in scenarios without good network coverage
- High traffic load of GSM data scenario*
  - Description: Places with a high traffic load of GSM data, such as an urban area (if feasible)
  - Objectives: Test eCall in a scenario with a high load of GSM traffic (if feasible).
- Good GNSS conditions
  - Description: Areas with good GNSS visibility (open sky).
  - Objectives: Test eCall in areas with good GNSS satellite visibility
- Bad GNSS conditions
  - Description: Areas with bad GNSS visibility (e.g. tunnel, foliage…).

- Objectives: Test eCall in areas with bad GNSS satellite visibility

- Vehicle high speed (e.g. Highway)
  - Description: Areas where vehicles can drive at high speeds (e.g. highways)
  - Objectives: Test eCall at high speeds.

- Vehicle low speed (e.g. traffic jam)
  - Description: Areas where vehicles' speed is reduced (e.g. in a traffic jam)
    - Objectives: Test eCall at low speed or stopped.

- Driving in regional cross border
  - Description: Areas between two Spanish regions (Madrid and Castilla y León)
  - Objectives: Test the quality of eCall in cross-regional areas, IVS should remain connected to the Regional 112 PSAP where the call has been redirected by the intermediate PSAP at DGT.

All parameters necessary for the evaluation of the corresponding KPIs will be logged in the IVS and PSAPs information systems as well. Additionally, some IVS will be complemented by specific data logging systems, which can also serve to remotely trigger automatic eCalls via CAN bus signals.

Figure 7 CTAG's data logger and testing automation tools

6.5.3 Country specific matters

Spain will implement the Pan European eCall service into the already existing regional E112 system, using an intermediate PSAP which will allow filtering and discrimination of eCalls. This feature is the most relevant characteristic of the Spanish pilot. The pilot architecture is based on a several layer approach, agreed with the Spanish Commission on Civil Protection. The first level will be an intermediate PSAP deployed by the DGT in Madrid which will be in

charge of filtering the received eCalls, decoding the received MSD and sending the information to the appropriate regional 112 PSAP.

At the DGT intermediate PSAP, after MSD decoding, the information received will be provided to three parties:

- Regional 112 PSAP, where previous upgrading and system integration of the eCall system and the E112 already running system will be done
- TCC/TIC in own DGT intermediate PSAP, where also the information will be related with the following own DGT databases:
    - Spanish database of the Vehicle Identification Number (VIN)
    - Spanish database of traffic incidents (ARENA)

And additionally, other databases providing necessary information such as

- RACC-owned database of Rescue Sheets by VIN
- Traffic Police

In respect to recommended KPIs, given that the eCall flag will not be implemented in the network, at least for the Phase 1 of the pilot, **KPI_002a** will be measured in the Spanish pilot, where possible, by using a long number.

The following table summarises the list of KPIs to be collected in the Spanish tests:

ID of KPI	Name of KPI	recommended	Remark	Spanish remarks
KPI_001a	Number of automatically initiated eCalls		Describes the number of manually initiated eCalls.	Yes
KPI_001b	Number of manually initiated eCalls	Y	Describes number of “real” eCall scenarios with vehicle not moving and voice communication	Yes
KPI_002a	Success rate of completed eCalls using 112	Y	It is recommended to use eCall flag for call establishment with 112	NO. See above
KPI_002b	Success rate of completed eCalls using long number		eCall flag is not used and a long number for a PSAP is used as a telephone number for an emergency call	Yes
KPI_003	Success rate of received MSDs	Y	Measures exactly what differs eCall from 112 call	Yes
KPI_004	Success rate of correct MSDs	Y	Measures proper en-/de-coding of MSD	Yes
KPI_005	Duration until MSD is presented in PSAP	Y	Measures time until information is available to operator	Yes
KPI_006	Success rate of established voice transmissions	Y	Measures basics of eCall, MSD and voice transmission	Yes
KPI_007a	Duration of voice channel blocking	Y	Most important to minimize, as during this time passengers in the vehicle do not know if eCall does work or not	Yes
KPI_007b	Duration of voice channel blocking: automatic		Refers to KPI_008 and evaluates voice channel blocking if an automated	Yes

