## CONTROL SHEET

### Version history

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1 Management summary

D6.2 Deployment enablers and opportunities and challenges: Final Report is an update of the D6.1 Barriers and Enablers Preliminary Report that has been prepared during the first six months of the HeERO2 project. Following the methodology proposed in HeERO1, the results of this work will be used for the preparation of the Guidelines for the implementation of eCall.

The report is structured based on five layers: policy layer, business layer, operative layer, technical/technological layer and user layer. Furthermore the D6.2 provides an overview of the enablers, opportunities and challenges for the implementation of the eCall related to the new emerging topics of HeERO2: Heavy Good Vehicles (HGV), Powered 2 Wheeled Vehicles (P2W), Retrofit Devices and GNSS.

The content of the Deliverable is based on phone interviews carried out by ICOOR, during the months of March 2014 and September 2014 with the aim to detect the new challenges and enablers and opportunities identified during the execution of the pilots.

The phones interviews with Member States representatives consisted in questions aimed to determine if the challenges already identified during the first phase of the project were or were not solved at the moment the interview took place or if new challenges were identified during the pilot implementation. The interviews also consisted in asking the reasons the identified challenges were not solved and to describe the solutions identified. These solutions have been reported as new eCall enablers.

Each interview lasted about half an hour and the representatives of Belgium, Bulgaria, Denmark, Luxembourg, Spain and Turkey provided their answers. Specifically, the updates on the challenges and solutions related to P2W and HGV and dangerous goods have been provided by Luxembourg and Spain representatives and two additional partners, GMV and ISMB, were interviewed to provide updates on retrofit devices and GNSS.

Next an additional list of questions related to the National pilot and the main difficulties encountered during its implementation, were asked to the Member States representatives by email.

All the collected information has been summarized using the layer framework. A review of the findings reported in the Deliverables 2.6 and 4.4 of HeERO2 was carried out and the most relevant recommendations are included. Finally, the chapters providing an overview of
the current status of eCall regulation, standardisation, and eCall events have been updated from HeERO1.

Basing on the structure of D6.1 eCall Deployment Barriers and Enablers Preliminary Report, this document is intended to highlight the different perspectives existing between respondents and to converge to a set of aspects that might prevent or enable the eCall implementation. These viewpoints reports the opinion of HeERO2 partners, dealing with the organisation of the Pilot Sites (in this case observations are more specific to the country peculiarities) and the vision of the different stakeholders involved in the eCall value chain depending on their position in the European eCall development process.

The structure of the deliverable is the result of the cooperation and availability of WP6 participants to provide all the information needed to have an overview of the challenges and enablers for the eCall deployment.

The main challenge for the eCall deployment at policy level is the need to have coordinated efforts by all the stakeholders that are part of the eCall value chain. This includes the respect of the deadline established by the European Commission on the full implementation of eCall by Member States on the PSAPs upgrade, the implementation of the eCall discriminator by the MNOs and the completion of the national regulations that allow the eCall deployment at national level.

The most important aspect at policy level is the completion of the type approval regulation by the European Commission. This is seen as a proof of real commitment and could further encourage the stakeholders to invest on eCall technologies.

Another aspect that has shown to be very important for a better coordination of the actors and of the operations for the correct eCall management is the realization of a national implementation roadmap by Member States in which they delineates the procedures that have to be followed at country level in particular with reference to procurement issues. Delays and too complex procurement procedures have in fact caused delays during the preparation of the HeERO2 pilot sites and, in some cases, these complex procedures are expected to cause additional delays in the future.

The HeERO2 pilots in Belgium included the rollout of a filtering instance to reduce the number of false calls in the PSAP. This has evidenced the need for regulation on the
certification of the filtering instance. Finally a clarification on liability aspects of eCall is needed from the point of view of the interviewed participants.

The limitation of the pilot has been experienced in both HeERO project phases. In HeERO2 the limitations were connected to the use of a limited number of devices that did not allow making considerations on the capacity of the network. Furthermore cross border testing between Luxembourg and Belgium was not possible because the eCall Flag was not implemented in adjacent areas.

The architectures of European Member are very different from each other and tailored considerations should be made for the full deployment of the eCall. Member States that have not decided the architecture of the eCall system should prepare a national implementation plan and HeERO project is, in some cases such as in Bulgaria, the first step towards this direction.

The IVS should be tested in order to ensure the device is working properly. The correct procedure can be partially ensured by the completion of the type approval regulation. Many issues have been solved during the pilot implementation but additional analysis is needed. Further research is also needed on the MSD transmission time and on the long term evolution of eCall and the new proposal I_HeERO is the first step towards this direction.

There are few aspects that most likely will be taken into account once the eCall will be implemented at European level such as the need to ensure network coverage in rural areas or issues related to the capacity of the network.

The approach followed in this study is based on the systematic identification of challenges and solutions and in the integration of the results obtained thanks to the activities carried out by HeERO1 participants. The main objective is to draw attention to the challenges that have been not solved during the execution of HeERO projects and, as such, need further analysis and research. This work is also the basis of the analysis carried out to prepare the guidelines and the recommendations for eCall deployment.

It has to be pointed out that the resources assigned to carry out this work were limited so that it has not been possible to perform an in-depth analysis of the challenges and enablers. For instance, the success of the MSD transmission has been identified as challenges during the implementation of HeERO1 and it has been confirmed by HeERO2 participants. Therefore a
more detailed analysis of the factors that contribute to the failure or success of MSD is still needed.
# Terms and abbreviations

<table>
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<tr>
<td>ASN.1</td>
<td>Abstract Syntax Notation One</td>
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<tr>
<td>ADR</td>
<td>European Agreement concerning the International Carriage of Dangerous</td>
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<td></td>
<td>Goods by Road</td>
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<td>ACEM</td>
<td>European Motorcycle Manufactures Association</td>
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<td>AOC</td>
<td>Advanced Operational Capability</td>
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<td>CEN</td>
<td>European Committee for Standardization</td>
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<tr>
<td>CIP</td>
<td>Competitiveness and Innovation Programme</td>
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<td>CC</td>
<td>Call Centre</td>
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<td>CS</td>
<td>Commercial Service</td>
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<td>DOP</td>
<td>Dilution of Precision</td>
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<td>EC</td>
<td>European Commission</td>
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<td>ECEF</td>
<td>Earth Centre Earth Fix</td>
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<td>ECI</td>
<td>Earth-Cantered-Inertial</td>
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<tr>
<td>EDAS</td>
<td>EGNOS Data Access Service</td>
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<td>EGNOS</td>
<td>European Geostationary Navigation Overlay System</td>
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<tr>
<td>ETSI</td>
<td>European Telecommunications Standards Institute</td>
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<tr>
<td>DIV</td>
<td>Directie Inschrijvingen van Voertuigen – Vehicle Registration Service (Belgium)</td>
</tr>
<tr>
<td>GBAS</td>
<td>Ground Based Augmentation System</td>
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<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>HGV</td>
<td>Heavy Goods Vehicle</td>
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<tr>
<td>INS</td>
<td>Inertial Navigation System</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>IVS</td>
<td>In-Vehicle System</td>
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<tr>
<td>LADGPS</td>
<td>Local Area Differential GPS</td>
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<tr>
<td>LCV</td>
<td>Light Commercial Vehicle</td>
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<td>LTE</td>
<td>Long-Term Evolution</td>
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<td>MNO</td>
<td>Mobile Network Operators</td>
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<td>MSD</td>
<td>Minimum Set Data</td>
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<td>IVS</td>
<td>On-Board Unit</td>
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<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<tr>
<td>OMA-SUPL</td>
<td>Open Mobile Alliance-Secure User Plan Location</td>
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<tr>
<td>PER</td>
<td>Packed Encoding Rules</td>
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<tr>
<td>PPS</td>
<td>Precise Positioning Service</td>
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<td>PRS</td>
<td>Public Regulated Services</td>
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<td>PSAP</td>
<td>Public Safety Answering Point</td>
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<td>PTI</td>
<td>Periodic Test Inspection</td>
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<td>P2W</td>
<td>Power Two Wheeler</td>
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<tr>
<td>RSS</td>
<td>Received Signal Strength</td>
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<tr>
<td>RTCM</td>
<td>Radio Technical Commission for Maritime Services</td>
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<tr>
<td>RTK</td>
<td>Real Time Kinematic</td>
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<tr>
<td>RoHS</td>
<td>Restriction of Hazardous Substances</td>
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<tr>
<td>SAR</td>
<td>Search And Rescue</td>
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<tr>
<td>SBAS</td>
<td>Satellite Based Augmentation System</td>
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<tr>
<td>SISNeT</td>
<td>Signal in Space through the Internet</td>
</tr>
<tr>
<td>SoL</td>
<td>Safety of Life</td>
</tr>
<tr>
<td>SPS</td>
<td>Standard Positioning Service</td>
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<tr>
<td>TDOA</td>
<td>Time Difference Of Arrival</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>TEC</td>
<td>Total Electron Content</td>
</tr>
<tr>
<td>TTFF</td>
<td>Time To First Fix</td>
</tr>
<tr>
<td>TOA</td>
<td>Time Of Arrival</td>
</tr>
<tr>
<td>TPSP</td>
<td>Third Parties service Provider</td>
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<tr>
<td>VIN</td>
<td>Vehicle Identification Number</td>
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<tr>
<td>WADGPS</td>
<td>Wide Area Differential GPS</td>
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3 Introduction

3.1 Objectives

The aim of this document is to build up an updated reference for the eCall enablers, opportunities and challenges in HeERO2 Member States. In line with the activities of HeERO1, the results of this report will be used as an input to the Guidelines for eCall Implementation and Operations.

The objective of this document is to update and integrate what has been already done during the first months of the projects thanks to the experiences of the partners in the pilots. Moreover the deliverable is based on the methodology developed within HeERO1 and it aims to complete and complement the work by providing an overview of enablers, opportunities and challenges thanks to the joint experience of the two project phases. In this regard, some tables from D6.2 of HeERO1 are here reported and updated with new challenges. The objective is to combine the results of the two projects Phases and to present a unified contribution.

The deliverable adopts the same concepts defined in D6.2 of HeERO1. That is the barriers are here called challenges that have the potentiality to delay the eCall implementation, to reduce user acceptance for the service, service benefits or service quality or increase the cost of implementation.

The enablers are the solutions to the challenges. Specifically, these can be measures, institutions and other factors which remove the challenges for deployment or reduce their impacts.

3.2 Structure of the document

To ensure the continuity of the activities carried out during HeERO1 execution, this deliverable is a continuation of the activity carried out in the first phase of HeERO project. Therefore the Deliverable 6.2 of HeERO2 maintains the same structure of Deliverable D6.2 of HeERO1.

The first part of the deliverable describes the method used to collect the information on the updated challenges and enablers. The methodology is basically the same as described in HeERO1 with the main difference consisting of additional phone interviews aimed to asks
questions aimed to obtain a description of the solutions found to solve the barriers identified before the implementation of the pilot that are described in D6.1 of HeERO2.

This report includes a summary and review of the methodology that has been already described in D6.2 of HeERO1 (Chapter 4). Chapter 5 describes the challenges and enablers identified at country level by providing a short introduction of the architecture of the pilot site. The information that are reported in this chapter have been collected by means of phone interviews or by asking information by email. Chapter 6 provides a summary of the barriers, opportunities and challenges identified during the project execution and evidence the list of barriers identified by HeERO2 participants and provide a comparison with the challenges highlighted by HeERO1 partners. Chapter 7 reports a table in which the barriers and solutions are summarized and the indication on whether the identified challenge has been solved or not. Furthermore the table provides an explanation of the reasons that did not allow solving the challenge. Chapter 8 includes the description of the challenges and identified solutions related to the new emerging topics of HeERO2. Finally, Chapter 9 and 10 respectively present the discussion of results and the conclusions of the study.

3.3 HeERO 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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Communications Networks, Content and Technology
B-1049 Brussels
Belgium
By electronic mail: CNECT-ICT-PSP-325075@ec.europa.eu
4 Methods

4.1 Framework for systematic identification of enablers, opportunities and challenges

The framework of this deliverable follows the structure of D6.1 eCall Deployment enabler’s opportunities and challenges: Preliminary report of HeERO2 and D6.2 eCall deployment enablers and opportunities and challenges: Final Report of HeERO1. These deliverables proposed a five layers structure that corresponds to eCall main macro-areas. The layers are:

- Policy Layer
- Business Layer
- Operational Layer
- Technical/Technological Layer
- User Layer

The enablers, opportunities and challenges are here reported at two different levels. The first is country specific since it deals with aspects identified during the execution of the pilots; the second is at European wide level and it consists of opportunities and challenges that affect multiple or all HeERO countries. The reporting at both levels follows the layer structure described above.

4.2 Analysis process and collection of information

The work for the preparation of D6.2 of HeERO2 consisted in phone interviews with Member States representatives. The interviewed partners had to answer if the barriers identified during the first months of HeERO2 duration still represented a challenge for eCall implementation or they had been solved. Specifically, partners were asked how the barriers were eliminated and if they were not, what were the reasons why they could not solve them. The questions dealt with the barriers that were identified at general level (i.e. European Level) but also at country level. The objective of this work is to have an overview of the advances obtained during the project implementation especially in relation to the factors that are identified as enablers of eCall implementation and to highlight the aspects that still represent a challenge.
The second part of the work is based on what has been done in HeERO1. This means that the following questions have been posed to Member States representatives in order to identify the main issues related to the pilot execution.

Here below are the questions posed to partners both by phone interviews and by email. The answers collected are reported in each country level paragraph.

1. Was the whole chain (vehicle IVS – MNO network – PSAP) tested, if not why?
2. Were there cross-border activities already? Will there be in the next phase?
3. Where were the main focuses and efforts in the piloting (in percentages) and why?
4. PSAP
   a. Technical performance – problems and solutions?
   b. Any issues related to standards?
   c. Any issues related to stakeholders and operational issues?
5. Technical performance – problems and solutions (MNO)?
   a. Technical performance – problems and solutions?
   b. Any issues related to standards?
   c. Any issues related to stakeholders and operational issues?
6. Technical performance – problems and solutions (PSAP)?
   a. Technical performance – problems and solutions?
   b. Any issues related to standards?
   c. Any issues related to stakeholders and operational issues?
7. New material or links to relevant information?

