D6.6 Recommendations on implementation and operation of eCall

HERO 112 SOS)

Harmonised eCall European Pilot

Version number:	Version 1.0
Main author:	ICOOR
Dissemination level:	PU
Lead contractor:	ERTICO – ITS Europe
Due date:	3.09.2014
Delivery date:	18.12.2014
Delivery date updated document	28.04.2015

Page left intentionally blank

Control sheet

Version history			
Version	**Date**	**Main author**	**Summary of changes**
0.1	15 Oct 2014	Selini Hadjidimitriou	Table of contents
0.2	18 Dec 2014	Selini Hadjidimitriou	Recommendations
1.0	28 April 2015	Selini Hadjidimitriou	Review according to reviewers comments

	Name	**Date**
Prepared	Selini Hadjidimitriou	28 April 2015
Reviewed	Andy Rooke	20 January 2015 14 May 2015
Authorised	Andy Rooke	20 January 2015 14 May 2015

Circulation	
Recipient	**Date of submission**
Project partners	20 January 2015 - 14 May 2015
European Commission	20 January 2015 - 14 May 2015

TABLE OF CONTENTS

Figures

Tables

Terms and abbreviations

Abbreviation	Definition
API	Application Programming Interface
CEN	Comité Européen de Normalisation
CIP	Competitiveness and Innovation Framework Programme
DoW	Description of Work
EC	European Commission
ENT	Ericsson Nikola Tesla
ERC	Emergency Rescue Centre
ETSI	European Telecommunications Standards Institute
EUCARIS	European CAR and driving license Information System
GIS	Geographic Information System
GLONASS	Russian Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HAK	Croatian Automobile Club/Hrvatskiautoklub
HGV	Heavy Goods Vehicle
HW	Hardware
ICT PSP	ICT Policy Support Programme
ICT	Information and Communications Technology
In Band Modem	The technology to transfer the MSD from the IVS to PSAP
IVS	In-Vehicle System
KPI	Key Performance Indicators
LTE	Long Term Evolution (4G mobile network)

MNO	**Mobile Network Operator**
MS	**Member State**
MSD	**Minimum Set of Data**
NENA	**National Emergency Number Association (USA)**
OEM	**Original Equipment Manufacturer**
P-PSAP	**Primary Public Safety Answering Point**
Process	**The method of operation in any particular stage of development of the material part, component or assembly involved.**
PSAP	**Public Safety Answering Point**
PSTN	**Public Switched Telephone Network**
PTI	**Periodical Technical Inspection**
SIM	**Subscriber Identity Module**
SW	**Software**
TCP/IP	**Transmission Control Protocol/Internet Protocol**
TMC	**Traffic Management Centre**
TPS	**Third Party Service**
TPSP	**Third Party Service Provider**
UMTS	**Universal Mobile Telecommunications System**
VIN	**Vehicle Identification Number**
VoIP	**Voice over Internet Protocol**
WAN	**Wireless Area Network**
YPR	**Yokosuka Research Park**
Term	**Definition**

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. The principal EC Project Officer is:

> ***Wolfgang Hoefs***
> EUROPEAN COMMISSION
> DG CONNECT
> Office: BU 31 – 6/35
> B - 1049 Brussels
> Tel: +32 296 2188
> E-mail: wolfgang.hoefs@ec.europa.eu

One other Project Officer will follow the HeERO2 project:

> ***Dimitrios AXIOTIS***
> Dimitrios.AXIOTIS@ec.europa.eu

Address to which all deliverables and reports have to be sent:

> Wolfgang Hoefs
> EUROPEAN COMMISSION
> DG CONNECT
> BU 31 – 6/35
> B - 1049 Brussels
> Tel: +32 296 2188
> By mail: wolfgang.hoefs@ec.europa.eu

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:

> **European Commission**
> **Communications Networks, Content and Technology**
> **B-1049 Brussels**
> **Belgium**

By electronic mail: CNECT-ICT-PSP-325075@ec.europa.eu

1 Introduction

1.1 HeERO2 project

The aim of the HeERO2 project is "to extend HeERO to new Member States or associated countries to demonstrate the scalability of the HeERO solutions and to widen the acceptance of eCall." The objective of HeERO2 work package 6 is provide a deep and continuous scan of new topics and issues (i.e. barriers and enablers) taking advantage from the experiences and "lessons' learned" gathered in HeERO 1. Furthermore, the attention is on the new emerging topics: adaptation of the eCall to the Powered 2 Wheelers, heavy good vehicle and dangerous goods, geo-referencing and retro-fit devices.

1.2 Objectives

The objective of the report is to provide a set of recommendations for the implementation and operation of eCall in Europe. The document will follow the structure developed in HeERO 1 for the planning, design and implementation of eCall, it will integrate and update the recommendations and it will contribute to develop additional recommendations related to the new emerging topics of HeERO2.

1.3 Barriers and enablers for eCall

A summary of the challenges and enablers for eCall deployment has been provided in HeERO2 deliverable and it is reproduced in this report (Table 1). Furthermore the summary of the challenges and enablers related to the new emerging topics are reported in three additional tables. Specifically, barriers and solutions related to PTW are reported in Table 2, HGV and dangerous goods vehicles in Table 3 and retrofit devices in Table 4.

Identified Challenge	Identified Enablers and solutions
1.1 Challenges in gathering full support from all stakeholders (PSAP, MNO, etc.) due to lack of legislative framework or legally binding decision to implement eCall at member state level	- Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles. - Encourage member states to implement the necessary legal and operational national framework to tackle eCall deployment issues, especially at PSAP level
1.2 Stakeholders may understand standards in a different way (for example, ETSI/3GPP standards could have more clearly marked references to timers mentioned in Annex A of EN16062)	- Include references to CEN standards in the ETSI/3GPP standards, when necessary.
1.3 Retrofit IVS will require a legal framework	- Provide development guidelines for retrofit IVS products; this could be a task of the EeIP task force "RETRO". - Monitor the status of retrofit IVS products and consider actions, if significant challenges or risks are encountered. - Continue development of retrofit IVS certification scheme.
1.4 Procurement procedures are too complex	- Introduce call for tenders to select the best PSAP technology provider. - Governments should simplify procurement procedures. - All the MS PSAPs should be conform to eCall specification. This could be assured by a certification process. - Procurement process models could be develop by I_HeERO or the EeIP.
1.5 There is no regulation on the implementation of eCall Discriminator (eCall Flag).	- Introduce regulation on the implementation of eCall for MNOs to implement the eCall Discriminator (eCall Flag). - Introduce regulations on Minimum network coverage (i.e. on main roads). - eCall with the designation of TS12 will work across ALL networks irrespective of which network the SIM is registered to.
1.6 Liability aspects related to eCall device performance.	- Introduce regulation on liability aspects.
1.7 Need to test if IVS is working properly.	- Testing should be performed using data provided by both vehicle manufactures and electronic devices manufactures. - It is important to define and standardise the validation process of the IVS with reference to the sensitivity of the antenna. - IVS communication systems need to be tested in order to ensure the interoperability of the eCall system. - All manufactured in-vehicle system (IVS) must be able to communicate with any other manufactured PSAP. - The IVS unit should be tested during the PTI process (see also 2.6)

1.8 It should be made clear how filtering instances shall be certified.	- Filtering instance is a new solution and it needs to be certified. - when the eCall is rolled out with filtering instances, also the PSAPs should be equipped with a modem, or there should be an arrangement between the filtering instance and the PSAP to callback through the modem in order to have retransmissions of the MSD after the call-back from PSAP to the IVS.
2.1 Limitations in scope of eCall tests (no eCall flag or real PSAP).	- Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall. - Take limitations into account when interpreting the results of the pilot sites.
2.2 Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)	- Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles.
2.3 Current standards do not mandate the IVS to support 3G networks. A big challenge is LTE.	- Further research and related road-mapping work on the long-term evolution of eCall including analysis of options available to manage the lifecycles of vehicles and wireless communication networks. - Cooperation of stakeholders in the context of EeIP. - Standardisation taking into account the work carried out by ETSI STF 456 and IETF working group ECRIT. - The call routing should be tested and should be accurate. Especially at the borders areas where there are also foreign MNOs. - For enhanced eCall services, a multi-profile SIM could be used in order to allow users to choose their preferred MNOs. This technology is under development. - LTE is a different technology but work is already underway to understand its implications.
2.4 PSAPs in a member state have very different technical infrastructure.	- Centralisation of reception and handling of eCall to a few key PSAPs – at least as an interim solution. - Development of a national eCall roadmap or a national eCall implementation plan.
2.5 Performance and reliability of eCall are lower in rural areas than in urban areas	- Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall - Analyse the impact of the network echo canceller disabling tone on the reliability of MSD transmission and implement NEC disabling tone in PSAPs, if clear improvement can be observed - Analyse the reliability of eCall on member state level and the factors contributing to it. Implement necessary changes to the communication networks or to the PSAP (for example, changes to codecs used or transcoding between codecs along the call path from IVS to PSAP) - Monitor the service quality of E112 emergency calls; analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary.