ID of KPI	Name of KPI	recommended	Remark	Spanish remarks
	retransmission of MSD		retransmission of MSD is initiated by IVS	
KPI_008	Time for call establishment		Time difference between time of eCall initiation and time of eCall reception at PSAP	Yes
KPI_009	Accuracy of position		Evaluation depends on the use or not of a reference system (in order to quantify it). Otherwise, only qualitative assessment is possible	Yes
KPI_010	Number of usable satellites		Visible and operational satellites	Yes
KPI_011	Geometric Dilution of Precision (GDOP)		As reported by satellite navigation receiver	Yes
KPI_012	Time between successful positioning fixes		Time interval between two consecutive successful positioning fixes	Yes
KPI_013	Success rate of heading information	Y	This value is calculated by IVS and is critical to identify right side on highways	Yes
KPI_014	Success rate of VIN decoding without EUCARIS		Correct encoding and decoding of vehicle identification	Yes
KPI_015	Success rate of VIN decoding with EUCARIS		How many requests at EUCARIS DB lead to the correct information provided by EUCARIS	No. EUCARIS will not be used in the Spanish pilot
KPI_016	Time for VIN decoding with EUCARIS		Time required for a successfully established connection and the transfer of data	No. EUCARIS will not be used in the Spanish pilot
KPI_017	Dispatch time of incident data to rescue forces		Time required until the PSAP starts to dispatch all necessary information to emergency services	Not yet known if rescue forces will be involved in the pilot
KPI_018	Time to activate rescue forces		Mean time required for activation of rescue forces for sufficient number of processed tests.	Not yet known if rescue forces will be involved in the pilot
KPI_019	Dispatch time of incident data to TMC		Time it takes to inform the TMC operators after the collision	Yes
KPI_020	Success rate of presented incident data in TMC		Relation between number of initiated eCalls vs. number of successful received cases in the TMC	Yes
KPI_021	Number of successful call-backs		Successful call backs from PSAP to IVS	Not yet decided if there will be call backs in the Spanish pilot
KPI_022	Success rate of call-backs		Number of successful call-backs from PSAP to IVS compared with the number of attempted call-backs	Not yet decided if there will be call backs in the Spanish pilot
KPI_023	GSM network latency		Time it takes a call to pass through the GSM network before reaching 112 national networks	Yes
KPI_024	112 National network latency		Time it takes a call to pass through the 112 national networks before reaching a PSAP	No
KPI_025	112 Operator reaction time		Time it takes an operator to answer a call once it is presented with a visual or audio notification	No
KPI_026	Time for acknowledgment of emergency services		Time it takes emergency services to acknowledge the information sent by the 112 PSAP	Not yet known if rescue forces will be involved in the pilot
KPI_027	Total response time		Total response time for the whole operational flow from the time of collision	Not yet known if rescue forces will be involved in the pilot

ID of KPI	Name of KPI	recommended	Remark	Spanish remarks
			until the emergency resources reach the incident scene	
KPI_028a	Number of cross border tests	Y	Required tests and should be specified per member site with which cross border was performed	Yes
KPI_028b	Number of interoperability tests	Y	Required tests and should be specified per member site with which interoperability was performed	Yes

Table 9: KPIs to be evaluated in Spain

6.5.4 P2W

In case of P2Ws, the way to carry out the emergency call is the same as the other IVVs; so the related KPIs are not different. In some KPIs its value will vary comparing with a passenger car, but the KPI meaning is the same.

A specific MSD will be defined as an output of the project, so P2Ws will have a different MSD fields and this fact can be affect to MSD related KPIs. To obtain the complete information in the MSD a short questionnaire has been performed as follows:

P2W Information Questionnaire

Post-crash position and orientation related questions

- Is it useful to differentiate between the position of the driver and the position of the motorbike in the MSD?
- Is it useful to communicate the orientation of the driver and the motorbike in the MSD?
- Is it useful to communicate the distance between the driver and the motorbike in the MSD?
- How often the positions of the driver have to be updated?
- How long should be the duration of the update of the positions of the driver?
- How often the positions of the motorbike have to be updated?
- How long should be the duration of the update of the positions of the motorbike?

Passenger related question

- Is it useful to know if there is any passenger on the motorbike?

Communication related questions

- Is it useful to know if the communication between the driver and the motorbike has been lost?
- Knowing that in many cases the communication between the driver and the motorbike is lost in the incident, is it useful to know previous motorbike information regarding pre-crash information, e.g. velocity, time to stop…?

Crash severity related questions

- Is it useful to know a “crash severity index” given by the data registered in the motorbike?
- Is it useful to know a “crash severity index” given by the data registered in the helmet?

Generic additional question

- Which additional information makes sense in the MSD for P2W?

6.6 Turkey

The goal of testing and validation of the eCall system in Turkey is to validate technological and functional properties of the system. The testing environment to be implemented will cover the whole service chain from the IVS to PSAP.