The deliverable reports the answers provided by HeERO2 partners, including the additional barriers identified during the pilot implementation. The present deliverable include also information related to the latest activities of the European Commission, the European Parliament, activities related to eCall such as organized workshops or other actions that have not already been reported in the previous version of the deliverable or in D6.2 of HeERO1.

The standards approved are here summarized to complete and complement the work initiated in D6.2 of HeERO1.

Finally, this deliverable includes the enablers, opportunities and challenges related to the new emerging topics that are the focus of HeERO2. These are also the aspects that are considered within the pilot implementation of HeERO2 countries, thus a dedicated chapter to them is included in the report.
Finally, once the challenges have been identified and summarized, the corresponding enablers and opportunities have been reported. This work represents the basis of the future work described on D6.5 eCall implementation guidelines and roadmap and D6.6 Recommendations on implementation and operation of eCall.
5 Call and current development activities

5.1 European Parliament

On 15 April 2014, the European Parliament (EP) adopted its first-reading position on the proposal for a Decision of the EP and of the Council on the deployment of the interoperable EU-wide eCall. According to the decision, EU Member States have to install the eCall infrastructure required for the handling of all eCalls on the EU territory not later than 1st October 2017 (Decision 585/2014/EU). This is one of the two legislative measures introducing mandatory automated emergency calls for cars in road incidents from 2018.

The second legislative measure is the Council agreement on a general approach on a draft regulation aimed at introducing in the EU motor vehicle type-approval system requirements for fitting eCall devices in new models of vehicles (9879/14). The eCall devices have to be fitted in the vehicles at least 6 months before the date of application of the Regulation.

5.2 European Commission

On 25 April 2014, the Ministry of Infrastructure, Transport and Networks in Greece organised the International Conference “Intelligent Transport Systems, eCall and Road Safety”, in cooperation with the European Commission and ERTICO-ITS Europe. The Conference was organised within the framework of the Hellenic Presidency of the Council of the European Union.

In the policy session, the Greek Attaché and Chairman of the Technical Harmonisation WP, Mr. Mamalis, presented the work of the Hellenic Presidency, concerning:

1. the Proposal for the Decision on the deployment of the inter-operable EU-wide eCall and
2. the Proposal for the Regulation concerning type-approval requirements for the deployment of the eCall in-vehicle system and amending Directive 2007/46/EC.

There has been a simulation of an automatic eCall to the PSAP that was installed in the Ministry, dispatching it to the Fire brigade call centre that successfully decoded the MSD and the received geographical position from the Greek PSAP. The fire brigade responded immediately by sending a rescue team at the location of the incident.
5.3 Status of standardization

The revision of standards is mainly devoted to the timing optimization. One of the tasks of HeERO2 project consisted in the revision of EN16102 that deals with Third Party Service eCall and that is out of the scope of HeERO2 description of work. The Belgian pilot took charge of the task because the standard is relevant in case of false calls and the pilot main activity deals with the introduction of a filtering instance to reduce and handle false calls so this important information is being provided to CEN278 WG 15 despite being outside of the scope of the project.

The following is an updated list of the mandatory standards for eCall from Chapter 2 of D3.10b - Report on eCall Deployment Status of the iMobility Support project:

- Technical Specification Group Core Network and Terminals; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (Release 10) 3GPP TS 24.008 V10.0.0 (2010-09)
- In-band modem solution; General description (Release 10) 3GPP TS 26.267 V10.0.0 (2011-03)
- In-band modem solution; Conformance testing (Release 10) 3GPP TS 26.269 V10.0.0 (2011-03)
- In-band modem solution; ANSI-C reference code (Release 10) 3GPP TS 26.268 V10.0.0 (2011-03)
- Intelligent transport systems – eSafety – eCall minimum set of data (MSD) EN 15722, June 2011
- Intelligent transport systems – eSafety – ECAll high level application requirements (HLAP) prEN 16062, Date: 2010-09
- Intelligent transport systems – eSafety – Pan European eCall - Operating requirements EN 16072, Date: 2011 -07
- PrEN 16102 - Intelligent transport systems – ECAll – Operating requirements for third party support (Optional)

5.4 Plugtests

ETSI Plugtests™ events have been organized since 1999. The events aim the development of global standards by providing feedbacks to ETSI standardization committee. Feedbacks are also provided by companies that are invited to test their products at the event.
5.5 TPEG™ Testfest

TPEG™ Testfest aims to carry out Interoperability test event for ITS standards implementations. The first events was organized by ERTICO-ITS Europe and TISA in Munich in September 2012 with the aim to providing the framework for one-to-one testing and live debugging with clearly defined use-cases and a systematic record of the learning points. The test cases focused mainly on the implementation of TPEG™ Applications currently defined in TISA Specifications which are soon to become worldwide Standards:

- TPEGTM-SNI (TISA Specification SP11014, to become ISO/TS 18234-3),
- TPEGTM-TEC (TISA Specification SP11016, to become ISO/TS 18234-9),
- TPEGTM-TFP (TISA Specification SP10036, to become ISO/TS 21219-18),
- TPEGTM DAB adaptation layer (TISA specification SP10008).

During the event the level of interoperability has achieved an average success rate of 87%.

5.6 eCall interoperability events

The first eCall Plugtest was organized in Nuneaton (UK) in 2012 and focused on testing interoperability of the Pan European eCall. The objective was to provide a realistic environment for vendors to test their implementations against each other. The tests were performed over the innovITS ADVANCE GSM/3G private network, allowing IVS units to make 112 based eCall to the PSAP. More than five hundred interoperability tests were run during the course of the event and these tests gave an excellent success rate of almost 90%. However since the pass rate was high, the event ended up with the need for more interoperability tests.

The second Testfest event organised jointly between ERTICO ITS-Europe and ETSI, was held in September 2013 in Essen (DE) at CETECOM’s independent test facility with the aim to test the interoperability of the eCall implementation from 30 vendors. The participants were able to reach real operators at several active emergency answering points based in Croatia, Luxembourg, Czech Republic, Greece and The Netherlands. All test results were reported using the ETSI test reporting tool, which allowed all participants to receive a report with the results of all the test sessions they attended. The overall level of interoperability achieved amounted to more than 93%. This result implies that in 2015 response time of emergency services are expected to be reduced by 50% in rural areas and 40% in urban areas. In the
final wrap session vendors stated that a certification framework is necessary for device manufacturer to ensure matching a set of minimum requirements; and that harmonisation with Glonass Union standards and certification is wanted.

The third eCall interoperability event organized, by ERTICO-ITS Europe and ETSI. The event took place in October 2014 in Vigo (ES) hosted by CTAG in cooperation with CETECOM. The purpose of the event was to test the interoperability of PSAP and IVS devices. Specifically, the event focused the attention on the many issues that need to be solved when performing interoperability tests. The critical aspects are the following:

- What tests should be considered in the context of the vehicle type approval
- To what extend eCall module requires certification
- Harmonising EU and ERA GLONASS testing
- How to coordinate PSAP conformity assessment at EU level
- How to assess GNSS performances for eCall.

5.7 ITS World Congress

During the ITS World Congress that was held in Detroit on the 7-11 September 2014, ERTICO ITS Europe organized a special session on eCall Advancement to Deployment – Global Perspective. This session discussed the deployment of eCall from the perspective of the four geographic areas. Specifically, the discussion focused on the difference across the continents and on the possible influence of the implementation of eCall in Russia and Europe on the view points from continents where eCall is not currently deployed.

5.8 ERA-GLONASS

The Russian ERA (Emergency Road Assistance) GLONASS System is harmonized with the European eCall System and in future this will result in a common road safety space intended to bring rapid assistance to motorists involved in a collision throughout Russia and EU member states. The planning for the implementation of the ERA-GLONASS system is reported in Figure 1.

Legal aspects of ERA-GLONASS implementation and operation are based on the Federal Law No. 395-FZ "On the ERA-GLONASS State Automated Information System". Draft regulations under development are established by the Federal Law and focus on implementation of standards:
• govern how the system is built and operated,
• how the emergency services alert devices are used,
• define how the ERA-GLONASS System will be integrated with other information systems,
• technical, software, and linguistic requirements for supporting subsystems,
• the order for providing the data to the System.

Source: APEC, TPT-WG40, 18-22 August 2014, Hong Kong, China

Figure 1: The ERA-GLONASS System: 4 Years from Concept to Operation

On 30 December 2013, the Ministry of Transport signed a contract for the roll-out of ERA-GLONASS in 2014 with NP GLONASS, a federal navigation network operator.

On July 2014, Fujitsu Ten has provided an eCall emergency call specification Telematics Control Unit (TCU) for an eCall demonstration supported by the GLONASS Union, VTT and Gemalto. To demonstrate the interchangeability between the European eCall system and the Russian ERA-GLONASS system, demonstrations were carried out simultaneously in Europe and Russia for the first time. This demonstration and interoperability tests are a part of the HeERO pan-European project promoting eCall. The demonstrations verified that typically a vehicle equipped with ERA-GLONASS initiates an emergency call (eCall) to a PSAP in
Europe, and likewise that a vehicle equipped with eCall initiates an emergency call (ERA-GLONASS) to PSAP in Russia. Thus, the interoperability between eCall and ERA-GLONASS was confirmed.

On September 2014, the first crash test of a vehicle equipped with the Russian eCall incident emergency response system (ERA-GLONASS) has been carried out in the Scientific Research Automobile And Automotive Engine Institute “NAMI”. The aim of the test was to develop methods of certification tests for compliance with the technical regulations of the Customs Union “On Safety of Wheeled vehicles” for the automatic triggering of ERA-GLONASS terminals in a head-on collision. Methods of certification tests were worked out during the crash tests of category M1 (cars) vehicles in accordance with UNECE Regulation No. 94.

All new passenger vehicles (e.g. automobiles and light vehicles) getting new (first) type approval will be required to have the ERA-GLONASS In-Vehicle System (IVS) installed from January 2015.

5.9 HeERO2 Piloting experience

For each Pilot Country, an interview about the main challenges encountered during the pilot implementation is provided. Below, these barriers are highlighted in italic and the connected comments are shown. Additional challenges and solutions are reported from other Deliverables that have been prepared in others WPs of HeERO2.

Specifically, deliverable D2.4 sets the basis of the analysis to test how PSAPs will operate in the Member States after eCall systems in order to ensure that any vehicle from any European Member State has the possibility to use eCall in case of collision and the system is harmonized all over Europe. The D2.6 Final Test Cases Report describes the main results of the implementation for IVS, PSAP and Mobile Network Providers on each pilot site and it includes the technical solutions adopted. The two deliverables of WP3, the D3.2 Operation Preliminary Results and D3.3 Final Operations Results, analyse the results of the first and of the final operational phase which includes issues that include, for instance, the reception of the signal by the IVS, interoperability issues, the need for a filtering instance.

The most significant issues found in the D3.2 have been selected and compared to the solutions identified by the partners during the final pilot implementation (D3.3). Finally, this information has been integrated with the answers provided by the partners during the phone
interviews and the answers provided by email. WP4 evaluates the main results of the pilots and provides a set of KPIs to measure them. Finally, the document includes a set of recommendations as the result of the evaluation.

To ensure the continuity between the two phases of HeERO project and to provide an overview of the main challenges, a table that summarizes the main barriers found in each Member State is reported. Specifically, Table 3 *Challenges identified by the pilot sites and in the literature study* included in D6.2 of HeERO1 has been integrated, completed and updated with the new information resulting from the activities carried out by the HeERO2 partnership.

The table that is shown at the end of this chapter is the result of the attempt to combine the identified challenges of the two project phases in a scheme that allows having an overview of the barriers that are causing delays in the Member States for the implementation of the eCall services.
5.10 Piloting in Belgium

5.10.1 General

For the purpose of the HeERO pilot project in Belgium, the Mobistar mobile network was used to verify the well-functioning of the public eCall implementation and it was adapted to detect the eCall flag as part of the TS12 emergency call.

Prior to the real HeERO pilot, an internal Mobistar validation of the eCall function was conducted. After that, the roll-out of the software upgrade was performed and the eCall function was activated in one operative MSC, for a limited amount of time.

A filtering instance was created and implemented at Touring on a dedicated server using the “eCall Router” software of OECON Product & Services GmbH. The decision to introduce a filtering instance was mainly driven by the expected increase of calls due multiple scenarios:

- In case of several vehicles involved in a collision, parallel calls are expected,
- More drivers will push the bottom installed into the vehicles (i.e. false calls),
- Large amount of calls that do not need the intervention of an emergency service.

The focus of the Belgian pilot was the filtering instance. Specifically, the following topics were considered:

- Identification of criteria for the creation of routing tables in networks,
- Number of filtering instance to be introduced,
- Certification of the filtering instance,
- Interface between eCall PSAP and 112 PSAP,
- Time elapsed to receive an eCall,
- Interface between eCall PSAP and the traffic management system,

The PSAPs were managed by ASTRID. Figure 2 shows the structure of the pilot: the functional work-flow (Figure 2a) and the technical scheme (Figure 2b).
The key challenges regarding the pilot are reported below:

- **Was the whole chain (vehicle IVS - MNO network - PSAP) tested, if not why?**
  
The whole chain has been tested.

- **Were there cross-border activities already? Will there be in the next phase?**
  
The devices of the Luxembourg pilot were tested in Belgium and the devices of the Belgian pilot were tested in Luxembourg. However, the 112 eCall flag was not available at the borders of Luxembourg, so that practical tests were not possible.