2.6 There is currently no way to check the functionality of the IVS except making a false eCall. The final version of the proposal for PTI of the IVS is not yet available .	- Continue the work of the PTI task force of the EeIP. - Implementation of the self-test feature of the IVS; this is mandated in Chapter 7.1.5 of EN16062: "On power up, the IVS shall normally perform a self-test without attempting to connect to the network…" - Implement changes to standards of eCall, if required.
2.7 PSAPs in member states need updates which may be difficult to complete until 1st October 2017.	- Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCall to one PSAP equipped with eCall). - The schedule of deployment and the actions required should be defined in a national eCall roadmap or an implementation plan. - Increasing awareness of stakeholders on member state level on the options available for implementation of eCall and the related benefits and costs. - Results for HeERO and HeERO2 projects will support deployment of eCall in shortest possible time. - Monitoring of eCall deployment based on the European ITS directive. - Call for tenders to be put in practice to select the best PSAP technologies.
2.8 The introduction of a filtering entity may help the implementation of eCall services by reducing the number of false calls but it is not clear which entity should finance it.	- All MS are covered by the necessary legislation that requires a competitive tendering process; however there are delays on the national legislation application. - A call for tenders should be put in practice in order to select the best PSAP technologies.
2.9 There are considerable costs for the MNOs eCall discriminator (eCall flag) implementation.	- PSAPs not allowed pushing the costs of dealing with emergency calls back to operators. - Universal Service Directive has decreed that 112 eCall is a free service so that the most important aspect related to MNOs is the effectiveness of the eCall service. - Introduce obligation to implement the mechanism to handle the 'eCall discriminator' in their networks.
2.10 eCall is a free service but there is an extra cost for OEMs, this is no different from the existing arrangement for all 112 calls single number emergency calls across Europe.	- OEMs could offer additional services together with the eCall such as vehicle tracking, fleet management and should allow some open choice for customers.
2.11 It is not clear which entity should finance the upgrade of existing PSAPs	- All MS are covered by the necessary legislation that requires a competitive tendering process.
3.1 Organisational or technical changes in PSAP simultaneously with eCall deployment.	- Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCall to one PSAP equipped with eCall). - The schedule of deployment and the actions required should be defined in a national eCall roadmap or an implementation plan.

3.2 PSAPs do not have personnel resources to manage eCall in other languages.	- Appropriate call handling procedures should be defined at member state level (for example, opening a conference call between the IVS, PSAP and staff speaking the language of the vehicle occupants and use of information in the MSD). - Information included in the MSD is available even in cases in which it is not possible to obtain additional information from the vehicle occupants.
3.3 Possible false alarms from eCall enabled vehicles	- Development of certification scheme for eCall IVS. - Provision of development guidelines for IVS - especially for the automatic and manual triggering features. - Education of car users on the operation and correct use of eCall. - Validation of incoming calls before connecting them to a PSAP operator.
3.4 eCall routing plan is required to route manual and automatic eCall to correct places.	- Define call routing in a national eCall implementation roadmap or eCall implementation plan - The IVS number should be exchanged between CC's in the same manner as the MSD. - To avoid sending resources twice, information between PSAPs should be shared and updated. - PSAP architecture will permit the handling of both Pan EU eCall and TPS eCall. - There are 8 dedicated training manuals linked to a generic manual, with another 7 produced in HeERO 2.
3.5 All the staff in PSAPs have not been trained to handle eCall	- Training of PSAP staff. - Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCall to one PSAP with trained staff) - Training solutions, already there are 8 dedicated training manuals linked to a generic manual, with another 7 produced in HeERO 2.
3.6 Silent calls	- Appropriate call handling procedures to be defined at member state level. - Use of information available via voice connection (background noise etc.) . - Utilisation of information available in MSD. - Use of network based positioning to validate location of the caller (available for all E112 calls).
3.7 Operational questions in call handling (noise, silent calls, queuing of calls, answering and eCall with failed MSD transmission etc.)	- Appropriate call handling procedures to be defined at member state level (use the guidelines from EeIP and results of the HeERO and HeERO2 projects)
3.8 Dormant SIM	- A clear and unique standardisation process should be introduced.
3.9 Cross-border eCall was not successfully tested	- The areas where the eCall flag was rolled should match in the neighbouring countries. - Procedure to exchange MSD data between neighbouring countries should be proposed.
4.1 Unavailability of IVS prototypes functioning properly in the beginning of the HeERO pilot	- Change IVS vendor

4.2 Weaknesses in IVS implementation	- Development of certification scheme for eCall IVS. - Development of certification scheme for the components implementing the eCall in-band modem. - Regulations on vibration testing, electronic test or temperature of eCall devices would allow eCall devices to have minimum requirements and to be more reliable. - Continuation of the eCall test-fest events. - Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall.
4.3 Problems with mobile network coverage or signal strength	- Monitor the service quality of E112 emergency calls; analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary - Regulations could be introduced in order to ensure minimum network coverage for eCall, for instance coverage should be ensured on the main roads. - Need to clarify funding aspects before the introduction of legislations on network coverage. - Set up a consortium of different countries and different MNOs who are capable and willing to roll out the eCall flag in the different countries with adjacent geographical areas.
4.4 Time synchronisation between IVS and PSAP is required to calculate several HeERO KPIs.	- Synchronisation of PSAP clock using NTP (network time protocol), GPS or some other means to an accurate time reference. - Note: this challenge is related to calculation of HeERO KPIs but not to the operation of eCall.
4.5 Increased duration of MSD transmission and call setup when testing with a moving vehicle.	- See challenge 4.8.
4.6 Repeated MSD update request by PSAP not possible.	- Further analysis on the scope of the problem and corrective actions if necessary. - Development of a certification scheme for eCall IVS and the in-band modem components. Note: this challenge is likely related to an individual IVS or PSAP implementation
4.7 False eCall generated by mobile phones which erroneously activate eCall flag.	- Documentation of the erroneous operation of the mobile phones affected by the problem and contacting the equipment manufacturers.
4.8 MSD transmission times have been longer than the target value for eCall at least at some pilot sites.	- Study the possibilities to reduce voice channel blocking time by optimising the acknowledgement mechanism of eCall MSD transmission. - Analyse the reason for the difference in the results measured in laboratory environment and results measured in real-life networks. - Analyse the impact of the network echo canceller disabling tone on the reliability of MSD transmission and implement NEC disabling tone in PSAPs, if clear improvement can be observed.
4.9 Differences between performance of IVS even if IVS conform to standards.	- see challenge 4.12

4.10 Lower than expected robustness of in-band modem	- see challenge 4.12
4.11 There are no guidelines or target values for MSD success rate acceptable for eCall	- Development of guidelines on the service quality acceptable for eCall service
4.12 MSD transmission is not always successful.	- PSAP initiates a retransmission of the MSD in case the first transmission is not successful. - PSAP uses the voice connection to communicate with vehicle occupants. - Possibility that the MSD transmission fails should be taken into account in operation of eCall and related guidelines. - Further analysis on correlation of the outcomes of individual MSD transmissions during the same call should be carried out. - Development of certification scheme for eCall IVS. - Development of certification scheme for the components implementing the eCall in-band modem. - Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall - Further analysis of the factors which contributed to MSD success rate in the HeERO pilots should be carried out to increase the reliability of MSD transmission.
4.13 When the PSAP calls back to the IVS, the audio-channel is not passing the Filtering instance, and thus, not passing through the modem. The DTMF-call to retransmit the MSD will not function.	- Cross boarder eCall could be handled as new call to the IVS so that only the voice channel is opened and the operator can request the MSD. - There should be an arrangement between filtering instance and PSAP to callback through the modem in order to have retransmissions of the MSD after call-back from PSAP to the IVS. - When eCall is rolled out with filtering instance, also the PSAPs has to be equipped with a modem.
4.14 Minor inaccuracies in the TSP standard (EN15722)	- Instead an exhaustive bit by bit explanation of the "ASN.1 PER unaligned example MSD message should be given in order to easily understand the structure of the message".
4.15 The eCall with the designation of TS12 should work across ALL networks irrespective of which network the SIM is registered.	- Introduce certification of testing procedures for TS-12.