6.6.1 In General

The field tests will be carried out with four test vehicles. Two of these vehicles will be equipped with Civitronic IVS units which are supplied by Renault and the other two will be equipped with Magneti Marelli IVS units which are supplied by Tofaş. The IVS units will use Turkcell's GSM network for establishing eCall.

The tests will involve only manually initiated eCalls which will be activated by pressing a button on the IVS equipment.

6.6.2 Testing Environment

The Turkish eCall system architecture is shown in Figure 8.

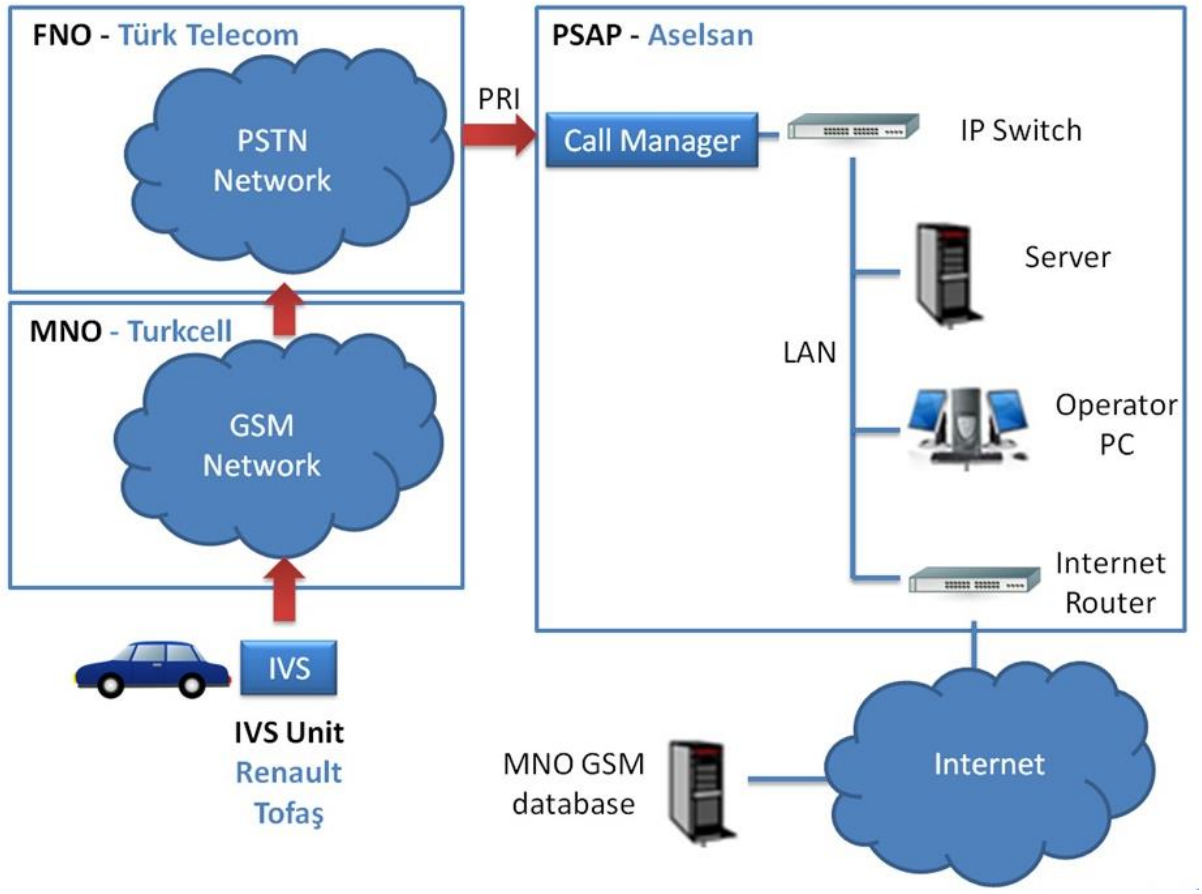

Figure 8: Turkish eCall system architecture

The field tests will provide quantitative metrics about system quality and performance. The tests will cover the KPIs that are presented in Section 6.6.3. All the field tests will take place in Antalya province. 112 PSAP in Antalya will be used as the PSAP for handling eCalls. Four vehicles will be equipped with IVS units. Manually triggered eCalls will be used for collecting test data. The position of the vehicles will be available from two sources. One from the GPS receiver of the IVS unit and the other is from the Mobile Network Operator's position information. The test statistics will be collected both from the logs on the IVS units and the recorded data on the PSAP.

6.6.3 Country Specific Matters

The KPIs which shall be evaluated in Turkey are given in Table 10.