- **Where were the main focuses and efforts in the piloting (in percentages) and why?**
  
  - in IVS 40 %
  - in MNO / Communications 5 %
  - in PSAP environment 30 %
  - getting the test results (KPI) 25 %

  The distribution shows that the main effort of the Belgian pilot was focused on the IVS functioning. The introduction of the filtering instance also required important efforts and the most challenging aspect was getting the IVS to work. However the test ended up with non-functional devices.
5.10.2 IVS

- **Issues related to standards.** If one of the parties in an EN16102 connection gets out of sync, for example due to reboots, crashes or for maintenance reasons, the protocol does not foresee any method for recovery.

In Belgium, all eCalls are transmitted to the special eCall centre. After checking the eCall MSD, an operator talks to the caller and finds out if there is really an incident and rescue service is required. In this installation, the eCall Router receives incoming eCalls and then does not transmit them directly to an operator (or the appropriate rescue service software), but to the national 112 centres using an EN16102 interface. The TPS eCall in-vehicle system shall comply with the standard EN 16102:2011 ‘Intelligent transport systems – eCall – Operating requirements for third party support’.

- **Issues related to stakeholders and operational issues.**

NXP left the project because of the technical issue related to the configuration mismatch in the SW provided. During the first test execution none of the IVS functioned well.

- The OECON-server does not support the enrichment of data (issue only for Call Centres using OECON solution) and there is no documentation or guidelines as to how this can be done.

Also the data transmission to the OECON-server is not regulated in detail: a possibility is to describe the mechanisms and the procedures on how the MSDs can be enriched prior to their forwarding to other CCs. There is already spare space in the XML definition (within EN16102) to store such information.

- There is the need for testing the eCall at cross border areas but, at the same time, communication is an issue.

To solve this problem, Belgian partners have made a test to identify the problem with more precision. During cross border testing in co-operation with the Luxembourg-pilot site many of the issues that had been discovered in testing the filtering concept were similar to the interoperability issues between the PSAPs of different countries.

- The process to detail IVS technical requirement is still open. The latest Proposal Directive 2007/46/EC) has been published by the EC on June 2013.

This issue is slowing down the introduction of the eCall. The lack of detailed technical requirements for IVS represents an issue for Belgium, but also on a larger scale, as it is a
political matter that should be considered at the European level. An updated regulation is perceived as urgent.

5.10.3 MNO – Communication

- 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. 
  
The described scenario is not defined for Belgium and foreigners roaming in Belgium: this is a specific aspect of the filtering instances and it depends on whether a country decides or not to allow several filtering instances to operate in parallel in the same area. This scenario is complex to be solved and it is not likely to be investigated during the timeline of HeERO2.

- If an incident occurs close to a border, it is possible that the vehicle’s IVS is still connected to the network of the country it has just left. Therefore this country receives an eCall and the MSD. It would be better if the information could be transmitted to the country PSAP where the incident has actually occurred.
  
  This is still an open issue: strong signals from MNOs at border regions can mean that the handover to a MNO that is resident in the country where the incident occurs can occur well after a vehicle has crossed between countries. This is not an issue itself, but a mechanism that allows the transmission of the eCall to the correct country’s PSAP, including the relevant telephone number and MSD, needs to be set in place. A solution can be to adapt the EN16102 so that it can be used to transfer the MSD’s and additional information to the central servers of different neighbouring countries. Also in this case, the EN16102 is complete enough to cover this aspect. The current implementation in Belgium filtering instance (Oecon) is not fulfilling and corrective actions within Belgium Pilot site are needed.

5.10.4 PSAPs

- Some technical problems may occur when the CC1 receives a call and tries to forward it to CC2: when the re-forwarding process does not work, these bugs should be fixed.
  
  While the EN16102 is complete enough to cover this issue, the current implementation in Belgium Filtering instance (Oecon) is not fulfilling. Corrective actions have been applied within Belgian Pilot site.

- When the CC1 receives an eCall and forwards it to the CC2 (as a simple call from CC1): it may occur that while the CC2 receives information for the dealing number of
the CC1, the original IVS in the car does not and it cannot call the potential victim back.

In this case, the IVS number should be exchanged between the two CCs in the same manner as it occurs for the MSD. Also regarding this issue, the EN16102 is complete enough. This problem arises because the callback-number is not added to the extra XMLs. Thus, the current implementation in the Belgium filtering instance (Oecon) is not fulfilling and some corrective actions within Belgian Pilot site should apply.

- Dealing with silent eCalls can be a real challenge for emergency services.
This was an issue in Belgium and no solutions have been found so far. This is perceived as a general problem. With the introduction of eCall, it is expected that the amount of calls to the 112 centre will again rise because the PSAPs receive a large amount of false calls.

5.10.5 Other issues

- The MSD retransmission mechanism works as follow: an eCall is forwarded from CC1 to CC2, where CC2 requests a retransmission of the MSD, in order to receive an update of the location or other information. When the retransmission occurs during the time that the concession is still open, it is not a problem: this can be done by the operator in the PSAP by dealing certain DTMF tones, which triggers the in-band modem, and which in turn retrieves the new MSD from the IVS and sends it to the PSAP. Instead, when the PSAP calls back the IVS, the audio-channel does not pass the filtering instance and consequently not even the modem. As a result, the DTMF-call to retransmit the MSD does not function.

The EN16102 should include a retransmission protocol which assumes the above mentioned procedure to occur electronically (instead of the DTMF), so that it can also work in combination with private eCalls. A solution is to include the modem in the loop when calling the IVS back: adding extra information into the EN16102 would allow the request of a retransmission of MSD. To conclude, 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.
5.10.6 Conclusions and recommendations

During the first test phase some issues were reported with IVS prototypes. In fact, most of the efforts have been focused to obtain results from IVS functioning and the final test ended up with no functioning devices.

Besides the challenges with the IVS functioning, issues were registered at cross-border areas for the roll-out of the filtering instance. Guidelines and new standards should be defined, including the case in which more filtering instances are introduced. The cross-border eCall was not successfully tested because the areas where the eCall flag was rolled out in Belgium and neighboring countries were not near each other. Another complication was due to the different SIM used in the different countries that made cross boarding testing even more difficult.

Belgian partners recommend implementing an interfacing mechanism based on EN16102 to transfer the MSD and additional information between countries. However this mechanism need to be further developed and agreed among the different countries.

Furthermore false calls or inappropriate calls have not been fully explored and they still remain an issue.

Belgian partners also recommend to 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 (from D4.2 of HeERO2).
5.11 Piloting in Bulgaria

5.11.1 General

The eCall system in Bulgaria, follows the existing and operating E112 system, pilot is centralized, all eCalls (data and voice) are routed to a central PSAP located in Sofia, and then can be forwarded to the Emergency Agencies (Police, Fire Safety and Protection of Population Directorate, Emergency medical care centres, Executive Agency Maritime Administration and Mountain Rescue Service).

![eCall implementation in Bulgaria](image)

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. Also Bulgarian HeERO 2 pilot site is presented as a first step made for eCall implementation in Bulgaria. Figure 2 shows how the architecture of the eCall pilot implementation in Bulgaria. The details are reported in D2.6.

The first phase of the test has already been carried out and the second phase was started in May 2014. The following workflow was implemented in Bulgaria:

- the IVS initiate eCall with manual or automatic activation,
- MNOs identify eCall and reroute to the PSAP test environment in Sofia PSAP test environment in Sofia accepts eCall, including establishing voice connection with the IVS and ensuring the MSD transmission,
• PSAP test environment in Sofia requests the VIN from local VIN database/EUROCARIS
• if needed the call taker may trigger resend and callback functionalities of the eCall Test and Development server.

The key challenges regarding the pilot are reported below:

1. Was the whole chain (vehicle IVS – MNO network – PSAP) tested, if not why?
   Yes, the whole chain was tested.

2. Were there cross-border activities already? Will there be in the next phase?
   Yes, there was only one cross-border test in April 2014 between Romanian IVS and PSAP test environment. The KPIs have not been evaluated for it.

During the Project HeERO other cross-border tests are not going to be performed. The next steps are going to be included in the National eCall implementation plan.

3. Where were the main focuses and efforts in the piloting (in percentages) and why?
   • In IVS: 30%
   ICOM successfully completed the necessary modifications of its commercial telematics OBU’s and produced the first version of its eCall IVS device with manual and automatic eCall triggering in Q1 of 2013. A second version of ICOM’s IVS device with combined GPS/GLONASS positioning was successfully built in Q2 of 2013. These devices were installed into 10 vehicles and their positioning and communication subsystem were extensively tested in the field within Q2, Q3, and Q4 of 2013. Both versions of the IVS device included an inertial system for automatic eCall triggering as ICOM’s IVS device is mainly targeted for aftermarket implementation, which was undergoing continuous laboratory and field testing. Due to non-satisfactory results of the inertial system performance, which triggered a large percentage of false calls, a third version of ICOM’s IVS system was built, with complete redesign of the inertial system in Q2 of 2014. This third version of the device is currently being tested internally and ICOM offered a plan for performing functional and KPIs tests of its IVS final version. The TUS working team developed an IVS device aimed at laboratory and field test in Q4 of 2013. Since then the device has undergone several modifications as well as continuous upgrades of its functions.
   • In MNOs/Communication: 20%
A series of tests were made in 2013 without eCall flag. In the middle of January 2014 Mobiltel implemented eCall flag in their network and as a result the test calls to 112 were routed to mobile switching centre(s) and then – to PSAP test environment. The integration between PSAP test environment and application software was available from March 2014.

- **In PSAP: 30%**
The adaption of the existing PSAP was subject of subcontracting. The 112 signalling protocol was used as it is and the 112 PRI trunks remain unchanged (see D2.6 Final System Test Cases Report for further details).

- **getting the test results (KPI) 20 %**
In August and September 2014 special test session was performed in order to collect the data for KPI evaluation.

### 5.11.2 IVS

- **IVS: the triggering system is the most challenging issue for retrofit eCall devices.**
  *There is a lack of certification procedures on IVS devices. There are standards but they are very general. Clear certification requirement and paths are needed.*

ICOM has identified that the triggering system is the most challenging issue for the retrofit of eCall devices. Like in the PTW, a retrofit eCall IVS cannot depend on the impact detection system of the vehicle. For this reason, throughout the project, ICOM’s efforts were focused to perfection its IVS inertial system which is highly integrated with the GPS in the device. The TUS team recognizes 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.

- **There are no standards for dormant SIM cards.**
Bulgarian partners believe that standards for dormant SIM have to be created.

- **There are many devices running into the market and they use different types of components (for instance modems may have different capabilities). There should be minimum set of requirements for IVS providers.**
In Bulgaria there is a lack of certification procedures in many fields. Standards exist, but they are very general. Clear certification requirement and paths are needed.
5.11.3 MNO – Communication

- **The issue of network coverage will affect all networks, and will represent a commercial decision for the respective network.**

  In Bulgaria, MNOs’ operators will solve the issue of network coverage by the end of 2014.

- **eCall discriminator.**

  MNOs have an obligation to implement the mechanism to handle the ‘eCall discriminator’ in their networks by 31st December 2014. They should handle an eCall like any other call to the single European emergency number 112.

- **Dormant SIM.**

  There are no standards for dormant SIM cards and such standards should be created.

5.11.4 PSAP

- **PSAP procurement procedures are too complex.**

  The issue related to hardware delivery was seen in Bulgaria and it has been solved. However, this problem is very likely to occur again in the future because there is not legislation. Bulgarian partners have solved the issue by dividing the project proposition in sections although this is not a structured way to proceed and it would be better to follow a technological path. Furthermore, procurement issues connected with the hardware and software needed for the upgrade of PSAP test environment in Sofia have caused delays on the subcontracting procedures.

- **The PSAP that have the capabilities to receive and process eCalls need to be identified.**

  The identification of PSAP is subject of national eCall implementation roadmap.

- **With the introduction of eCall, it is expected that the amount of calls to the 112 centre will rise again because the PSAPs receive a large amount of false calls.**

  Bulgarian PSAPs do not present this problem, even though partners are aware of the fact that there is no way to distinguish false calls and that some measures to prevent this problem should be thought.
5.11.5 Conclusions and recommendations

In Bulgaria, delays were caused by procurements procedures for the PSAP upgrade. This is expected to create additional delays in the future. Furthermore a National implementation roadmap to identify the PSAPs in which eCall is implemented is still missing and HeERO2 represents the first step in this direction.

The second challenge deals with the triggering system of retrofit devices that, in the opinion of the Bulgarian partners, can create further delays in the implementation of eCall at EU wide level because the technology is not mature and the regulation (i.e. IVS type approval) is still missing. The lack of a defined trigger for automatic eCalling beyond the airbag deployment is seen as a serious barrier to the successful development and operation of aftermarket IVS devices.
5.12 Piloting Denmark

5.12.1 General

The goal of the Danish Pilot Site was to make eCall fully operational in Denmark, so that when the pilot was completed the four Danish MNOs and the three PSAPs were to be ready to receive eCall from any eCall equipment, thus fulfilling the eCall standards.

The Danish pilot also has looked into challenges regarding refitting of IVS-equipment and Dormant IVS, and on the basis of the pilot, formulated a number of recommendations and lessons learned regarding equipment and Dormant IVS.

In Denmark there are three PSAPs operated by the National Police (2 PSAPS) and by the Copenhagen Fire Brigade (1 PSAP). In order to avoid disrupting the 112 service and to have a system similar to the real one, a test environment (PSAP-SUT) has been established at the Copenhagen Fire Brigade.

To carry out the tests, the PSAP at the Fire Brigade has been modified such that the VIN can look-up at the Danish database, and GIS and MSD display are available.

7-9 vehicles have been equipped with IVS retrofit devices from two different vendors (Fujitsu-Ten and GMV).

Figure 5: eCall implementation in Denmark
The tests were trying to be as close to real life, with vehicles travelling all over Denmark for other purposes, and occasionally conducting a manual eCall. During the first test phase, eCalls were answered by a machine (Intelligent Voice Response) during the second test phase; eCalls were answered by a trained operator.