4.16 In some areas there are challenges related to network capacity in case of an elevated number of generated eCall, even considering that eCall receive priority across all networks.	- The call routing should be tested and should be accurate. Especially at the borders areas where there also foreign MNOs. - For enhanced eCall services, a multi-profile SIM could be used in order to allow users to choose their preferred MNOs. This technology is under development. - See D6.7 of HeERO 2 dealing with cross-border aspects allowing continuity of service. - At European level the decision is to use 2G as this has the greater coverage in general across Europe, but it will also work as on a 3G system, as 2G and 3G are capable to support passage of data. 3GPP network standards support A-GNSS including ephemeris data for GLONASS
4.17 When several Filtering Instances are operational, a selection should be made by the Mobile Number Operator (MNO) as to which Filtering instance receives which eCall.	- In cross border situations, define a destination PSAP or destination filtering instance where the calls have to be transferred. This is the responsibility of the CC1 operator to determine where to transfer the call.
4.18 If one of the parties in an EN16102 connection gets out of sync the protocol does not foresee any method for recovery.	- The TPS eCall in-vehicle system shall comply with the standard EN 16102:2011
4.19 There are many devices rushing onto the market and using different types of components. For instance modems may have different capabilities. There should be minimum set of requirements for IVS providers.	- Task force RETRO deals specifically with aftermarket eCall and new testing procedures on the correct functioning of the retrofit device are developed in the context of Task 6.2 of HeERO 2 on certification and a further report on PTI has been completed by EEIP in order to verify integrity and reliability - enabling activities regarding IVS are carried out by the HeERO Standards task Force. - Useful contributions are the CEN EN standard End to End Conformance Test and the PTI report.
4.20 Need to ensuring a good antenna performance	- With fractal antenna design technology it is possible to develop small antennas which fit inside the IVS and to obtain good performances.
4.21 The communication between the retrofit IVS and the vehicle needs to be improved.	- For the IVS installed in the vehicle during production, the communication could be easily done by the CAN bus, but for equipping old vehicles different approaches should be evaluated.
4.22 IVS performance is tightly related to PSAP capabilities. PSAP implementations are quite different, rendering little incompatibilities which arise when testing.	- This point could be solved by a homologation process which certifies a common set of test to guarantee the interoperability. - A possible future improvement point includes adding some remote debugging mechanism to the IVS in test, in order to follow remotely what is happening and to be able to quickly correct any problems.
4.23 The lack of a defined trigger for automatic eCalling beyond the airbag deployment is perceived as a serious barrier to the successful development and operation of aftermarket IVS devices.	- eCall cannot depend on the impact detection system of the vehicle. - Perfectioning the IVS inertial system which is highly integrated with the GPS in the device.

4.24 The ICT environment of the 112 centre made direct connections to and from the internet very complex. Access to maps and email was not possible.	- proxy solutions have been used to provide the map service. Sending of emails with tests results by the test server were not possible.
4.25 Definition of the standard for integration of dangerous goods information into eCall	- Integration of standard information for dangerous goods
5.1 Consumers or the media confuse eCall with other in-vehicle emergency call services	- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP.
5.2 Misuse of eCall	- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP.
5.3 Users' concerns of privacy violations and risk of supervision and tracking of individual vehicles	- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP.

Table 1: Challenges for eCall deployment and related solutions

The challenges and related solutions reported in Table 1 are the update of the main findings of HeERO1 and their integration with the new results and findings of HeERO2 project. Therefore some of the issues that are relevant for the eCall implementation or for which new solutions have been identified during the execution of the HeERO2 activities are here reported.

Barriers	Solutions
6.1 Need for additional data about heavy goods vehicles loads which can be classed as dangerous goods.	Extend the MSD using an optional set of data that does not exceed the available number of bytes. Two applications for Optional Additional Data are recognised: - Embedding information about the load of commercial vehicles – this usage has been defined in EN16405 (currently in CEN ballot) - Embedding GLONASS extended accident information – this usage has been defined by GLONASS
6.2 Embed information about the load of commercial vehicles	- Include all relevant data that needs to be transferred to the emergency services - Include a reference to an external source where the relevant data is held– in this case the OID could also be used to define a method to retrieve the data from the specific source
6.3 In order to facilitate the referencing of the meaning and definition of data an Optional Additional Data Registry is of great importance.	EN15722 envisages the existence of such registry, but it should define it.
6.4 Logistic companies are the main stakeholders for the tracking service. However	If the logistic companies are not forced to support the eCall dangerous goods mechanism either by their

Barriers	Solutions
they are reluctant to provide the service for privacy issues.	customers (the sender) or by the EU regulation, they will not support this.
6.5 When the proposed enhancements of the MSD standard EN15722 are accepted a further standardisation effort is needed to standardise the interfaces to the external sources.	This standardisation has to include how 112 centre applications have to interpret the information provided by the additional data of the MSD and how they have to access the web service. This effort will need substantial discussion with 112 centre SW vendors and dangerous goods tracking service providers.
6.6 Need for additional data about heavy goods vehicles loads which can be classed as dangerous goods.	Extend the MSD using an optional set of data that does not exceed the available number of bytes. Two applications for Optional Additional Data are recognised: - Embedding information about the load of commercial vehicles – this usage has been defined in EN16405 (currently in CEN ballot) - Embedding GLONASS extended accident information – this usage has been defined by GLONASS

Table 2: Challenges for HGV and dangerous goods eCall deployment and related solutions

Barrier	Solution(s)
7.1 Radio and GNSS signal in retrofit devices is a problem. The correct functionality of the IVS cannot be fully guaranteed without and appropriate installation in the vehicle.	- A possible solution would be to offer a discount for vehicle insurance if the retrofit device is installed by a certified company. - Retrofit devices are almost 100% autonomous (with exception of the power supply). Their connection and interaction to vehicle's electronic devices and control units is limited. Challenges lie mainly in achieving a very robust design capable of delivering the required functionalities in extreme conditions, which is at the same time universal enough to allow fitting in all passenger car makes and models. Each car manufacturer has different communication systems. Therefore the challenge is to have a number of configuration templates such as different combination of retrofit device and vehicle models.
7.2 Standardization and certification	- Definition of clear requirements, standardization and procedures for certification - No recommendations or guidelines exist for crash test or for the installation of retrofit devices by skilled people. There should be a certification or warranty on airbag functioning and clear regulation on liability issues. There should be an independent body that certifies retrofit devices.
7.3 Legislation and regulation	- Liability aspects should be clarified. - The retrofitting market will need a legal framework capable of defining exactly what a retrofit device is and its requirements in terms of

	technical aspects and robustness. Strict regulations are also necessary. All that in turn could lead to an increased public acceptance level of eCall system.
7.4 Design, requirements and standardization	- Clear requirements, standardization or procedures for certification represent up to now deployment challenges for retrofit devices - The location of the unit should be analysed in terms of vehicle impact thus considering the construction year of the vehicle which has an influence on the performance

Table 3: Challenges for retrofit devices and related solutions

The other work packages of HeERO2 follow the same structure as in HeERO1 so that they consist in activities dealing with the planning and implementation of the eCall in member states participating in HeERO2, with the operation of the pilots and their evaluation using a set of key performance indicators and with the dissemination of the results.