ID of KPI	Name of KPI	Recommended	Remark

ID of KPI	Name of KPI	Recommended	Remark
KPI_01b	Number of manually initiated eCalls	Y	Describes number of “real” eCall scenarios with vehicle not moving and voice communication
KPI_02a	Success rate of completed eCalls using 112	Y	It is recommended to use eCall flag for call establishment with 112
KPI_03	Success rate of received MSDs	Y	Measures exactly what differs eCall from 112 call
KPI_04	Success rate of correct MSDs	Y	Measures proper en-/de-coding of MSD
KPI_05	Duration until MSD is presented in PSAP	Y	Measures time until information is available to operator
KPI_06	Success rate of established voice transmissions	Y	Measures basics of eCall, MSD and voice transmission
KPI_07a	Duration of voice channel blocking	Y	Most important to minimize, as during this time passengers in the vehicle do not know if eCall does work or not
KPI_13	Success rate of heading information	Y	This value is calculated by IVS and is critical to identify right side on highways
KPI_28b	Number of interoperability tests	Y	Required tests and should be specified per member site with which interoperability was performed

Table 10: Selected KPIs for Turkish pilot project

6.7 Greece

6.7.1 In General

The objective of the Greek eCall Pilot is to assess and evaluate the eCall system performance in Greece from IVS to PSAP, end-to-end. The actual tests will be performed in October and November 2013. It is envisaged to perform 1500 eCalls activations. The testing scenarios are shown below.

6.7.2 Testing environment

The test locations have been selected to simulate different scenarios, with possible low GPS coverage and include urban roads with tall buildings within Athens, the ATTIKI ODOS peripheral of Athens where there are numerous tunnels, the Athens – Korinthos highway and rural roads in the Attica region. The tests will be performed in two shifts, a morning shift from 8:00 to 14:00 and an afternoon shift from 14:30 to 20:30.

Code	Location	Number of vehicles involved	Number of vehicles in roaming	eCall initiation	Number of tests
H1	Attiki Odos Arterial Highway of Attiki (65 km)	2	2	M /A	400
H2	E65 highway, Athens – Korinthos (82 km)	2	2	M /A	200
U1	Urban roads, Athens city centre	2	2	M /A	500
R1	Rural road, Rafina – Oropos (65 km)	2	2	M /A	400

Table 11: Overview of Greek real traffic test scenarios

Figure 9: H1 test environment - Greek pilot project

Figure 10: H2 test environment - Greek pilot project

Figure 11: U1 test environment - Greek pilot project

Figure 12: R1 test environment - Greek pilot project

- **Preconditions**: 1) Vehicle equipment

IVS and voice communication to the PSAP

Manual/ Simulated automatic initiation of the eCall

2) Mobile network

Dialling long number

3) PSAP

Inband modem installed

Decoding and visualizing MSD content possible

Voice connection to the vehicle possible

- **Test Procedure**: The driver manually initiates an eCall at various positions; in different traffic environments (see Table 4 above). At several selected locations along the road, representative of the area and with possible low GPS coverage, the driver stops the vehicle at the roadside and manually activates eCall or presses the automatic simulation button. Log files are stored in the vehicle and in the PSAP and both the driver and the PSAP operator complete a subjective questionnaire containing a standardized value scale for the evaluation after the end of each eCall.
- **Measurement**: Documentation

  1) Vehicle

  Log with time stamps of eCall initiation, MSD sending, end of eCall.

  Log with MSD content.

  Subjective questionnaire completed by driver.

  2) PSAP

  Log with time stamps of eCall reception, MSD reception, MSD display, voice call start, end of eCall.

  Log with MSD content.

  Subjective questionnaire completed by PSAP operator.

The KPIs that will be evaluated are shown below:

KPI_01a	Number of automatically initiated eCalls
KPI_01b	Number of manually initiated eCalls
~~KPI_02a~~	~~Success rate of completed eCalls using 112~~ (*)

KPI_02b	Success rate of completed eCalls using long number
KPI_03	Success rate of received MSDs
KPI_04	Success rate of correct MSDs
KPI_05	Duration until MSD is presented in PSAP
KPI_06	Success rate of established voice transmissions
KPI_07a	Duration of voice channel blocking
KPI_07b	Duration of voice channel blocking: automatic retransmission of MSD
KPI_08	Time for call establishment
KPI_14	Success rate of VIN decoding without EUCARIS
KPI_21	Number of successful call-backs
KPI_22	Success rate of call-backs
KPI_26	Time for acknowledgement of emergency services
KPI_27	Total response time (**)
KPI_28a	Number of cross-border tests (**)
KPI_28b	Number of interoperability tests

Table 8: Selected KPIs for Greek pilot project

(*) KPI_02a will not be calculated because the eCall flag won't be implemented by the Greek MNOs during the tests.