All calls were manual calls to a test-number (not 112), due to this fact, no real cross-border tests were conducted, but some of the vehicles were equipped with foreign SIM-cards, thus testing for roaming and interoperability.

The focus of the pilot was:

- **In IVS:** 40%
- **In MNO / Communication:** 20%
- **In PSAP environment:** 50%

*Figure 4: Position of vehicle, when test calls were made, as registered by the IVS*

The main focuses of the test were:

- How is eCall to be implemented in Denmark
- Does it work/is it valuable?
• Does it work with Dormant IVS (all IVS-units had Dormant IVS capability, and all testing was performed with the Dormant feature set)?

The main efforts were (in descending workload/complexity order):

• Agreeing on a common PSAP implementation specification
• Implementing changes in the PSAPs
• Conducting the pilot-tests (with evaluation)
• HeERO2 coordination and reporting
• Understanding and obtaining Dormant IVS capability
• Driving MNO’s to plan for implementation

5.12.2 IVS

• Duration aspects related to the IVS: technical maturity.
There are no mature retrofitable IVS in circulation. The ones that have been tested in the Danish Pilot have a number of issues, such as instability, bad GPS-receiver, bad audio.

• It is not clear how to test the correct functioning of the device, if it is working properly or not.
It was not an issue in the Danish test but it will become a barrier. The confidence of the solution depends on the correct functioning of the device. Right now, based on the results of the test, Danish partners are not confident with the maturity of the products.

• The process to detail IVS technical requirement is still open. The latest Proposal (Directive 2007/46/EC) has been published by the EC on June 2013.
This problem was present in the Danish pilot site and it denotes a lack of sense of urgency. The only idea to overcome this barrier is to act at the political level and change management.

• It is unclear if IVS-units are to be certified.
There is a number of quality issues that are still open, for instance it is unclear if IVS-units are addressed both to retrofit-able devices and OEM devices. In Denmark quality issues concern the crash survival, the audio and the satellite receiver.

• Doubts about the manner to conduct the vehicle’s inspection when an eCall-unit is present.
This is still an open issue as the EU regulation does not define this aspect in detail.
- Need to define testing procedures to determine if the IVS is working properly. Danish partners have tested the IVS, and they are concerned on how to carry on the tests to make certain, that retrofitable IVS-units are working properly after installation, and that both OEM and retrofit devices continues to work properly, also after 10 years of inactivity.

![Retrofit device of the Danish pilot](image)

**Figure 5: Retrofit device of the Danish pilot**

- Need to ensure a good antenna performance. This was a problem only partly: in Denmark they had several antenna issues in the test. Some of the IVS simply had bad performance while others had problems with the antenna positioning as it had to be in the passenger seat. In the latter case the solution was to stick the antennas on plexi-frames, and sometimes securing a good reception position with tools at hand.

5.12.3 MNO – Communication

- Lack of business case for eCall discriminator implementation at MNO. The lack of business case for eCall discriminator was a problem for the Danish pilot sites. Today this issue has been overcome due to the way the EU-directives are adopted in Danish
law. There is still no good business case for MNOs in Denmark, and no MNO installed the eCall flag, so that it could be tested during the pilot-tests.

- **Dormant SIM services providers have unclear demand.**

It has not been clarified who can provide the SIM cards for “eCall only” solutions. There are a number of challenges associated with SIM cards for “eCall only” equipment, for instance:
1) Who can guarantee that the SIM card is recognized by any MNO, if the card has not been used for 10 years?
2) Which procedures are needed to guarantee the back up?
3) How can we be certain that these procedures are followed?

### 5.12.4 PSAP

- **PSAPs procurement procedures are too complicated.**

PSAPs are operated by two different authorities in Denmark. For one of the two Danish PSAP-owners procurement procedures regarding eCall upgrade were very complicated due to many issues:
1) The PSAP-owner is in a locked-in situation with its external vendor (who provides PSAP-system), causing slack and costly responses from the vendor.
2) The PSAP-owner has an “internal” vendor, who operates the infrastructure,
3) Negotiation between PSAP-owner, external vendor, internal vendor and the cross-governmental eCall programme was complicated, as all parts seldom were able to “sit at the same table at the same time”
4) As PBX-technology is in a declining market (losing to server-based telephony), there seems to be a “squeeze” on remaining customers. After negotiations were thought to be finished, a new demand of total upgrade of PBX-technology to newest version was introduced, tripling the cost, and exceeding the budget for eCall implementation and new negotiations were started. A solution was found, but after scrutinizing the consequences, the solution was realized to have an additional negative economic impact on the PSAP of the same order, as the cost for eCall implementation. The final solution was to postpone the eCall implementation, and thereby be able to bypass/overcome the negative economic impact.

- **With the introduction of eCall, it is expected that the amount of calls to the 112 centre will again rise because the PSAPs receive a large amount of false calls.**

In the future this issue will be encountered and Danish partners plan to tackle it like they do with “pocket” calls. An example: Ford has introduced Ford Sync, and now the PSAPs are
receiving silent calls with robot voice repeating GPS-coordinates. These calls mean less to
the PSAP, and they cannot act upon them.

- **Dealing with silent eCalls can also be a real challenge for emergency services.**
  This was an issue in Denmark. No solution has been identified yet.

- **Technical Maturity of equipment at PSAP.**
  There are still challenges with the equipment used in the Danish site: for instance, the
  internal clock in the eCall router is not synchronized with timeservers.

- **Agile implementation at PSAP can be recommended**
  When all descriptions, and all the hardware were in place, the changes to the PSAP-system
  at one of the PSAP-owners was a relative effortless task, due to an agile implementation,
  were functionality was added and tested piece by piece.

### 5.12.5 Other issues

- **General lack of understanding of Dormant SIM/IVS issues.**
  This caused two issues. 1) Resources were spent understanding and obtaining Dormant SIM
  cards. 2) Only one out of four expected IVS-vendors, were able to provide Dormant IVS in
  time for testing, and only one additional of these four, managed to provide Dormant IVS
  before testing was finished, even though testing was delayed 5 months to wait for equipment.

- **Lack of TS-12 testing possibility.**
  It represented a problem as no eCall-flag was installed prior to test, so it was not possible to
  carry on testing with 112, but it was conducted with normal long number.

### 5.12.6 Conclusions and recommendations

The pilot executed in Denmark has shown several challenges affecting eCall implementation
at National and European level.

Procurement procedures delayed the pilot execution and caused a huge increase of costs.
The solution to tackle the expected increase of false calls has been found in the Ford Sync
like system. However this remains an issue.

The real challenge dealt with retrofit devices functioning for which the technology is not
mature, yet. Several issues form the technical and technological views remain unsolved. The
following is a summary of challenges dealing with retrofit devices for which no solution has been identified:

- Based on the test results, Danish partners are not confident on the possibility to ensure that the retrofit device is working properly.
- Quality issues are still open such as the crash survival, the audio quality and the satellite receiver.
- It has not been clarified who can provide the SIM cards for “eCall only” solutions.

Finally there are challenges that must be solved at European level such as the need to define the procedures to conduct the vehicle’s inspection when an eCall-unit is present and the need to close the process to detail IVS technical requirements.
5.13 Piloting in Luxembourg

5.13.1 General

The European standard for eCall defines the general operating requirements and intrinsic procedures for in-vehicle emergency call (eCall) services in order to transfer an emergency message from a vehicle to a ‘Public Safety Answering Point’ (PSAP) in the event of a crash or an emergency, via an ‘eCall’ communication session and to establish a voice channel between the in-vehicle equipment and the PSAP. The eCall infrastructure that has been implemented into the Luxembourg PSAP is shown in the following figure (Figure 6: Luxembourg eCall infrastructure).

![Figure 6: Luxembourg eCall infrastructure](image)

In phase 1 a fleet of 6 test vehicles was set up. The deployed IVS were provided by FICOSA, NXP and Fujitsu TEN. They comply with the CEN and ETSI standards. The test eCalls were sent via the MNO “EPT Luxembourg” who implemented the eCall flag in mid 2014 and who is responsible for delivering the eCall messages to the designated entry point in the EPT fixed network. The PSAP is connected to the fixed network via ISDN.

1. Was the whole chain (vehicle IVS – MNO network – PSAP) tested, if not why?
   Yes, the whole chain was tested in Luxembourg.

2. Were there cross-border activities already? Will there be in the next phase?
   As the 112 eCall flag was not available at the borders of Luxembourg, practical tests were not possible. Instead a discussion about the standards needed for the data exchange was started. Belgium and Luxembourg discussed the topic and came up with a proposal.
proposal was described by the Belgium partners and is based on the same interface that is used by the Belgium filtering instance. In the next phase, it is planned to carry out cross border tests, together with border country’s MNOs, using the 112 calling number.

3. Where were the main focuses and efforts in the piloting (in percentages) and why?
The following topics were undertaken in the piloting:

- **PSAP and eCall router functionality: 20%**
The PSAP was the heart of the implementation. The main software in the PSAP will be replaced in 2015 therefore only an eCall router and a test server were installed. The main effort was in the integration of an eCall server and client into the PSAP environment as well as procedures and testing of the solution. Several iterations of testing were performed as the SW evolved.

- **e-Call Flag and Mobile Network: 20%**
This was not major part of the project as such, given that the MNO was obliged to make upgrades at their own expense anyway. The project however provided the testing and coordination of these changes as well as verifying that they followed the standards.

- **In IVS call control, MSD transmission and Voice quality: 40%**
The main topic for the eCall implementation was the integration and testing of the different IVS solutions from the different vendors. Test were performed nationally (approx. 700 test cases) and in the neighbouring countries to check the quality and availability of the different networks near the Luxembourg borders.

- **Crossborder handling: 5%**
For Luxembourg cross border handling is unavoidable as the country is very small. Additionally Luxembourg has unique profile in terms of cross border commuters. Real cross border testing was not possible due to the unavailability of the eCall flag near the borders. Instead an initial process and possible operating procedure was defined between Luxembourg and Belgium.

- **Handling of dangerous goods in eCall: 15%**
Dangerous goods handling was a major topic for Luxembourg in the HeERO project. Definition of the standard for integration of dangerous goods information into the eCall was discussed together with the Dutch partners and first drafts introduced to the standardisation
bodies. Luxembourg is also working on an associated ESA project concerning dangerous goods which brought added value to Luxembourg’s contribution.

5.13.2 IVS

Luxembourg is testing IVS units from two manufacturers (NXP was taken off the list during the process so really does not figure in our reports). Overall the tests progressed as expected but the units all have weaknesses that need to be addressed. While the measurable aspects of the units can be rated per unit (voice quality in a call for example), the procedural and transmission “fails” seem to be intermittent and are shared equally between all the units. What this means is that it is not a case where Unit A always drops the MSD in a transmission and Unit B transfers the incorrect GPS. Unit A might drop the MSD intermittently and then not transfer the GPS coordinates correctly, but Unit B is just as likely to exhibit the same errors in a manner which cannot be predicted. The obviously response to this barrier is to press the IVS manufacturers to ensure their units conform to the basic requirements in the field and for pilot site testers to correctly identify which errors are “country specific” is any, in order to resolve the locally.

- **Technical performance – problems and solutions?**
  The rate for correct MSD transmission was very low for both tested IVS. Also the voice quality was not very good. The transmission rate and the voice quality were ameliorated with a new SW version of the IVS that were provided in September 2014 by FICOSA and October 2014 by Fujitsu Ten. Unfortunately the rate of successful transferred MSD is still below 85% that is too low for a final implementation.

- **Liability aspects related to eCall device performance should be clarified and regulated.**
  The lack of regulation on eCall performance liability has been an issue in Luxembourg: at the moment no clarification on this aspect is available, partners are waiting for the introduction of such a regulation.

- **There are many devices running into 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.**
  IVS technical requirement that lack regulation has been a barrier for partners in Luxembourg. The main issue is that OEMs are obliged to include the IVS in the car; they have to invest in PSAPs without knowing if the investment is going to have any benefit, as the test of the IVS
suppliers is not regulated. A similar line of reasoning can be applied when dealing the technical structure of the devices, it seems urgent that a neutral certification agency introduces a minimum set of requirement for IVS providers.

- **Positioning of the eCall device and checking if it is working properly represents a problem.**

The modem is the main issue as they have seen problems with the PSAP router. In fact, some standards exist, but they are weak from the technical point of view. Furthermore in Luxembourg there are many modems and a certification of this issue should be introduced. At the moment, partners have not found any solution.

- **The existence of different devices in the market does not offer a guarantee of a minimum level of performance and therefore an eCall system that is inter-operable without a clear certification process cannot be assured.**

Performance homologation and the inter-operability of eCall are undermined by the fact that regulation is missing; without a certification process it is difficult to make all the devices work together with the PSAPs. This issue was present in Luxembourg and it was not possible for the Luxembourg partners to solve it alone.

- **There should be a third party that guarantees a centralised approach to certification of different components of the eCall device.**

Partners in Luxembourg agree with this statement as main issues in the test were connected to this fact.

- **Need to ensuring a good antenna performance**

Due to the fact that the IVS is still under development at the moment, the test has not been finished yet. The antenna performance will be tested together with the final implementation of the eCall.

**5.13.3 MNO – Communication**

**Competition between Networks for Traffic**

The existence of different network operators in close proximity to one another can produce a sort of competition for the IVS unit’s attention where no one wins. The units tested in these situations can simply pick no network (resulting in call failure) where it fails to “pick” and attach to a specific network. In Luxembourg this is particularly important on the border regions where foreign networks are positioned to compete with the Luxembourg networks,
and in city areas where the different MNOs are all present. Other member states should be aware of this situation and the obvious solution seems to be also something that the unit manufacturers need to address (as has already been done for mobile telephones which do not generally have problems selecting networks).