As in HeERO1, the challenges described in D6.2 do not include the analysis of the impacts of the encountered challenges. Therefore the objective of this work is to provide a set of recommendations for actions to be carried out with the final aim to achieve a fully operational eCall in Europe.

1.4   Recommendations

The eCall pilots realised in HeERO2 countries – Belgium, Bulgaria, Denmark, Luxembourg, Spain, Turkey – have provided information on the technical functioning of eCall, the deployment process and implementation options available, barriers and enablers for implementation and operation and solutions to the challenges identified during the project. The pilots included tests on HGV and dangerous goods (Luxembourg), on PTW (Spain) and retrofit devices (Turkey, Denmark, Bulgaria). This knowledge has been documented in the deliverables of HeERO, but no one of the earlier reports has provided a set of recommendations addressing the whole deployment process, technical and non-technical aspects including both implementation and operation of the service.

HeERO2 WP6 has also provided guidelines intended for member states or other countries planning to implement eCall including a list of barriers and solutions for operation and implementation of eCall (Table 4 of D6.5). However, these guidelines have their main focus on challenges that are encountered and that can be addressed at member state level. Therefore, they provide recommendations for actions on member state level but are not enough as such as recommendations for implementation and operation.

Barrier	Solution(s)

Barrier	Solution(s)
There is no full support from, different stakeholders.	- Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles.
Retrofit IVS will require a legal framework	- Provide development guidelines for retrofit IVS products; this could be a task of the EeIP task force "RETRO". - Monitor the status of retrofit IVS products and consider actions, if significant challenges or risks are encountered. - Continue development of IVS certification scheme.
Too many and too extensive standards	- Introduce a centralised approach, through a third party, that is in charge of the certification and standardisation. - Create a summary so that operators can have a clearer overview of the existing standards.
Procurement procedures are too complex	- Introduce call for tenders to select the best PSAP technology provider. - Governments need to simplify procurement procedures. - All the MS PSAP should be conform to eCall specification (i.e. conformity assessment)
There is no regulation on the implementation of eCall Discriminator (eCall Flag).	- Introduce regulation on the implementation of eCall for MNOs to implement the eCall Discriminator (eCall Flag). - Introduce Minimum network coverage (i.e. on main roads). - Make eCall with the designation of TS12 to work across all networks irrespective of which network the SIM is registered to.
Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies) .	- Complete the European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles.
PSAPs in a member state have very different technical infrastructure	- Analyse the architectural and deployment options available building on the experiences from HeERO and HeERO2 projects. - Centralisation of reception and handling of eCall to a few key PSAPs – at least as an interim solution. - Development of a national eCall roadmap or a national eCall implementation plan.
PSAPs in member states need updates which may be difficult to complete until 1st October 2017	- Use temporary arrangements to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCall to one PSAP equipped with eCall) - Define the schedule of deployment and the actions required in a national eCall roadmap or an implementation plan. - Increase the awareness of stakeholders on member state level on the options available for implementation of eCall and the related benefits and costs. - Results for HeERO and HeERO2 projects will support deployment of eCall in shortest possible time. - Monitoring of eCall deployment based on the European ITS directive. - Call for tenders to be put in practice to select the best PSAP technologies. - Use existing 112 PSAPs for eCall.
Route manual and automatic eCall to correct places (transmission to the correct PSAP).	- Define call routing in a national eCall implementation roadmap or eCall implementation plan - Exchange the IVS number between call centers in the same manner as the MSD.

Barrier	Solution(s)
	- Share updated information between PSAPs. - Allow PSAP architecture to handling both Pan EU eCall and TPS eCall. - Use dedicate training manuals linked to a generic manual and training manuals produced in HeERO 2.
All the staff in PSAPs have not been trained to handle eCall	- Train PSAP staff. - Temporary arrangements to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCall to one PSAP with trained staff) - Use dedicate training manuals linked to a generic manual and training manuals produced in HeERO 2.
Silent calls	- Define appropriate call handling procedures at member state level. - Use of information available via voice connection (background noise etc.). - Utilisation of information available in MSD. - Use of network based positioning to validate the location of the caller (available for all E112 calls).
Operational questions in call handling (noise, silent calls, queuing of calls, answering and eCall with failed MSD transmission etc.)	- Define appropriate call handling procedures at member state level (use the guidelines from EeIP and results of the HeERO and HeERO2 projects).
Dormant SIM	- Introduce a clear and unique standardisation process on dormant SIM.
Weaknesses in IVS implementation	- Development of certification scheme for eCall IVS - Development of certification scheme for the components implementing the eCall in-band modem. - Introduce regulations on vibration testing, electronic test or temperature of eCall devices to allow eCall devices to have minimum requirements and to be more reliable. - Continuation of the eCall test-fest events - Further analysis of the weaknesses identified but not analysed in detail in HeERO project. - Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall.
Problems with mobile network coverage or signal strength	- Monitor the service quality of E112 emergency calls; analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary. - Introduce regulations to ensure minimum network coverage for eCall, (i.e. coverage ensured on the main roads). - Clarify funding aspects before the introduction of legislations on network coverage. - Set up a consortium of different countries and different MNOs who are capable and willing to roll out the eCall flag in the different countries with adjacent geographical areas.
False eCall generated by mobile phones which erroneously activate eCall flag	- Documentation of the erroneous operation of the mobile phones affected by the problem and contacting the equipment manufacturers.
MSD transmission is not always successful	- Development of guidelines on the service quality acceptable for eCall service. - PSAP uses the voice connection to communicate with vehicle occupants.

Barrier	Solution(s)
	- Take into account the possibility that the MSD transmission fails in operation of eCall and related guidelines. - Carry out further analysis on correlation of the outcomes of individual MSD transmissions during the same call. - Development of certification scheme for eCall IVS. - Development of certification scheme for the components implementing the eCall in-band modem. - Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall. - Carry out further analysis of the factors which contributed to MSD success rate in the HeERO pilots to increase the reliability of MSD transmission.
When several Filtering Instances are operational, a selection should be made by the Mobile Number Operator (MNO) as to which Filtering instance receives which eCall.	- In cross border situations, define the destination PSAP or destination filtering instance where the calls have to be transferred.
The lack of a defined trigger for automatic eCalling beyond the airbag deployment is perceived as a serious barrier to the successful development and operation of aftermarket IVS devices.	- Do not rely eCall on the impact detection system of the vehicle. - Perfectioning the IVS inertial system that should be highly integrated with the GPS in the device.
Definition of the standard for integration of dangerous goods information into eCall	- Integration of standard information for dangerous goods and provision of dynamic information on the type and quantity of load.
Consumers or the media confuse eCall with other in-vehicle emergency call services	- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP
Misuse of eCall	- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP
Users' concerns of privacy violations and risk of supervision and tracking of individual vehicles	- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP

Table 4: Solutions to eCall deployment barriers (adapted from D6.5 of HeERO2)

HeERO has also acted as a platform for cooperation between the pilot sites and the member states. After the conclusion of the HeERO project, the results and the recommendations based on the results of the project will be shared among the wider community of eCall stakeholders.