(**) KPI_27 and KPI_28a will be tested if possible.

6.7.3 Country specific matters

Greece has acquired a completely new eCall PSAP. After MSD decoding, the eCall PSAP operators answers the call and according to the specificities of the call transfers it to the corresponding emergency service. The Call Centre of the emergency service is also connected to the eCall PSAP server and sees the incident on the eCall PSAP screen together with all relevant information. The eCall PSAP is connected to the Greek VIN database.

Several verification tests have been performed with the PSAP and IVS equipment, during July and August 2013. Successful manual eCall activations have been made, one of which came from a real vehicle that drove in the area of Chalandri.

Moreover, during the eCall "Testfest" organised on 9-13 September 2013 in Essen, the Greek PSAP was tested with IVS devices from all IVS manufacturers and it functioned according to the eCall standards completing successfully the relevant tests. Furthermore,

there were eCalls from German SIM cards to the Greek PSAP and they were all successfully processed and handled.

7 References

[1] Hughes, I G and T P A Hase, Measurements and their Uncertainties: A Practical Guide to Modern Error Analysis, Oxford University Press, Inc., New York, NY, 2010, ISBN 978-0199566334

[2] Maindonald, J and W J Brown, Data Analysis and Graphics Using R - an Example-Based Approach (3rd edition), Cambridge University Press, Cambridge, UK, 2010, ISBN 978-0521762939.

[3] Ott, R L and M Longnecker, An Introduction to Statistical Methods and Data Analysis (5th ed), Duxbury, Thomson Learning, Inc., Pacific Grove, CA, 2000, ISBN 978-0534251222.

8 Annex I – Overview of result sheets for evaluation

The results of KPIs shall be filled in a template like Table 12. For each different test case a new column shall be used. The different test cases shall be specified in Table 13.

KPI_xx	Name of KPI	Combination of IVS/MNO/PSAP:		Combination of IVS/MNO/PSAP:	
		IVS 1/MNO 1/PSAP 1		IVS2/MNO1/PSAP1	
		Result	Unit	Result	Unit
01a	Number of automatically initiated eCalls		-		-
01b	Number of manually initiated eCalls		-		-
02a	Success rate of completed eCalls using 112		%		%
02b	Success rate of completed eCalls using long number		%		%
03	Success rate of received MSDs		%		%
04	Success rate of correct MSDs		%		%
05	Duration until MSD is presented in PSAP		s		s
06	Success rate of established voice transmissions		%		%
07a	Duration of voice channel blocking		s		s
07b	Duration of voice channel blocking: automatic retransmission of MSD		s		s
08	Time for call establishment		s		s
09	Accuracy of position		m		m
10	Number of usable satellites		-		-
11	Geometric dilution of precision		-		-
12	Time between successful positioning fixes		s		s
13	Success rate of heading information		%		%
14	Success rate of VIN decoding without EUCARIS		%		%
15	Success rate of VIN decoding with EUCARIS		%		%
16	Time for VIN decoding with EUCARIS		s		s
17	Dispatch time of incident data to rescue forces		%		%
18	Mean time to activate rescue forces		S		S
19	Dispatch time of incident data to TMC		s		s
20	Success rate of presented incident data in TMC		%		%
21	Number of successful call-backs		-		-
22	Success rate of call-backs		%		%

KPI_xx	Name of KPI	Combination of IVS/MNO/PSAP:		Combination of IVS/MNO/PSAP:	
		IVS 1/MNO 1/PSAP 1		IVS2/MNO1/PSAP1	
		Result	Unit	Result	Unit
23	GSM network latency		s		s
24	112 national network latency		s		s
25	112 operator reaction time		s		s
26	Time for acknowledgement of emergency services		s		s
27	Total response time		s		s
28 a	Number of cross-border tests		-		-
28 b	Number of interoperability tests		-		-
28c	number of cross regional tests		-		-
29	Dispatch time of Intermediate PSAP		s		s
30	Number of calls flagged as dangerous good		-		-
31	Number of successful access of dangerous goods information		-		-
32	Number of Dormant SIM card tests		-		-

Table 12: evaluation result sheet

name		version	home country
IVS 1:			
IVS 2:			
IVS 3:			
…			
MNO 1:			
MNO 2:			
…			
PSAP 1:			
PSAP 2:			
…			

Table 13: specification of test cases