**Incomplete Network upgrades**

The most recently identified barrier to a timely implementation of eCall in Luxembourg is that while the main MNO has successfully upgraded all the MSCs to include the eCall “flag” the switch manufacturers have not included the required Bit definitions to allow routing for eCalls. 3GPP have defined the eCall bits as follows:

- Bit 1 Police
- Bit 2 Ambulance
- Bit 3 Fire Brigade
- Bit 4 Marine Guard
- Bit 5 Mountain Rescue
- Bit 6 manually initiated eCall
- Bit 7 automatically initiated eCall
- Bit 8 is spare and set to "0"

Luxembourg only has one 112 centre and they handle all the emergency calls for the country. Historically, and logically, it made no sense to set up the bits individually in the switches when they all point to the same telephone number; there was only ever one route to follow. Our latest tests have shown that while the switches have been upgraded (eCall flag = Yes), Bits 1-5 are set as per the 3GPP specifications; buts 6-8 are still non-defined (“unregistered”). Effectively this means that any call from an IVS to the number 112 will be directly routed to the 112 centre without passing the OECON solution and without the possibilities this offers. Basically it will be treated as a voice 112 call.

The Luxembourg pilot team feels this is an important point for other member states to check as they make their first tests using the 112 number. The solution for Luxembourg is to upgrade the Switch software again to ensure the Bits are correctly registered. This is a time consuming and possibly costly change which must be requested from the Switch manufacturer. At the time of writing the pilot team are still investigating the timing and implications this change request will bring.

Fortunately this situation does not necessarily impact testing as the major MNO has a test laboratory where the correct situation can be simulated and tests carried out in the correct environment. The impact on the real environment however remains at this time. The
Government is responsible for the test and for the large scale implementation. The Ministry of interior will administrate the services and the security aspects.

- **Technical performance – problems and solutions?**
The implementation of the eCall flag into POST Luxembourg’s switches was planned to be completed for mid of 2014 and with the exception of a small number of remote switching points this was completed in late August 2014. However, tests in September 2014 revealed that it was not sufficient to merely update the eCall flag indicator in the switch and that the Switch software needs to be able to distinguish Bits 6 and 7 (routing information for manual and automatic eCalls, as per the specifications). As this has previously not been necessary in Luxembourg (due to our having only one PASP and all 112 calls being voice and being routed straight to that site) the change was not made in POSTs MSCs. Testing was only possible in a shielded test server environment using workarounds. An updated version of the software that contains the correct routing for Bits 6 and 7 is part of the next scheduled upgrade of the POST’s switches and is scheduled to be installed in Q2 2015.

- **Any issues related to stakeholders and operational issues?**
The partner MNO’s operational department requested a written confirmation from the 112 operator that the redirection of the 112 calls with an e-Call flag set to the test server would be authorised by the operator. They saw the risk that real 112 calls could be transferred to the eCall test environment and could be lost or delayed. The 112 operator confirmed that this is no problem and that the calls can be transferred.

- **There is no regulation on the implementation of eCall Discriminator (eCall Flag).**
The eCall Discriminator is not regulated: this problem has not been solved yet. In fact the Luxembourg partner MNO cannot change the 112 router because it is not possible to distinguish between a “test” call and a “normal” call. They are still dealing with this issue.

- **The issue of network coverage will affect all networks, and will represent a commercial decision for the respective network.**
This issue was present in Luxembourg and it has not been solved. This is a commercial problem especially for MNOs, as they have no complete coverage.

- **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.**
In Luxembourg there are not many devices, hence this problem could not be solved.


1. There are considerable costs for the MNOs eCall discriminator (eCall flag) implementation.

The partner MNO in Luxembourg did face the question of the high costs of the eCall implementation but this had to be carried out as part of the operators own expenses as it was a European directive. What was unexpected was the MSC software suppliers request to pay for the implementation of the correct Bit routing as discussed in the above MNO section. The Luxembourg partner had the opportunity to discuss this point with several other partner MNOs in the project from other European countries and found that while they were all asked to pay for this change the price varied hugely even when the supplier was the same.

5.13.4 PSAPS

- Technical performance – problems and solutions?

In Luxembourg the eCall router is installed as a virtual machine environment (VMware). In the initial concept USB-ISDN modems have been foreseen to bring the voice to the eCall router. Unfortunately this did not work very well in the VMware environment as it was not possible to forward more than one USB connection from the real server to the virtual machine. We therefore decided to replace the USB-ISDN modems by a media gateway with converting ISDN to Voice over IP with 4 ISDN input channels. This solution works very well.

The used test server created problems when test calls arrived with a too short delay. The eCall router handled the calls correctly, but the timestamps in the protocol were not correct what made the measurement of the KPIs very difficult and reduced the number of useful measurement drastically.

- Any issues related to stakeholders and operational issues?

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. Therefore proxy solutions have been used to provide the map service. Sending of emails with tests results by the test server were not possible. Also the necessary access to EUCARIS is very complex and was not solved yet.

- PSAPs procurement procedures are too complex.

The complexity of the PSAPs procurement procedures has been a problem in Luxembourg and at the moment the issue is not solved. However, the plan is to introduce new software in 2015 for which the procurement has just started and it will include the eCall.
- The PSAP personnel will have to adapt to the new system that consists in the integration of the eCall into it so that the upgraded systems should have an easy interface.

Partners have not encountered this problem yet but, as new software has been purchased, they do not know how the integration will be like.

- The challenge will be to integrate eCalls into the existing workstations.

With the introduction of the new software, eCalls will be integrated to the existing workstation as part of a planned upgrade of the 112 Centre. Due to the fact that in Luxembourg there is only one PSAP, this issue is present and calls may arrive also from other countries. For this reason this issue has not been solved.

5.13.5 Conclusions and recommendations

In Luxembourg the eCall is working properly and partners were able to test it in a test environment. The main issue concerns the viability of the IVS for which a minimum set of requirements are needed to make sure the eCall is working properly.

The network coverage is occasionally a problem and the eCall implementation can be costly for the MNOs, especially for new operators.

In Luxembourg the public procurement procedures are too complex. The issue has been solved in the context of HeERO2 project. Since in Luxembourg there is only one PSAP that handles eCall for the whole country, the complexity of public procurement procedures does not represent a problem.

The Luxembourg pilot team feels it is important for other member states to check their MNO Switch capabilities where the eCall flag and subsequent Bit routing is concerned. This will have a direct impact on testing with the 112 number and eventually the correct routing of eCall.
5.14 Piloting in Spain

5.14.1 General

Main features of the eCall pilot in Spain are:

- Technical architecture based on an intermediate PSAP (hosted by the Directorate General of Traffic – DGT in Madrid) acting as a filtering instance for eCalls and dispatching centre to the regional PSAPs. Among other, important roles of the DGT PSAP is to filter false alarm eCalls (especially manual eCalls) in order to reduce the workload of the regional PSAPs; to some extent, it has also been a goal to leverage investment needed to upgrade the PSAP software for handling eCalls, so that main installation would be done at the DGT PSAP (including software for decoding the MSD and retrieving car information based on the VIN), and regional PSAPs would access MSD data on a light web-based interface and be transferred the voice call by the DGT PSAP. Also, an automatically-triggered connection to the ATEX database at the DGT (Spanish equivalent to the European EUCARIS) was established, which retrieves characteristics of the car through the VIN (and makes this information available to the regional PSAP to which the eCall is dispatched, based on the location of the caller). The DGT has started the work to implement the interface against EUCARIS.

![Figure 7: Spain eCall infrastructure](image)
• Tests have been carried out in four different regions covering 31% of the Spanish territory. These are “Galicia”, “Castilla y León”, “Madrid” and “Comunidad Valenciana”, and each of them run their own 112 PSAPs.

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**Figure 8 Geographical scope of the Spanish pilot**

- Direct interface set up between intermediate PSAP in the DGT and the four regional 112 PSAPs (one in each region).
- Testing of eCall between adjacent regions in an area where the eCall can be routed to one or another PSAP (based on the accuracy of the location data sent by the IVS in the MSD, once eCall received by the DGT in the first instance).
- 22 IVS (provided by Ficosa, GMV and CTAG) were involved in the tests: 12 IVS’s mounted in cars and 10 IVS’s installed in P2Ws.
- Spain has been the only pilot country to develop and test an eCall system for P2W based on an IVS together with an intelligent helmet. An online-based survey targeting more than 600 motorcycle users were conducted which gathered valuable feedback from potential future users of the system.

The whole chain from the mounted IVS through the MNO (Telefonica) up to the DGT PSAP (based on Telefonica’s “Séneca” system), and the full (data and voice) integration between this and “Madrid”, “Galicia” and “Castilla y León” regional 112 PSAPs is achieved using the
so-called interoperability bus built into the “Séneca” emergencies platform, which has been developed following EENA standards.

5.14.2 IVS

CTAG have tested two different types of IVS in order to maximize interoperability of the different equipments. Moreover, CTAG have developed a tool within their eCall tracking centre to monitor the tests and/or generate events like automatic eCall calls in real time during the operation phase. CTAG has implemented a solution mounting a datalogger installed in the cars in order to record all defined KPIs and upload automatically to a server for processing.

Some hardware modifications have been made in order to incorporate audio functionalities to GMV’s IVS. In particular, microphone and speaker features have been added and the necessary software modifications and adaptations have been incorporated to ensure full compatibility of GMV’s IVS with the eCall standards.

The Spanish pilot trials were split in two phases:

- Phase 1 was intended at verifying the IVS and fine-tuning technical issues. In phase 1, the tests were split in sub-phase A - testing the IVS to the DGT PSAP - and sub-phase B - where eCalls were forwarded to the final regional 112 PSAP from the intermediate DGT PSAP according to the geographical location of the caller. In the Madrid Pilot, for instance, KPI_009 shows the accuracy of the GPS receiver (% of positions with an error lower than 100m). In the definition of the KPIs there are two ways to specify the result of this KPI (value of the accuracy in meters or the success rate of the accuracy; success is defined as the accuracy is within 100m). Here the success rate of the accuracy was measured by comparison with the real location and the presented location. The operator at the PSAP compared the shown location (in the GIS) with the real position and reported the result.

- Although, the position obtained in PSAP from MSDs was commented between the driver and the person on PSAP, and in all cases location was completely.

- In phase 2, intensive test campaigns were carried out in “Galicia”, “Madrid” and “Castilla y León” (the latter for regional border testing purposes). The complete chain was tested and KPIs measured, as issues detected in phase 1 had already been fixed.

The tests were satisfactory in general terms:
• Communication between the different IVS and the intermediate PSAP was achieved. Nevertheless, as the eCall flag has not yet been deployed by the Telefonica in Spain (neither have any of the other three MNOs operating in Spain), a dedicated long telephone number was used instead (not the real 112). Therefore, successful routing of eCall-signalled 112 calls to the DGT PSAP was not tested and there might be technical difficulties or malfunctions (e.g. related to the software update at the MSCs of the MNOs) when eCall is fully deployed. This is also applicable to the GMV’s and Ficosa’s IVS.

• The voice calls were successfully established in all test cases, automatic and manual calls, and the voice quality was acceptable.

• The callback from the intermediate PSAP worked as expected.

• The MSD was transmitted, received and correctly decoded at the DGT PSAP.

These satisfactory results were achieved after fine-tuning the system and solving several technical issues detected during phase 1, including:

• The main issue was related to timestamp measurement. The synchronization of the logged data sometimes did not work as expected which posed problems to obtain time-related KPIs.

• Some technical issues involved the dispatch of the eCall from the intermediate DGT PSAP to the regional 112 PSAP. In general terms, adding more “legs” to the eCall handling adds more complexity to the whole process, and this is more evident in complicated scenarios (e.g. when callback is needed from the regional PSAP handling the call back to the IVS, especially in low GSM coverage conditions).

Ficosa’s IVS were tested against the Valencia PSAP (provided by Ericsson) and against the Telefonica PSAP (installed in the Madrid PSAP). Phase 1 and phase 2 trials included intensive regional cross-border tests, between “Galicia” and “Castilla y León”, and between “Madrid” and “Castilla y León”. The calls were correctly forwarded to the appropriate regional 112 PSAP according to the geographical location of the caller.

The three Spanish IVS (GMV, CTAG and FICOSA) were tested at the interoperability event eCall Testfest that took place in Essen, Germany from 9th to 13th, September, 2013 where 22 IVS vendors and 11 different PSAPs from several countries/vendors took part. Interoperability was tested between each IVS and local and remote PSAPs from different countries and providers; concretely, interoperability was assessed with the following PSAPs: HiTec (Luxembourg), OECON (Germany), Telefónica (Czech Republic), AREU (Italy), NPRD (Croatia), NAVCERT (Germany), G4S (Greece), PicoSoft (Italy) and VTT (Finland). The tests used dedicated long numbers to call the PSAP. Manual and automatic eCall tests were
The three Spanish IVS also participated in the interoperability event eCall Testfest that took place in Vigo, Spain from 27th to 31st, October, 2014 where 16 IVS providers and 10 different PSAPs from several countries/vendors took part. Interoperability was tested between each IVS and local and remote PSAPs from different countries and providers; namely, interoperability was assessed with the following PSAPs: HiTec (Luxembourg), OECON (Germany), Cestel (Spain), Telefónica (Spain), AREU (Italy), PicoSoft (Italy), VTT (Finland), Belgium and Bulgaria. The tests used long numbers to call the PSAP. Manual and automatic eCall tests were performed.

Tests were also carried out between IVS and test systems, including IVS testers (IOP) such as ANRITSU, Picosoft and Rohde & Schwarz, Speech Testers (Head Acoustics) and IOP PSAP simulators (NavCert). Some tests were carried out using the 112 emergency numbers.

A conclusion of the three IVS providers in the Spanish pilot is that IVS performance is tightly related to the PSAP capabilities. Different PSAP implementations are quite different, rendering little incompatibilities which arise when testing. This could be solved by a homologation process which would certify a common set of tests to guarantee interoperability. Also, a possible future improvement would include adding some remote debugging mechanism to the IVS in test mode, in order to remotely monitor its operation and to be able to efficiently correct any detected issues.