2 Methods

2.1 Overview

The overall structure of HeERO2 WP6 is illustrated in Figure 1.
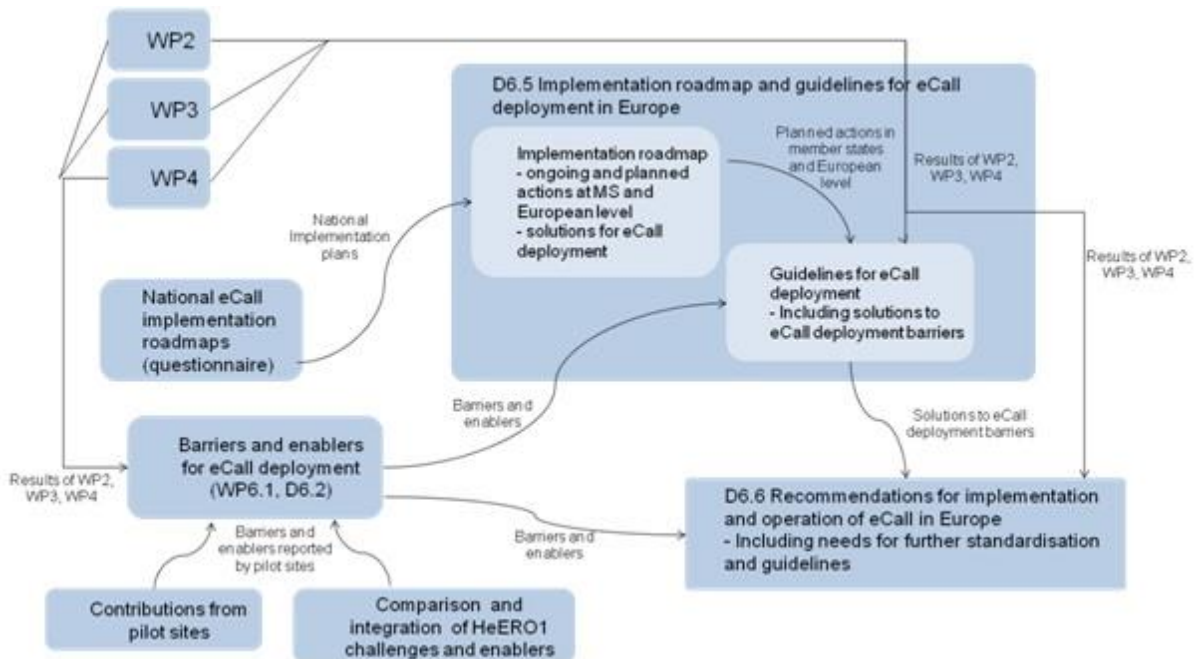
Figure 1: Structure of HeERO2 WP6 and relations between deliverables

The development of recommendation is based on both the barriers and enablers for eCall deployment identified in WP6.1 and reported in deliverable D6.2 of HeERO2, on the integration and revision of barriers and enablers drafted in D6.2 of HeERO1, on the solutions drafted in the guidelines for eCall deployment (deliverable D6.5 of HeERO2) and on the inputs from other HeERO2 work packages such as WP2, WP3 and WP4.

The barriers for implementation and operation of eCall (Table 1) have been obtained directly from HeERO D6.2 where they have been identified on the basis of reports from pilot sites and other information and reported in a systematic way. The barriers for eCall implementation are also referred as challenges in deliverables of HeERO WP6.

The enablers for eCall deployment can be understood as solutions to the challenges identified. In addition to the challenges, deliverable D6.2 includes also the solutions addressing the challenges (Table 1).

2.2 Analysis of challenges for eCall implementation and operation

The work is based on what has been done in HeERO1. So that the challenges for implementation and operation of eCall challenges were analysed in terms of their impact, expected severity and relevance outside the HeERO project.

Successively, the challenges were first classified with their potential impact on the implementation and operation of eCall. The impacts of the challenges were classified into the following categories:

- implementation of a complete eCall service chain is not possible

- reduction in service quality or reliability

- cost overrun

- delay in implementation

- reduction in service benefits

- user issues

The severity of the challenges was assessed using three categories. Challenges having potential to completely prevent eCall deployment or operation were classified into the 'High' category. Challenges with any significant potential for adverse impacts on implementation and operation of eCall but not likely preventing the implementation and operation of eCall were classified into 'Moderate' category. Challenges which were considered to have only minor impact on eCall were classified into 'Low' category. Challenges with potential to prevent the implementation of a full eCall service chain were classified as 'High' or 'Moderate' in terms of severity.

Challenges relevant only within the HeERO project were not assumed to be relevant during the actual deployment. For these challenges, it was assumed that there is no need to address them with the recommendations to be provided.

2.3 Development of recommendations

The recommendations were developed on the basis of solutions identified in HeERO D6.2. When developing the recommendations, the main focus was on the recommendations to challenges classified in the category of 'High' severity. The recommendations were described separately for each type of stakeholder to ensure that they would be as accurate and relevant as possible.

3 Challenges for deployment of eCall

A classification of the challenges of implementation and operation of eCall, including the emerging topics tested in the second phase of the project, in terms of their impacts and relevancy outside the HeERO2 project is provided in Table 5.

Challenge		Impacts							Relevance
		Implementation of a complete eCall service chain is not possible	Reduction in service quality or reliability	Cost overrun or cost increase	Delay in implementation	Reduction in service benefits	Reduced user acceptance	Other	Relevant outside HeERO?
1.1	Challenges in gathering full support from all stakeholders (PSAP, MNO, etc.) due to lack of legislative framework or legally binding decision to implement eCall at member state level	■			■				Yes
1.2	Stakeholders may understand standards in a different way (for example, ETSI/3GPP standards could have more clearly marked references to timers mentioned in Annex A of EN16062)		■	■	■				Yes
1.3	Retrofit IVS will require a legal framework		■			■			Yes
1.4	Procurement procedures are too complex			■	■				Yes
1.5	There is no regulation on the implementation of eCall Discriminator (eCall Flag)		■		■				Yes
1.6	Liability aspects related to eCall device performance		■						Yes
1.7	The test on the IVS need to be regulated		■			■			Yes
1.8	Certification of the filtering instance		■		■				Yes
2.1	Limitations in the scope of eCall tests (no eCall flag or real PSAP)		■		■				Yes
2.2	Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)				■				Yes
2.3	Current standards of eCall do not mandate the IVS to support third generation mobile networks							■	Yes
2.4	PSAPs in a member state have very different technical infrastructure			■					Yes
2.5	Performance and reliability of eCall are lower in rural areas than in urban areas	■			■	■			Yes
2.6	There is currently no way to check the functionality of the IVS except making a false eCall. The final version of the proposal for PTI of the IVS is not yet available.	■	■	■	■				Yes
2.7	PSAPs in member states need updates which may be difficult to complete until 1st October 2017				■				Yes
2.8	It is not clear who will fund the filtering instance		■						Yes
2.9	Costs for the implementation of the eCall				■				Yes

Challenge		Impacts							Relevance
		Implementation of a complete eCall service chain is not possible	Reduction in service quality or reliability	Cost overrun or cost increase	Delay in implementation	Reduction in service benefits	Reduced user acceptance	Other	Relevant outside HeERO?
	discriminator				■				
2.10	eCall is a free service but there is an extra cost for OEM				■				Yes
2.11	It is not clear which entity should finance the upgrade of existing PSAPs				■				Yes
2.12	The process to detail IVS-es technical requirement is still open	■	■			■			Yes
3.1	Organisational or technical changes in PSAP simultaneously with eCall deployment				■				Yes
3.2	PSAPs do not have personnel resources to manage eCalls in other languages					■			Yes
3.3	Possible false alarms from eCall enabled vehicles		■	■					Yes
3.4	Call routing plan is required to route manual and automatic eCalls to correct places							■	Yes
3.5	All the staff in PSAPs has not been trained to handle eCalls				■				Yes
3.6	Silent calls					■	■		Yes
3.7	Operational questions in call handling (noise, silent calls, queuing of calls, answering eCall with failed MSD transmission etc.)		■	■		■			Yes
3.8	Dormant SIM					■	■		Yes
3.12	Cross-border eCall was not successfully tested					■			No
4.1	Unavailability of IVS prototypes in the beginning of the HeERO pilot							■	No
4.2	Weaknesses in IVS implementation	■	■			■	■		Yes
4.3	Problems with mobile network coverage or signal strength		■			■			Yes
4.4	Time synchronisation between IVS and PSAP is required to calculate several of the HeERO KPIs							■	No
4.5	Increased duration of MSD transmission and call setup when testing with a moving vehicle		■			■			Yes
4.6	Repeated MSD update request by PSAP not possible		■			■			Yes
4.7	False eCalls generated by mobile phones which erroneously activate eCall				■	■			Yes
4.8	MSD transmission times have been longer than the target value for eCall at least at some pilot sites		■				■		No
4.9	Differences between performance of IVS even if the IVS conform to standards	■	■			■			Yes
4.10	Lower than expected robustness of in-band modem		■			■			Yes
4.11	There are no guidelines or target values		■						No

Challenge		Impacts							Relevance
		Implementation of a complete eCall service chain is not possible	Reduction in service quality or reliability	Cost overrun or cost increase	Delay in implementation	Reduction in service benefits	Reduced user acceptance	Other	Relevant outside HeERO?
	for MSD success rate acceptable for eCall		■						
4.12	MSD transmission is not always successful		■		■	■	■		Yes
4.13	When the PSAP calls back to the IVS, the audio-channel is not passing the Filtering instance		■			■			Yes
4.14	Minor inaccuracies in the TSP standard (EN15722)				■				Yes
4.15	Lack of TS-12 testing possibility		■		■				Yes
4.16	Network capacity		■			■			Yes
4.17	Selection of the filtering instance by the MNOs		■			■			Yes
4.18	If a EN16102 connection gets out of sync the protocol does not recovery		■						Yes
4.19	Too many devices in the market				■				Yes
4.20	Ensure a good antenna performance						■		Yes
4.21	Communication between the IVS and the vehicle					■			Yes
4.22	IVS-es performance and difficulties to ensure interoperability		■		■	■			Yes
4.23	Lack of a defined trigger for automatic eCalling of retrofit devices beyond the airbag deployment				■	■			Yes
4.24	Direct connections to and from the internet very complex.							■	No
4.25	Definition of the standard for integration of dangerous goods information into eCall	■							Yes
5.1	Consumers or the media confuse eCall with other in-vehicle emergency call services						■		Yes
5.2	Misuse of eCall						■		Yes
5.3	Users' concerns of privacy violations and risk of supervision and tracking of individual vehicles						■		Yes

Table 5: Impacts of various challenges on implementation and operation of eCall

3.1 Classification of challenges

Classification of challenges in terms of their severity is provided in Table 6. Only challenges which are relevant outside the HeERO project are included in the analysis.

Challenge		Severity		
		High	Moderate	Low
1.1	Challenges in gathering full support from all stakeholders (PSAP, MNO, etc.) due to lack of legislative framework or legally binding decision to implement eCall at member state level	■		
1.2	Stakeholders may understand standards in a different way (for example, ETSI/3GPP standards could have more clearly marked references to timers mentioned in Annex A of EN16062)		■	
1.3	Retrofit IVS will require a legal framework		■	
1.4	Too many and too extensive standards			■
1.5	Procurement procedures are too complex			■
1.6	There is no regulation on the implementation of eCall Discriminator (eCall Flag)	■		
1.7	Liability aspects related to eCall device performance		■	
1.8	The test on the IVS need to be regulated		■	
1.9	Certification of the filtering instance			■
2.1	Limitations in the scope of eCall tests (no eCall flag or real PSAP)			■
2.2	Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)			■
2.3	Current standards of eCall do not mandate the IVS to support third generation mobile networks		■	
2.4	PSAPs in a member state have very different technical infrastructure		■	
2.5	Performance and reliability of eCall are lower in rural areas than in urban areas	■		
2.6	There is currently no way to check the functionality of the IVS except making a false eCall. The final version of the proposal for PTI of the IVS is not yet available.	■		
2.7	PSAPs in member states need updates which may be difficult to complete until 1st October 2015 (now 1st October 2017)			■
2.8	It is not fully clear who will purchase and install the SIM card to the IVS			■
2.9	It is not clear who will fund the filtering instance			■
2.10	Costs for the implementation of the eCall discriminator			■
2.11	eCall is a free service but there is an extra cost for OEM			■
2.12	It is not clear which entity should finance the upgrade of existing PSAPs			■
2.13	The process to detail IVS technical requirement is still open	■		
3.1	Organisational or technical changes in PSAP simultaneously with eCall deployment		■	
3.2	PSAPs do not have personnel resources to manage eCalls in other languages			■
3.3	Possible false alarms from eCall enabled vehicles		■	
3.4	Call routing plan is required to route manual and automatic eCalls to correct places		■	
3.5	All the staff in PSAPs has not been trained to handle eCalls			■
3.6	Operational questions in call handling (noise, silent calls, queuing of calls, answering eCall with failed MSD transmission etc.)		■	
3.7	Dormant SIM			■
4.1	Unavailability of IVS prototypes in the beginning of the HeERO pilot			■
4.2	Weaknesses in IVS implementation	■		
4.3	Problems with mobile network coverage or signal strength		■	
4.4	Time synchronisation between IVS and PSAP is required to calculate several of the HeERO KPIs			■
4.5	Increased duration of MSD transmission and call setup when testing with a		■	

	moving vehicle		⬛	
4.6	Repeated MSD update request by PSAP not possible		⬛	
4.7	False eCalls generated by mobile phones which erroneously activate eCall		⬛	
4.8	MSD transmission times have been longer than the target value for eCall at least at some pilot sites		⬛	
4.9	Differences between performance of IVS even if the IVS conform to standards	⬛		
4.10	Lower than expected robustness of in-band modem		⬛	
4.11	There are no guidelines or target values for MSD success rate acceptable for eCall			⬛
4.12	MSD transmission is not always successful	⬛		
4.13	When the PSAP calls back to the IVS, the audio-channel is not passing the Filtering instance			⬛
4.14	Minor inaccuracies in the TSP standard (EN15722)			⬛
4.15	Lack of TS-12 testing possibility		⬛	
4.16	Network capacity		⬛	
4.17	Selection of the filtering instance by the MNOs			⬛
4.18	If a EN16102 connection gets out of sync the protocol does not recovery			⬛
4.19	Too many devices in the market			⬛
4.20	Ensure a good antenna performance		⬛	
4.21	Communication between the IVS and the vehicle	⬛		
4.22	IVS-es performance and difficulties to ensure interoperability	⬛		
4.23	Lack of a defined trigger for automatic eCalling of retrofit devices beyond the airbag deployment		⬛	
4.24	Direct connections to and from the internet very complex.			⬛
4.25	Definition of the standard for integration of dangerous goods information into eCall		⬛	
5.1	Consumers or the media confuse eCall with other in-vehicle emergency call services		⬛	
5.2	Misuse of eCall		⬛	
5.3	Users' concerns of privacy violations and risk of supervision and tracking of individual vehicles	⬛		

Table 6: Assessment of severity of challenges

4 Solutions for challenges to deployment

The solutions to the challenges identified in D6.2 are presented in Table 7. The solutions have been obtained from D6.2 and D6.5 (Table 1 and Table 4). Based on the same structure of D6.5 Recommendations on eCall implementation and operations of HeERO1, the solutions have been classified into three categories: solutions to be implemented on member state level, solutions to be implemented at European level and solutions which can be implemented at member state and European levels or require cooperation of all stakeholders.

Solution		Scope	
Number	*Description*	*European level*	*Member state*
1	Introduce regulations to clarify liability aspects with reference to network coverage (i.e. on main roads).	X	
2	Regulations on vibration testing, electronic test or temperature of eCall devices would allow eCall devices to have minimum requirements and to be more reliable.	X	
3	Call for tenders would allow selecting the best PSAP technology provider.		X
4	Governments should simplify procurement procedures.		X
5	All the MS PSAP should be conform to eCall specification.		X
6	OEMs could offer additional services together with the eCall such as vehicle tracking, fleet management and should allow some open choice for customers.		
7	Introduce call for tenders in order to select the best PSAP technologies.	X	X
8	Test call routing especially at cross border areas.	X	
9	Use of multi-profile SIM to allow users to choose their preferred MNOs.		X
10	Provide development guidelines for retrofit IVS products within EeIP task force "RETRO".	X	
11	A centralised approach, through a third party, that is in charge of the certification and standardisation.	X	
12	Create a summary of existing standards.	X	X
13	Introduce call for tenders to select the best PSAP technology provider.		X
14	Governments need to simplify procurement procedures.		X
15	MS PSAP to be conform to eCall specification.		X
16	Set up of a homologation process which certifies a common set of test to guarantee the interoperability.	X	
17	Perform testing using data provided by both vehicle manufactures and electronic devices manufactures.		X
18	Ensure communication between all manufactured in-vehicle system (IVS) with any other manufactured public safety answering point (PSAP).	X	X
19	Certify filtering instance	X	X
20	Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCal		X
21	Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles	X	
22	Cooperation of stakeholders in the context of EeIP	X	
23	Standardisation taking into account the work carried out by ETSI STF 456 and IETF working group ECRIT	X	
24	Use of multi-profile SIM to allow users to choose their preferred MNOs	X	X
25	Continue research on 4G and LTE	X	