For the IVS involved in the Spanish pilot intensive laboratory tests were performed in order to identify unexpected problems and solve them before running the field tests.

Some issues had to be solved in relation to operational aspects of the process (handling of emergencies is not homogenised across the country; neither is at European level, which is a major barrier for the successful deployment of pan European eCall). It was found necessary to agree on a common operational protocol for handling eCall with the different regional 112 PSAPs to carry out the tests in phase 2. The agreed protocol takes into account the fact that the final and definitive approach for eCall deployment in Spain is not fixed yet (and it is pending on political decision). Last but not least, ACASA made the recommendation to include the retrieval of the rescue sheet of the vehicle that generates the eCall as an important piece of information that can be used by the rescue bodies when reaching the vehicle. ACASA provided comprehensive information about the different types of rescue sheets (this document is not homogenised across all the automotive OEMs) and how to obtain them based on the Car Maker – Model – Year of the car (info retrieved from DGT’s ATEX database, and EUCARIS in the future).
5.14.3 MNO – Communication

Telefonica could not commit to address, within the scope of Heero2, to the network modifications necessary for routing calls to the 112 mobile networks based on the eCall flag. This is due to the excessive cost that the technology provider has offered for implementing the needed upgrades on the network. During the test phase a long number (instead of 112) was used to access the intermediate PSAP from the IVS’s.

5.14.4 PSAPS

In the Spanish pilot scope only the intermediate DGT PSAP was equipped with the MSD decoder. Decoded information was made available to the regional 112 PSAPs using the so-called interoperability bus. As regional PSAPs can't decode the MSD themselves, they can't do call-backs to the IVS. This is a limitation of the trialled technical approach, as the regional PSAP responsible for handling the eCall will not be able to call back in case of poor GSM coverage and interruption of voice connection.

5.14.5 Other issues

Issues with the trialled IVS are, in some cases, attributable to the fact that these IVS are retrofit devices, and that there is no certification process yet that clearly defines how these must be installed, etc. It is likely that factory-fitted IVS will perform better in some aspects.

5.14.6 Conclusions and recommendations

After the pilot conclusion and with the obtained results Spain will take during 2015 the political decision whether to fully deploy eCall based on the architecture based on a filtering instance (as in the HeERO2 pilot) or pursues an approach where 112 PSAPs in each of the regions handle eCall directly (this is linked with the need to reach an agreement on how to update the protocol, at national level, for handling emergencies at the 112’s, very soon including eCall). Furthermore, some regional PSAPs in Spain have not taken part in the tests thus not have the valuable experience gained in HeERO2. Both aspects, especially if 112 PSAPs would need to upgrade their systems for being able to decode MSD directly, given that public procurement processes are complex, and given the fact that Spain most likely will not participate in the I-HeERO initiative, makes implementation of eCall in Spain from October 2017 unclear. Last but not least, Spain will initiate the political actions to oblige the MNOs operating in Spain to upgrade the MSCs in their networks with the eCall flag discriminator, and there is the risk that eCalls might not be efficiently routed to the PSAP, as
experience from other pilots (like Luxembourg) proves that this requires testing and it cannot be launched live without.
5.15 Piloting in Turkey

5.15.1 General

Two types of eCall IVS equipment have been used in the Turkish pilot; one from Civitronic (RENAULT) and another one from Magneti Marelli (TOFAŞ) and installations have been implemented in four vehicles. Figure 4 shows how the eCall has been deployed in Turkey. A detailed description may be found in D2.6.

![Diagram of eCall deployment in Turkey]

Figure 9: eCall deployment in Turkey

1. Was the whole chain (vehicle IVS – MNO network – PSAP) tested, if not why?
Yes, whole chain is tested. The tests cover the initiation of eCall by the IVS device, transmission of the call in the MNO network and processing of the call in the PSAP.

2. Were there cross-border activities already? Will there be in the next phase?
No, cross-border activities have not been tested.

3. Where were the main focuses and efforts in the piloting (in percentages) and why?
%25 of main focus was taking the e-calls from 112 numbers. This step required effort in both MNO and PSAP side. MNO used a special software configuration for this project.

%45 of efforts was focused on operating software.

%20 of efforts was focused on solving the MSD data for different IVS devices.

In Turkey 4 IVS devices have been used in the test. At the moment there are no problems with the deployment of the devices. However when the implementation will occur everywhere in Turkey, this may be an issue and MNOs will need to intervene.

- dormant SIM card

A clear and unique standardisation process should be introduced.

5.15.2 IVS

- Technical performance – problems and solutions?

Field tests are made with Magneti Marelli's device. Once the call is established, there is no issue solving the MSD data. %1 of the call trials is unsuccessful due to bad GSM coverage.

- Any issues related to stakeholders and operational issues?

Civitronics device was also planned to be tested on field but they got issues solving the MSD data. Specifically they could not receive MSD data. To solve the issue they developed additional software to solve the issue. For the interoperability test, the final software will be completed. The test has not started yet.

The problems have been solved and tests are ongoing in test bed.

Specifically, logging on Civitronics site was a big concern because internet connection was needed to download data from remote servers. So that mini data were collected and Civitronic devices were used only for verification. The Magneti Marelli devices were not an issue because it was easy to connect them and download data.

5.15.3 MNO – Communication

- Technical performance – problems and solutions?

The configuration to detect 112 flag is made on only one switch of MNO in Antalya region. In urban areas of the city, the IVS was communicating through neighbour switches in which communication was not made. As a result of this, some of the e-calls were directed to the
112 operators. MNO solved this problem by directing the e-calls to the related switch when e-call was taken by neighbour switches.

- **Any issues related to stakeholders and operational issues?**
  Only stakeholder on MNO side was Turkcell. Tests were made in coordination with Turkcell. Turkcell implemented eCall discriminator software in the test location. Consequently no problems were observed during tests. There are 3 mobile operators in Turkey. In the deployment phase, in order to cover all part of the country, implementation must be done by all MNO’s.

- **The issue of network coverage will affect all networks, and will represents a commercial decision for the respective network**
  In Antalya the network covers the 95% of the territory: rural areas are those which are less covered by GNSS and MNOs should work on this issue. No solution to improve this situation has been found so far.

### 5.15.4 PSAPS

- **Technical performance – problems and solutions?**
  In our PSAP solution, conventional 112 systems and the newly implemented e-Call system used some hardware and software components in common. Our tests verified that two systems are able to work together without performance degradation. In Turkish PSAP 112 and eCall can operate without problem.

- **PSAPs procurement procedures are too complex.**
  At the beginning, complexity represented an issue in Turkey. This situation has been solved thanks to the intense cooperation of project’s partners with the Turkish Minister of Interior. As soon as there will be the decision for the full implementation of the eCall, procurement procedures will be not an issue anymore.

- **It is not clear which entity should finance the upgrade of existing PSAPs.**
  The Ministry of Interior is responsible for new model 112 emergency call centres. There are 81 provinces in Turkey and each province will have its own new model 112 emergency call center. The new 112 model brings together all the emergency service organizations into the
same location. The new 112 model is implemented in 12 provinces and will be installed in 13 cities in 2015. There is a plan to implement 81 new model “112” PSAPs (one dedicated PSAP per province) by 2018. Pilot eCall system is integrated into one of these the new 112 model PSAP.

- **The challenge will be to integrate eCalls into the existing workstations.**
  
eCall call takers and 112 call takers work in different work stations. Two systems use the same switching and network components but call taker software are different. eCall system is connected with the 112 system by using alarm interface of the 112 system. There was not any challenge in integration.

- **With the introduction of eCall, it is expected that the amount of calls to the 112 centre will again rise because the PSAPs receive a large amount of false calls.**
  
In Turkey, eCall and 112 call takers are separate operators working under the same roof. Only real eCalls will reach the 112 operator by alarm interface. False calls will be filtered by eCall operator. False calls statistics will be hold separately too.

### 5.15.5 Other issues

Most of the above topics should be better evaluated after eCall is deployed and used widely in Turkey. Turkish field tests were carried out with 4 IVS devices and this makes it difficult to assess the significance of the above topics as an issue.

### 5.15.6 Conclusions and recommendations

Our field test results show that the eCall system was successfully implemented in Antalya. Technical and operational problems, faced during the implementation, were solved without facing catastrophic problems.

Although 22 of the 27 EU Member States have signed the eCall “Memorandum of Understanding,” as well as Croatia, Iceland, Switzerland, Norway and Turkey, and although work aimed at engaging the support of the remaining Member States is continuing, necessary political decisions must be taken especially on IVS and MNO side.

Tests were made by 2 types of IVS devices and these devices were prototype devices. Commercial IVS devices are needed for deployment. In addition to the external IVS devices, built-in devices must be included in new cars. But EU level political decision must be taken in order to take a decision at national level. Turkey is the second country in Europe in car
manufacturing. There are many vehicle manufacturing companies in Turkey. eCall supported vehicles could be sold if EU level decisions are taken.

In Turkey only one MNO operator is taking part in eCall project. Other two operators must also have technical solutions for eCall flag before nationwide deployment decision. On MNO side, Turkcell updated her switches in only one city for eCall support. Political decisions are also needed to be taken on MNO side.

On PSAP side, eCall system infrastructure is designed as a modular system that 112 systems would have eCall support with adding some software and hardware components. Deployment of the eCall to the 112 PSAPs is not a difficult issue on technical side.
6 Identified enablers, opportunities and challenges

This chapter is a comparison and integration of the challenges encountered in HeERO1 and HeERO2. This comparison allows having an overview of which is the main issues that should be solved in order to have the EU-wide eCall deployment.

The aim of this chapter is to highlight the challenges that have not been solved since the beginning of HeERO Phase 1 project but also to integrate the new challenges identified in HeERO2 countries that have been collected thanks to the interviews with pilot sites representatives. Therefore the analysis is summarized on two tables. Table 1 is the update of Table 3 of D6.2 of the HeERO1 project and it reports a list of challenges by reporting the HeERO1 and HeERO2 Member States where the issues have been identified. Table 1 also includes the new barriers identified in HeERO2 countries. Finally this chapter includes a short description of the most important challenge included in Table 1.

Table 3 of this document lists the barriers identified in Table 1 and the corresponding solutions. Furthermore the table specifies whether the challenge has been solved during the execution of the HeERO project and reports an explanation of the reasons why the issue has not been solved.

<table>
<thead>
<tr>
<th>id</th>
<th>Challenge</th>
<th>Pilot site (s) HeERO1</th>
<th>Pilot site (s) HeERO2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Policy Layer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>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</td>
<td>CR, DE</td>
<td>ES</td>
</tr>
<tr>
<td>1.2</td>
<td>Stakeholders may understand standards in a different way.</td>
<td>FI, NL</td>
<td>BE, LU, DE</td>
</tr>
<tr>
<td>1.3</td>
<td>Retrofit IVS will require a legal framework</td>
<td>DE</td>
<td>DK, LU, BE, ES</td>
</tr>
<tr>
<td>1.4</td>
<td>Procurement procedures are very complex</td>
<td>-</td>
<td>BU, DK, ES</td>
</tr>
<tr>
<td>1.5</td>
<td>There is no regulation on the implementation of eCall Discriminator (eCall Flag)</td>
<td>-</td>
<td>LU, ES, TR</td>
</tr>
<tr>
<td>1.6</td>
<td>Liability aspects related to eCall device performance</td>
<td>-</td>
<td>ES, LU</td>
</tr>
<tr>
<td>1.7</td>
<td>The test on the IVS need to be regulated</td>
<td>-</td>
<td>ES, DK, LU, TR</td>
</tr>
<tr>
<td>1.8</td>
<td>Certification of the filtering instance</td>
<td>-</td>
<td>BE, ES</td>
</tr>
<tr>
<td></td>
<td><strong>Business</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Layer</td>
<td>Limitations in the scope of eCall tests (no eCall flag or real PSAP)</td>
<td>FI, DE, NL, BE, LU, ES, DK</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------------------------------------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)</td>
<td>FI, BE, LU</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Current standards of eCall do not mandate the IVS to support third generation mobile networks</td>
<td>FI, DE, ES, BU</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>PSAPs in a member state have very different technical infrastructure</td>
<td>SE, ES</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>Performance and reliability of eCall are lower in rural areas than in urban areas</td>
<td>SE, ES</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>There is currently no way to check the functionality of the IVS except making a false 112 eCall. The final version of the proposal for PTI of the IVS is not yet available.</td>
<td>- DK, LU, TR</td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td>PSAPs in member states need updates which may be difficult to complete until 1st October 2017</td>
<td>BE, ES</td>
<td></td>
</tr>
<tr>
<td>2.7</td>
<td>It is not clear who will fund the filtering instance</td>
<td>- BE, ES</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td>Costs for the implementation of the eCall discriminator</td>
<td>- ES, TR</td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td>eCall is a free service but there is an extra cost for OEM</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2.10</td>
<td>It is not clear which entity should finance the upgrade of existing PSAPs</td>
<td>- ES</td>
<td></td>
</tr>
<tr>
<td>2.11</td>
<td>The process to detail IVS-es technical requirement is still open</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2.12</td>
<td>Organisational or technical changes in PSAP simultaneously with eCall deployment</td>
<td>FI, ES, LU, DK</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>PSAPs do not have personnel resources to manage eCalls in other languages</td>
<td>DE, GR DK</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>Call routing plan is required to route manual and automatic eCalls to correct places</td>
<td>IT, BE, LU, DK</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>All the staff in PSAPs has not been trained to handle eCalls</td>
<td>RO, ES</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>Silent calls</td>
<td>NL, SE DK, BE</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>Operational questions in call handling (noise, silent calls, queuing of calls, answering eCall with failed MSD transmission etc.)</td>
<td>SE, LU, BE, ES, DK</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td>Dormant SIM</td>
<td>- DK</td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td>Cross-border eCall was not successfully tested</td>
<td>BE, LU, ES</td>
<td></td>
</tr>
<tr>
<td>3.8</td>
<td>Unavailability of IVS prototypes prototype functioning properly in the beginning of the HeERO pilot</td>
<td>CR, GR BE, DK</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Weaknesses in IVS implementation</td>
<td>CR, CZ, FI, RO DK, BU</td>
<td></td>
</tr>
<tr>
<td>4.2</td>
<td>Problems with mobile network coverage or signal strength</td>
<td>CR, GR, RO TR, LU</td>
<td></td>
</tr>
<tr>
<td>4.3</td>
<td>Time synchronisation between IVS and PSAP is required to calculate several of the HeERO KPIs</td>
<td>CR, GR ES, DK, TR</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td>Increased duration of MSD transmission and call setup when testing with a moving vehicle</td>
<td>CR, LU</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>Repeated MSD update request by PSAP not possible</td>
<td>CZ, BE</td>
<td></td>
</tr>
<tr>
<td>4.6</td>
<td>False eCalls generated by mobile phones which erroneously</td>
<td>CZ, FI, LU, BE</td>
<td></td>
</tr>
</tbody>
</table>
activate eCall | GR
---|---
4.8 | MSD transmission times have been longer than the target value for eCall | BE, LU, ES
4.9 | Differences between performance of IVS even if the IVS conform to standards | NL, DK
4.10 | Lower than expected robustness of in-band modem | RO, SE, LU
4.11 | There are no guidelines or target values for MSD success rate acceptable for eCall | TR, DK
4.12 | MSD transmission is not always successful | LU
4.13 | When the PSAP calls back to the IVS, the audio-channel is not passing the Filtering instance | BE, ES
4.14 | Minor inaccuracies in the TSP standard (EN15722) | BE
4.15 | Lack of TS-12 testing possibility | DK
4.16 | Network capacity | -
4.17 | Selection of the filtering instance by the MNOs | BE, ES
4.18 | If a EN16102 connection gets out of sync the protocol does not recover | BE
4.19 | Too many devices in the market | LU, TR
4.20 | Ensure a good antenna performance | DK
4.21 | Communication between the retrofit IVS and the vehicle | TR
4.22 | IVS-es performance and difficulties to ensure interoperability | TR, LU, BE
4.23 | Lack of a defined trigger for automatic eCalling of retrofit devices beyond the airbag deployment | BU, ES
4.24 | Direct connections to and from the internet very complex. | LU, TR