26	Development of a national eCall roadmap or a national eCall implementation plan		X
27	Centralisation of reception and handling of eCall to a few key PSAPs		X
28	Analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary	X	X
29	Analyse the reliability of eCall on member state level and the factors contributing to it.	X	X
30	Increasing awareness of stakeholders on member state level on the options available for implementation of eCall and the related benefits and costs	X	X
31	Analyse the availability of dormant SIM cards and then decide on the actions necessary	X	
32	Define new business models to implement eFlag	X	X
33	OEMs to offer additional services together with the eCall		X
34	Include the PSAP in the 112 system.		X
35	Temporary arrangements to have eCall by routing calls to one PSAP		X
35	Define in a national eCall roadmap or an implementation plan the schedule and actions for eCall implementation		X
37	The IVS number should be exchanged between CC's in the same manner as the MSD		X
38	Share updated information between PSAPs	X	X
39	Introduce PSAP architecture that spermit the handling of both Pan EU eCall and TPS eCall	X	X
40	Use of training manuals for operators provided by HeERO2	X	X
41	In case of silent call use information available via voice connection		X
42	Introduce complete manual of eCall handling procedures	X	X
43	Continuation of the eCall test-fest events	X	X
44	Clarify funding aspects before the introduction of legislations on network coverage	X	X
45	Set up a consortium of different countries and different MNOs who are capable and willing to roll out the ecall flag in the different countries with adjacent geographical areas.	X	X
46	Documentation of the erroneous operation of the mobile phones in case of false calls		X
47	Development of guidelines on the service quality acceptable for eCall service.	X	
48	PSAP initiates a retransmission of the MSD in case the first transmission is not successful		X
49	Introduce an arrangement between filtering instance and PSAP to callback through the modem in order to have retransmissions of the MSD after call-back from PSAP to the IVS.		X
50	When eCall is rolled out with filtering instance, also the PSAPs has to be equipped with a modem.		X
51	Introduce certification of testing procedures for TS-12.	X	
52	Especially at the borders areas, test call routing and its accuracy.	X	X
53	In crossborder situations, define a destination PSAP or destination filtering instance where the calls have to be transferred.		X
54	The TPS eCall in-vehicle system shall comply with the standard EN 16102:2011		X
55	With fractal antenna design technology it is possible to develop small antennas which fit inside the IVS and to obtain good performances.		X
56	Add some remote debugging mechanism to the IVS in test, in order to follow remotely what is happening and to be able to quickly correct any problems.		X
57	Perfectioning the IVS inertial system which is highly integrated with the GPS in the device.		X
58	Integration of standard information for dangerous goods.	X	
59	Introduce a standardised accident detection system for PTW	X	

60	Testing solutions for eCall for PTW, then work on the standards building on the results of the tests.	X	
61	Define an Optional Additional Data Registry for HGV and dangerous goods within EN15722.	X	
62	Introduce EU legislation for logistics companies to support the eCall dangerous goods mechanism.	X	
63	Include into standardization how 112 centre applications have to interpret the information provided by the additional data of the MSD and how they have to access the web service.	X	
64	Offer a discount for vehicle insurance if the retrofit device is installed by a certified company.		X
65	Introduce a number of configuration templates such as different combination of retrofit device and vehicle models.	X	
66	Define of clear requirements, standardization and procedures for certification for retrofit devices.	X	
67	Analyze the location of the aftermarket IVS unit in terms of vehicle impact thus considering the construction year of the vehicle which has an influence on the performance		X

Table 7: Solutions to challenges for implementation and operation

5 Recommendations

5.1 Recommendations for member states

The recommendations for member states intending to implement eCall are presented in Table 8.

Recommendation	
Identifier	**Description**
MS1	Encourage member states to implement the necessary legal and operational national framework to tackle eCall deployment issues, especially at PSAP level.
MS2	Set up procedures, guidelines, criteria and rules to provide the long numbers of PSAPs to filtering instances.
MS3	Set up an integrated project to test eCall at cross border and cross country.
MS4	Vehicle manufacturers shall implement best practices to minimise voice channel blocking time.
MS5	Analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary.
MS6	Continuously update the content of the MSD to be transmitted to PSAP.
MS7	Introduce training sessions or dedicated workshop on eCall standards and certification issues.
MS8	Testing should be performed using data provided by both vehicle manufactures and electronic devices manufactures.
MS9	Compliance of TPS with EN 16102:2011 'Intelligent transport systems – eCall – Operating requirements for third party support'.
MS10	Introduce call for tenders to select the best PSAP technology provider.
MS11	Simplify procurement procedures and reduce the time frame between procurement and installation.
MS12	When the eCall is rolled out with filtering instances, equip the PSAPs with a modem, or introduce an arrangement between the filtering instance and the PSAP to callback through the modem to have retransmissions of the MSD after the call-back from PSAP to the IVS.
MS13	Perform tests using data provided by both vehicle manufactures and electronic devices manufactures.
MS14	Perform eCall end-to-end tests to ensure correct functioning and reliable operation of eCall.
MS15	Further analysis of the factors which contributed to MSD success rate in the HeERO pilots should be carried out to increase the reliability of MSD transmission.
MS16	Use a multi-profile SIM to allow users to choose their preferred MNOs.
MS17	Analysis of the architectural and deployment options available building on the experiences from HeERO and HeERO2 projects.
MS18	Development a national eCall roadmap or a national eCall implementation plan.
MS19	The IVS number should be exchanged between call centres in the same manner as the MSD.
MS20	To avoid sending resources twice, information between PSAPs should be shared and updated.
MS21	Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet.
MS22	Training of PSAP staff using training manuals produced in HeERO2.
MS23	Test eCall flag in areas near each other where the eCall flag is rolled out.
MS24	Clarify funding aspects on eFlag implementation.
MS25	Cross border eCall could be handled as new call to the IVS so that only the voice channel is opened and the operator can request the MSD.
MS26	There should be an arrangement between filtering instance and PSAP to callback through the modem in order to have retransmissions of the MSD after call-back from PSAP to the IVS.
MS27	When eCall is rolled out with filtering instance, also the PSAPs has to be equipped with a modem.
MS28	In cross border situations, define a destination PSAP or destination filtering instance where the calls have to be transferred.
MS29	Add some remote debugging mechanism to the IVS in test, in order to follow remotely what is happening and to be able to quickly correct any problems.
MS30	Introduce regulations on vibration testing, electronic test or temperature of eCall devices to allow eCall devices to have minimum requirements and to be more reliable.
MS31	Introduce regulations on minimum network coverage (i.e. on main roads)
MS32	Introduce separate software for eCall handling and dispatching in the PSAP so only the eCall call takers have to be trained for this purpose.

Recommendation	
MS33	Introduce regulations on dormant SIM.
MS34	Work on the stability of IVS.
MS35	Test the capacity of the network.
MS36	Organize information campaigns on eCall.
MS37	Make aware users that MSD includes only the minimum required information needed by the emergency services to ensure an adequate response.
MS38	Integration of eCall with Traffic Management

Table 8: Recommendations for member states

5.2 Recommendations for European Commission

Recommendations intended for European Commission are presented in Table 9.

Recommendation	
Identifier	Description
EC1	Introduce regulations on the implementation of eCall
EC2	Introduce regulations on Minimum network coverage
EC3	Introduce regulations of IVS providers and OEMs responsibilities in case the system fails
EC4	Complete of regulation on new type-approvals
EC5	Further research and related road-mapping work on the long-term evolution of eCall
EC6	Cooperation of stakeholders in the context of EeIP.
EC7	Understand the implications of 4G or LTE for eCall.
EC8	Set up a consortium of different countries and different MNOs who are capable and willing to roll out the eCall flag in the different countries with adjacent geographical areas.
EC9	Introduce certification of testing procedures for TS-12.