**User layer**

<p>| | |</p>
<table>
<thead>
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<th></th>
</tr>
</thead>
</table>
5.1 | Consumers or the media confuse eCall with other in-vehicle emergency call services | FI, -
5.2 | Misuse of eCall | NL, -
5.3 | Users’ concerns of privacy violations and risk of supervision and tracking of individual vehicles | SE, -

Table 1: Challenges identified by the pilot sites and in the literature study (Table 3 updated from D6.2 of HeERO1)

### 6.1 Policy layer

In HeERO1 the main challenge at policy level dealt with the difficulties of obtaining the full support from the stakeholders involved in the eCall value chain. Moreover the identified solution relied on the completion of the national and European legislation (challenge 1.1 table 1 and chapter 6.1 of D6.2 HeERO1). According to the decision of European Parliament and the Council of the European Union (see chapter 5.1), European countries are expected to fully implement the eCall PSAP system by October 2017. Although 23 of the 28 EU Member States have signed the eCall “Memorandum of Understanding,” as well as, Iceland, Switzerland, Norway and Turkey, and although work aimed at engaging the support of the
remaining Member States is continuing, necessary PSAP upgrades to support the system are in some cases being delayed by political decisions at national level.

The difficulties in understanding the standards (challenge 1.2, Table 1) from different stackeholders can be easily overcome by introducing references between different standards and by organizing dedicated workshops.

Retrofit devices are the main focus of HeERO2 and most of the participants agree on the need to introduce a legal framework (challenge 1.3, Table 1). Furthermore the deployment of retrofit devices is seen as a prerequisite for the introduction of the eCall at European level, especially in Eastern European countries where the average age of vehicles is higher compared to Western European countries. However the pilots have shown that the technology is not mature yet. Moreover the lack of regulation is perceived as a lack of committment from the European Commission ti implement eCall.

Another challenge that has delayed the execution of few HeERO2 pilots relates to the complexity of procurements procedures (challenge 1.4 of Table 1). These complexities are expected to cause additional delays in the future once the eCall system will be implemented at national level. Therefore it is recommended that national governements simplify procurement procedures and introduce tendering proceses to select the best PSAP technology.

The lack of regulations on the implementation of the eCall discriminator (challenge 1.7 of Table 1) is causing delays to the eCall implementation. For instance in Luxembourg missing regulations implies that it is not possible to distinguish between a “test” call and a “normal” call. In Denmark the exact timing for the eCall discriminatory implementation by MNOs depends on the decisions of the EU Parliament to make eCall mandatory. However MNOs believe that the introduction of mandatory eFlag implementation would add complexities. Moreover, new MNOs will have difficulties to fund the eCall discriminator.

The need to identify testing procedures to determine if the IVS is working properly (challenge 1.7, Table 1) is mainly related to the interoperability aspects of the eCall. Thus it is necessary tho guarantee that different IVS devices works with different PSAPs.

Finally, the focus of the pilot that has been executed in Belgium was the introduction of a filtering instance with the objective to reduce the number of false calls (see chapter 5.10). This has highlighted the need to introduce regulations for the correct roll out of the filtering instance. Although this aspect is out of the scope of HeERO2, the participants from Belgium are working on this issue with the objective to offer their experience to Member States interested in this system.
6.2 Business layer

The *limitation of the scope of the test site* (challenge 2.1, Table 1) has been experienced in both HeERO project phases. In HeERO2 the limitation relied on the possibility to test at cross border areas. For instance cross border testing has not been possible between Luxembourg and Belgium because the two areas were the eCall Flag was implemented were not near by each other.

One of the main issue for the introduction of eCall is the cost that the OEMs need to face to introduce the IVS in the vehicles (challenge 2.9 of Table 1). More specifically, OEMs are requested to invest in PSAPs without knowing if the investment is going to have some benefits, as the test of the IVS suppliers is not regulated. OEMs will be obliged to factory-fit an eCall-compliant IVS to their cars. Most OEMs will build “added-value” services on top of the eCall platform in order to leverage the investment to provide embedded IVS in their cars. eCall is a free service, but issues remain on the modality SIM cards are used. These could be used for other connected services in the car or OEMs could use programmable SIM or other connectivity options, such as tethering or integration with smartphones (MirrorLink, CarPlay, Android Auto, …).

Moreover, in order the test the IVS correct functioning (challenge 2.6 of Table 1), IVS prototypes manufacturers should verify their devices with the PSAP. However PSAP need additional time resources for this purpose (see Turkish pilot) so that this aspect should be regulated.

The implementation of eCall represents a cost also for MNOs (challenge 2.10 of Table 1) so that the introduction of regulations on eCall Flag implementation could create additional complexities for MNOs, especially the new ones.

The Belgian partners aimed to explore possible funding mechanism of the filtering instance (challenge 2.8 of Table 1). The solution that was initially identified consisted in pushing the costs to the Telco operators. However this approach has been rejected by MNOs and new solutions need to be found. Some member states are working to overcome these challenges. For instance, the Ministry of Interior of Belgium has set-up a working group to explore new business models. On the other hand, the implementation of eCall depends on the PSAPs upgrade (challenge 2.11 of Table 1) and the entity that will finance the PSAP upgrade will have to be identified right after the system configuration for the full eCall implementation in the Member States are decided. In Turkey, for instance, the problem has been solved by integrating the eCall into the existing 112 PSAPs.

The identification of the PSAPs that will receive the eCall is subject to national decisions. In some cases such as in Bulgaria and Spain it has not been decided because of political
decisions are needed and because of the complexities of existing emergency systems (i.e. existence of several regional PSAPs).

6.3 Operational layer

At operational level, the identified issues are mainly related to the specific characteristics of the pilot sites. Some of the challenges deal with eCall handling at PSAP level (challenges 3.1, 3.2 and 3.5, Table 1). In these cases, it is suggested to use the available manuals and to the production of a National implementation roadmap.

Other challenges are related to cross border operations where solutions to transfer the eCall to the correct country's PSAP in case a cross border incident occurs (challenge 3.9 of Table 1) are needed. This challenge has been identified at the border with Luxembourg and Belgium. The solution consists in transferring the eCall to the PSAP of the country where the incident took place and in the continuous exchange of updated information between PSAPs.

The management of silent eCalls remain an issue (challenge 3.6, Table 1) and the combined use of voice connection, MSD and data on positioning is recommended to handle this type of calls.

HeERO2 participants mainly share the challenges identified by HeERO1 participants that are described in more detail in chapter 6.3 of D6.2 of HeERO1. The HeERO2 project brings with its activities dealing with the preparation of training manuals, solutions to the several issues related to eCall handling (noise, silent calls, etc.).

6.4 Technical/Technological layer

In this paragraph, the Table 4 of D6.2 of HeERO1 has been updated with the pilot countries of HeERO2. The new identified challenges have been appended to the table and the list of countries that have experienced weakness in IVS implementation are added to the column Pilot site(s) which now includes HeERO1 and HeERO2 countries. This comparison and integration allows determining if there has been a progress solving the weakness identified during HeERO1 project implementation or further actions need to be undertaken to improve the performance of IVS devices and their reliability.

The process to IVS detail technical requirement is still open and this is very important for the acceptance of eCall. Therefore interfaces should be standardised and should allow open choice for customers in order to guarantee fair competition for actors willing to offer additional services and applications. This would favour the acceptance of eCall devices from users. Furthermore certification has a strong role to play in this field, which would provide
assurance to vehicle manufacturers that devices are compliant with the standards and certified in terms of performance.

<table>
<thead>
<tr>
<th>Weakness in IVS implementation</th>
<th>Pilot site(s)</th>
<th>Soved?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Audio quality</td>
<td>CZ, DK, LU</td>
<td>No</td>
</tr>
<tr>
<td>2. Wrong value of timer T6 (2 s instead of 5 s mentioned in EN16062)</td>
<td>FI, LU</td>
<td>FI: No modem firmware update yet</td>
</tr>
<tr>
<td>3. All IVS functionalities not supported from the beginning</td>
<td>FI, CR, IT, BE, BU</td>
<td>Yes</td>
</tr>
<tr>
<td>4. No eCall flag implemented by the IVS</td>
<td>IT, DK, LU</td>
<td>Relate to pilot</td>
</tr>
<tr>
<td>5. Callback from PSAP to IVS not supported when IVS calls from a network not the native home of the SIM</td>
<td>RO, BE, LU</td>
<td>To be solved with national roaming</td>
</tr>
<tr>
<td>6. No callback from IVS possible, if original call terminated with clear down</td>
<td>RO, LU, ES</td>
<td>Related to pilot</td>
</tr>
<tr>
<td>7. Problems with the antenna</td>
<td>DK</td>
<td>DK: use of Gaffetape and plexi-frames.</td>
</tr>
<tr>
<td>8. Lack of TS-12 testing possibility</td>
<td>DK</td>
<td>No</td>
</tr>
<tr>
<td>10. Communication between the IVS and the vehicle</td>
<td>TR</td>
<td>Yes</td>
</tr>
<tr>
<td>11. The implementation of the eCall does not alone guarantees the eCall will be correctly routed.</td>
<td>-</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Table 2: Weaknesses in IVS implementations reported by pilot sites**

The new emerging topics that are tested in the context of HeERO2 include the test of retrofit devices. Several challenges have been indentified during the test with the IVS functioning. Details on the main challenges related to retrofit devices can be found in section 8.3.

A good transmission of the MSD is related to the modem firmware update. In Luxembourg, for instance, the software has been recently updated because of transmission problems but no results are available yet. **Audio quality** was an issue in Luxembourg and Denmark. The performance of eCall is mined by the fact that **regulation is missing** (challenge 1.3 of Table 1). Without a certification process it is difficult to make all the devices work together with the PSAPs.

The existences of too many devices in the market remain an issue that affects the performance homologation and the inter-operability of eCall if no regulation is defined (challenge 4.19 and 4.22 of Table 1). Since IVS performance is related to PSAP capabilities, the certification of a common set of test to guarantee the interoperability is needed. While the inclusion of remote debugging mechanism to the IVS in test would allow to follow remotely what is happening and to be able to quickly correct any problems. In this regard, the report "Technical considerations regarding type approval testing of eCall in-vehicle systems, published on September 2014 by the Transport Research Laboratory (TRL), states that the
areas that require substantial work to define appropriate requirements and test procedures are the following:

- The practicalities associated with demonstrating post-crash operations of the eCall IVS within the environment of full-scale crash test facilities.
- A mechanism to test and discourage superfluous eCall triggering in very low severity collisions.
- The appropriate testing regime for assessing wireless link performance of the vehicle regarding positional accuracy and mobile phone network communication robustness.
- The extent of self-test features of the IVS (and perhaps also periodic technical inspections) to identify faults and hence reduce the need to regulate lifetime performance at the type-approval stage.
- Defining guidelines for the HMI design of eCall systems.

The challenges related to network coverage (challenge 4.3 of Table 1) should be identified in new business models that identify the funding mechanisms of the implementation of the eCall flag. Successively, regulations on minimum network coverage should be also introduced.

**MSD transmission** (challenge 4.14 of Table 1) remains an issue. Although the success of the interoperability events, the field tests evidence that the transmission of data is not always successful. For instance, in the case of the Luxembourg pilot, the unsuccessful rate was 1%. Specifically, in cross border areas, the executions of the tests shown that when a call centre forwards an eCall to another call centre, callback IVS is not possible. Therefore the call centre that receives the forwarded eCall should also receive the IVS number otherwise the IVS number has to be transferred in parallel.