Table 9: Recommendations for European Commission

5.3 Recommendations for standardization organisations

Recommendations for standardization organisations are presented in Table 10.

Recommendation	
Identifier	Description
SDO1	MSD data format is required to comply with EN 15722 to ensure interoperability.
SDO2	Compatibility of the GNSS system with Galileo and EGNOS is not covered in the current European eCall standards framework and therefore needs to be included in type-approval testing.
SDO3	Prescribe a specific location for installation of the IVS, including antennas, to restrict the design freedom of manufacturers and possibly not lead to an ideal installation in each vehicle.
SDO4	OICA in the UN document AECS-03-11e recommend to perform an "audio test" independent of crash tests, but also to verify "audio capabilities" after a crash test.
SDO5	Include references to CEN standards in the ETSI/3GPP standards.
SDO6	A centralised approach, through a third party, that is in charge of the certification and standardisation.
SDO7	Summary of standards for operators.
SDO8	Certify the filtering instance.
SDO9	Introduce regulations on vibration testing, electronic test or temperature of eCall devices to allow eCall devices to have minimum requirements and to be more reliable.

Table 10: Recommendations for standards development organisations

5.4 Recommendations for other stakeholders

Recommendations for other stakeholders than member states, European Commission or standardization organisations are presented in Table 11.

Recommendation		Notes
Identifier	Description	
DEV1	Citizen have to be informed about the existence of the eCall service at the moment of buying/hiring a vehicle.	DG eCall recommendations
DEV2	Make eCall a "sleeping" application on the eCall generator that only comes to life when the eCall generator detect an incident serious enough for triggering an automatic eCall or the vehicle occupants generate a manual eCall	DG eCall recommendations
DEV3	Each manufacturer will design and implement an algorithm for deciding whether the eCall should be triggered.	
DEV4	Automatic eCall trigger signal is generated in the airbag control module and/or a combination of other sensor data (e.g. gyro, radar, axel load, speed)	DG eCall recommendations
DEV5	eCall shall be generated to reflect as many different crash types as possible (e.g. front, rear, side and roll crashes)	
DEV6	Trigger thresholds based on delta velocity could be send as additional optional data to the PSAP, provided that this information can be used in PSAPs with a sufficient level of reliability to evaluate the likeliness of serious injuries.	
DEV7	Vehicle manufacturers are responsible for determination of the automatic eCall trigger signal.	

Table 11: Recommendations for other stakeholders

5.5   Recommendations for PTW eCall

Recommendation	
Identifier	Description
PTW1	Use Galileo combined with GPS for complete coverage.
PTW2	Use wearable eCall system for good voice communication.
PTW3	Use sensors in onboard system to detect the number of passengers
PTW4	A wearable eCall system must be linked to the vehicle to determine the VIN.
PTW5	Introduce sensors at the front end, at the rear end, side, oblique, loose of grip, etc. for a standardise incident detection.
PTW6	Define testing solutions for eCall for PTW, then work on the standards building on the results of the tests.

Table 12: Recommendations for PTW

5.6   Recommendations for HGV and dangerous goods

Recommendation	
Identifier	Description
HGV1	Embed information about the load of commercial vehicles.
HGV2	EN15722 to define the data of the Optional Additional Data Registry.
HGV3	Force logistic companies to support eCall.
HGV4	Standardise the interfaces to the external sources.

Table 13: Recommendations for HGV and dangerous goods

5.7   Recommendations for retrofit devices

Recommendation	
Identifier	Description
RET1	Offer a discount for vehicle insurance if the retrofit device is installed by a certified company
RET2	Have a number of configuration templates such as different combination of retrofit device and vehicle models
RET3	Definition of clear requirements, standardization and procedures for certification
RET4	Certification or warranty on airbag functioning and clear regulation on liability issues.
RET5	Independent body that certifies retrofit devices.
RET6	Legal framework for the market of retrofit devices
RET7	Analyse the location of the unit in terms of vehicle impact thus considering the construction year of the vehicle which has an influence on the performance

Table 14: Recommendations for retrofit devices

5.8 Recommendations for GNSS

Table 15 reports the recommendation from GNSS perspective. They can be considered as a list of suggestion to take into account for the potential follow up of HeERO 2 project.

Recommendation	
Identifier	**Description**
GNSSR1	IVS positioning system shall be equipped with GNSS multi constellation receivers in order to ensure a bigger level of positioning availability and increase the accuracy.
GNSSR2	IVS positioning system shall rely on inertial measurements unit in order to ensure a robust positioning and overcome missing position due to temporary lack of satellite signal availability (e.g. under tunnel)
GNSSR3	Increase the awareness about the confidence level of positioning with introduction of Protection Level in order to understand if the position information at PSAP level can be considered trusted or not.
GNSSR4	IVS positioning system shall rely on wide area differential corrections in order to guarantee a higher level of accuracy.
GNSSR5	IVS positioning system shall rely on spoofing detection algorithm in order to alert PSAP system about intentional misleading position.
GNSSR6	IVS positioning system shall rely on GNSS Assistance service in order to reduce the time to first fix in critical conditions. Moreover, the assistance service shall be able to provide a raw estimation of position based on GSM network trilateration that can be used as a sort of further cross check at PSAP level.
GNSSR7	Empty fields of MSD shall be exploited to transmit additional GNSS information (e.g. list of satellites used) in order to permit the integration of GNSS services at PSAP level.

Table 15: Recommendations for GNSS

5.9 Mapping between recommendations and challenges for implementation and operation

The mapping between recommendations (table 9) and challenges for eCall implementation and operation is presented in table 18.

	MS1	MS2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13	MS14	MS15	MS16	MS17	MS18	MS19	MS20	MS21	MS22	MS23	MS24	MS25	MS26	MS27	MS28	MS29	MS30	MS31	MS32	MS33	MS34	MS35	MS36	MS37
1.1	■																																				
1.2							■																														
1.3																																					
1.4										■	■																										
1.5																■																					
1.6						■																															
1.7								■					■																								
1.8		■										■														■	■										
2.1																																					
2.2																																					
2.3																																					
2.4			■														■																				
2.5					■																																
2.6																													■								
2.7																		■																			
2.8		■																																			
2.9																							■														
2.10																																					
2.11																																					
2.12																																					
2.13																																					
2.14																																					
2.15																																					
3.1																																					
3.2																						■															
3.3						■																															
3.4																			■	■								■									
3.5																					■	■											■				
3.6																																					
3.7	■																																				
3.8																																■					
3.9			■																				■		■												
4.2				■																										■				■			
4.3					■																										■						
4.5																																		■			
4.6																																					
4.7																																					
4.8																																					
4.9																																					
4.10																																					
4.11																																					
4.12															■																						
4.13			■																																		
4.14									■																	■											
4.15																																					
4.16																									■										■		
4.17		■																																			
4.18																																					
4.19				■										■																							
5.1																																					
5.2																																				■	
5.3																																					■

Table 16: Mapping of recommendations to challenges

6 Concluding remarks

This document has provided recommendations for the implementation and operation of eCall based on the challenges and enablers identified in D6.2 and D6.5 of HeERO2 and based on the challenges and enablers identified in HeERO1. In addition, the recommendations are supported with an analysis of the challenges for implementation and operation of eCall.

The results of the analysis of the issues suggest that the most significant challenge is the introduction of regulations on eCall implementation. In few member states, the analysis of the architecture of the eCall system is still needed. Therefore the preparation of a national implementation roadmap and a set of guidelines at country level should be ensured. In this regard, the D6.5 eCall guidelines of HeERO2 represents the first step towards this direction.

There are also a set of technical issues that should be solved with reference to the IVS and to the transmission of the MSD that is not always successful or the time elapsed is to long.

The list of recommendations is non-exhaustive. It is possible that more recommendations could have been identified in additional discussions with stakeholders working with eCall.

7 References

Öörni, R., D6.5 Recommendations on implementation and operation of eCall (HeERO1)