The *implementation of the eCall flag into MSCs does not alone guarantee the eCall will be correctly routed*. The eCall Flag, once implemented requires a routing based on 3GPP definitions. Therefore MNO software requires to be updated to routing protocols in the MSCs. Depending on the provider, the cost for this upgrade can vary greatly.
## 7 Overview of enablers and challenges

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Solution</th>
<th>Issue solved</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>- 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</td>
<td>No</td>
<td>- The deadline for EU wide eCall implementation has been postponed to 1st October 2017</td>
</tr>
<tr>
<td>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)</td>
<td>- Include references to CEN standards in the ETSI/3GPP standards, when necessary.</td>
<td>No</td>
<td>Introduce training sessions or dedicated workshop on that matter.</td>
</tr>
<tr>
<td>1.3 Retrofit IVS will require a legal framework</td>
<td>- 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.</td>
<td>No</td>
<td>- More details in Chapter 8.3.</td>
</tr>
<tr>
<td>1.4 Procurement procedures are too complex</td>
<td>- 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.</td>
<td>Yes</td>
<td>- Specific to Member state. - Procurements procedures have been completed within the HeERO2 pilot’s implementation but, in some cases, they can cause delays.</td>
</tr>
<tr>
<td>1.5 There is no regulation on the implementation of eCall Discriminator (eCall Flag)</td>
<td>- 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.</td>
<td>Not yet</td>
<td>- Regulation has not been introduced. - New MNOs need funding to support the implementation of eCall discriminator.</td>
</tr>
<tr>
<td>Barrier</td>
<td>Solution</td>
<td>Issue solved</td>
<td>Reasons</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>1.6 Liability aspects related to eCall device performance.</td>
<td>- Introduce regulation on liability aspects.</td>
<td>No</td>
<td>Liability aspects still need to be clarified.</td>
</tr>
<tr>
<td>1.7 Need to test if IVS is working properly.</td>
<td>- Testing should be performed using data provided by both vehicle manufactures and electronic devices manufactures.</td>
<td>No</td>
<td>On-going work (see Technical considerations regarding type-approval testing of eCall in-vehicle systems, Transport Research Laboratory under a contract with the European Commission).</td>
</tr>
<tr>
<td>1.8 It should be made clear how filtering instances shall be certified.</td>
<td>- Filtering instance is a new solution and it needs to be certified.</td>
<td>No</td>
<td>It is out of scope of HeERO2 project. This is country specific however a good practice guide should be made available to other countries interested in this aspect. However the Belgian partners are working on this issue.</td>
</tr>
<tr>
<td>2.1 Limitations in scope of eCall tests (no eCall flag or real PSAP).</td>
<td>- Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall.</td>
<td>Yes</td>
<td>CEN/TS 16454 - eCall end to end conformance testing has been introduced.</td>
</tr>
<tr>
<td>2.2 Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)</td>
<td>- Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles.</td>
<td>No</td>
<td>Need to complete the UNECE regulation.</td>
</tr>
<tr>
<td>2.3 Current standards do not mandate the IVS to support 3G networks. A big challenge is LTE.</td>
<td>- 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.</td>
<td>Not yet</td>
<td>This work is led by ETSI/3GPP.</td>
</tr>
<tr>
<td>Barrier</td>
<td>Solution</td>
<td>Issue solved</td>
<td>Reasons</td>
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|                                                                        | - 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. |              | Further analysis of the architectural and deployment options available building on the experiences from HeERO and HeERO2 projects                                      |
| 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. | No           | This issue will be probably tackled after the eu-wide implementation of eCall.                 |
| 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 | - 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 | No           | Complete new type approval regulation.                                                        |
<table>
<thead>
<tr>
<th>Barrier</th>
<th>Solution</th>
<th>Issue solved</th>
<th>Reasons</th>
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</thead>
<tbody>
<tr>
<td>PTI of the IVS is not yet available.</td>
<td>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.</td>
<td>Not yet</td>
<td>- I. HeERO (CEF funding) - Establish working groups to explore business models to upgrade PSAP.</td>
</tr>
<tr>
<td>PSAPs in member states need updates which may be difficult to complete until 1st October 2017.</td>
<td>- 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.</td>
<td>No</td>
<td>- A working group on this issue has been set up at the Belgian Ministry of Interior to found a solution. This is country specific.</td>
</tr>
<tr>
<td>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.</td>
<td>- 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.</td>
<td>Specific to pilot</td>
<td>New business models are under study but no solution has been found until now. The problem is especially for new MNOs.</td>
</tr>
<tr>
<td>There are considerable costs for the MNOs eCall discriminator (eCall flag) implementation.</td>
<td>- 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.</td>
<td>Specific to pilot</td>
<td>New business models are under study but no solution has been found until now. The problem is especially for new MNOs.</td>
</tr>
<tr>
<td>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.</td>
<td>- OEMs could offer additional services together with the eCall such as vehicle tracking, fleet management and should allow some open choice for customers.</td>
<td>No</td>
<td>A dormant SIM also requires some SW adaptation and discussion on royalties.</td>
</tr>
<tr>
<td>It is not clear which entity</td>
<td>- All MS are covered by the necessary</td>
<td>Yes</td>
<td>- Include the</td>
</tr>
<tr>
<td>Barrier</td>
<td>Solution</td>
<td>Issue solved</td>
<td>Reasons</td>
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</tr>
<tr>
<td>should finance the upgrade of existing PSAPs</td>
<td>legislation that requires a competitive tendering process.</td>
<td></td>
<td>PSAP in the 112 system. - Reduce delays on the national legislation application. - I_HeERO CEF proposal.</td>
</tr>
</tbody>
</table>

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.  
NA  - Pilot specific

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.  
NA  - Pilot specific

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.  
Not yet  - Use voice connection, MSD data, positioning, technical IVS specification.

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.  
Yes  - Provide the IVS in parallel to the MSD.
<table>
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<tr>
<th>Barrier</th>
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<th>Issue solved</th>
<th>Reasons</th>
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</table>
| 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. | Yes | Introduce separate software for eCall handling and dispatching in the PSAP so only the eCall call takers have to be trained for this purpose. |
| 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). | No | - Use voice connection, MSD data, positioning, technical IVS specification  
- Use EeIP guidelines. |
| 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) | No | - Use anuals, training material, national eCall implementation plans. |
| 3.8 Dormant SIM | - A clear and unique standardisation process should be introduced. | No | - No regulation on dormant has been 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. | No | - Organize new pilots at cross border areas. |
| 4.1 Unavailability of IVS prototypes functioning properly in the beginning of the HeERO pilot | - Note: this challenge is not expected to be relevant in current situation with many IVS prototypes available. | Yes | - Change IVS provider. |
| 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 | Not yet | - Need for IVS type approval regulation. |
<table>
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<tr>
<th>Barrier</th>
<th>Solution</th>
<th>Issue solved</th>
<th>Reasons</th>
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</thead>
<tbody>
<tr>
<td>4.3</td>
<td>Problems with mobile network coverage or signal strength</td>
<td>- 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&lt;br&gt;- The regulations introduced to ensure minimum network coverage for eCall, should ensured coverage on the main roads.&lt;br&gt;- Need to clarify funding aspects before the introduction of legislations on network coverage.&lt;br&gt;- 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.</td>
<td>No</td>
</tr>
<tr>
<td>4.4</td>
<td>Time synchronisation between IVS and PSAP is required to calculate several HeERO KPIs.</td>
<td>- Synchronisation of PSAP clock using NTP (network time protocol), GPS or some other means to an accurate time reference.&lt;br&gt;Note: this challenge is related to calculation of HeERO KPIs but not to the operation of eCall.</td>
<td>Yes</td>
</tr>
<tr>
<td>4.5</td>
<td>Increased duration of MSD transmission and call setup when testing with a moving vehicle.</td>
<td>- See challenge 4.8.</td>
<td>No</td>
</tr>
<tr>
<td>4.6</td>
<td>Repeated MSD update request by PSAP not possible.</td>
<td>- Further analysis on the scope of the problem and corrective actions if necessary.&lt;br&gt;- Development of a certification scheme for eCall IVS and the in-band modem components.&lt;br&gt;Note: this challenge is likely related to an individual IVS or PSAP implementation</td>
<td>No</td>
</tr>
<tr>
<td>4.7</td>
<td>False eCall generated by mobile phones which erroneously activate eCall flag.</td>
<td>- Documentation of the erroneous operation of the mobile phones affected by the problem and contacting the equipment manufacturers.</td>
<td>No</td>
</tr>
<tr>
<td>4.8</td>
<td>MSD transmission times have been longer than the target value for eCall at least at some pilot sites.</td>
<td>- Study the possibilities to reduce voice channel blocking time by optimising the acknowledgement mechanism of eCall MSD transmission.&lt;br&gt;- Analyse the reason for the difference in the results measured in laboratory environment and results measured in real-life networks.</td>
<td>No</td>
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</table>
### D6.2 eCall Deployment enablers and opportunities and challenges:

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<table>
<thead>
<tr>
<th>Barrier</th>
<th>Solution</th>
<th>Issue solved</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.9</td>
<td>Differences between performance of IVS even if IVS conform to standards.</td>
<td>- see challenge 4.12</td>
<td>Yes</td>
</tr>
<tr>
<td>4.10</td>
<td>Lower than expected robustness of in-band modem</td>
<td>- see challenge 4.12</td>
<td>Yes</td>
</tr>
<tr>
<td>4.11</td>
<td>There are no guidelines or target values for MSD success rate acceptable for eCall</td>
<td>- Development of guidelines on the service quality acceptable for eCall</td>
<td>No</td>
</tr>
<tr>
<td>4.12</td>
<td>MSD transmission is not always successful.</td>
<td>- PSAP initiates a retransmission of the MSD in case the first transmission is not successful.</td>
<td>Not yet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- PSAP uses the voice connection to communicate with vehicle occupants.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Possibility that the MSD transmission fails should be taken into account in operation of eCall and related guidelines.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Further analysis on correlation of the outcomes of individual MSD transmissions during the same call should be carried out.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Development of certification scheme for eCall IVS.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Development of certification scheme for the components implementing the eCall in-band modem.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 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.</td>
<td></td>
</tr>
<tr>
<td>4.13</td>
<td>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.</td>
<td>- 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.</td>
<td>Yes</td>
</tr>
<tr>
<td>Barrier</td>
<td>Solution</td>
<td>Issue solved</td>
<td>Reasons</td>
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|                                                                         | 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”. | Yes          | The Belgian partners were in charge of this issue.                                             |
| 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.                                   | No           | There are not testing possibility 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. GLONASS works instead on 3G. | No           | The number of devices installed was not enough to test network capacity.                       |
<p>| 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. | No           | It is not sure if this can be solved in the scope of Heero2, as the subject is quite complex. |
| 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               | Yes          | Via a re-synchronization protocol                                                              |
| 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 | - 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 | Not yet      | The modem is the main issue. Problems with the PSAP router. There are standards but they are     |</p>
<table>
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<th>Reasons</th>
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| set of requirements for IVS providers. | 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. | weak from the technical point of view. | |
| **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. | Yes | In the Danish pilot Gaffe-tape and plexi-frames have been deployed. |
| **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. | No | The technology for retrofit IVS is not mature. |
| **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. | Not yet | Need to complete type approval regulation. |
| **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. | No | This is to be addressed in the future but should not impact current deployment |
<p>| <strong>4.24</strong> 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. | Yes | This issue is related to pilot. |
| <strong>4.25</strong> Definition of the standard for integration of dangerous goods information into eCall | - Integration of standard information for dangerous goods | Yes | First drafts introduced to the standardisation bodies. |
| 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. | No | Need for a information campaigns. |
| Misuse of eCall | - Educate car users on the functionality and correct use of eCall; | No | To be organized during the eu- |</p>
<table>
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<tr>
<th>Barrier</th>
<th>Solution</th>
<th>Issue solved</th>
<th>Reasons</th>
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<tbody>
<tr>
<td>5.3 Users’ concerns of privacy violations and risk of supervision and tracking of individual vehicles</td>
<td>- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP.</td>
<td>Yes</td>
<td>Need to make aware users that MSD includes only the minimum required information needed by the emergency services to ensure an adequate response.</td>
</tr>
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</table>

Table 3: Identified barriers and solutions
8 Barriers and enablers on emerging topics

8.1 PTW

The following table summarizes the main challenges and the solutions identified. Since the technology is not mature, the solutions are provided for systems, the wearable eCall and the IVS system.

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Solutions</th>
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<tbody>
<tr>
<td>PTWs do not have sensors to trigger the emergency call (as cars have, for example airbag sensors). Incident detection system not ready yet on PTWs; some manufacturers have some proprietary systems but not much sophisticated yet.</td>
<td>Robust incident detection system requires many sensors and complex algorithms. Such systems are expensive, and this is a barrier for low end motorbikes</td>
</tr>
<tr>
<td>Incident in areas with poor (or no) GPS coverage.</td>
<td>Use Galileo combined with GPS.</td>
</tr>
<tr>
<td>Establishing a good voice communication channel is difficult.</td>
<td>In a wearable eCall system this problem could be solved. In an IVS system range problems with Bluetooth communication still to be solved.</td>
</tr>
<tr>
<td>One of the most important information is the number of occupants which is in general very difficult to determine.</td>
<td>In a wearable eCall system only the system with eCall capabilities would inform. In an on board system more sensors are needed.</td>
</tr>
<tr>
<td>Determine the VIN number.</td>
<td>A wearable eCall system must be linked to the vehicle. And issues may arise with 2 passengers in the same motorcycle. With an IVS-based system the VIN number is not a problem because it is embedded in the electronics.</td>
</tr>
<tr>
<td>Regulations on environmental, electrical, safety and stress tests, functional safety (ISO 26262 or ISO 61508) and reliability of the communication protocol are needed. Standards for ‘front end’ on PTWs need to be defined (i.e. incident detection).</td>
<td>IVS-based: there is not yet a standardised incident detection system for PTW. Possible solutions that have been piloted are based on sensors at the front end, at the rear end, side, and oblique, lose of grip, etc.</td>
</tr>
<tr>
<td>Need for planning the development of eCall architecture for PTWs. The interest of customers is proved by the different projects developed in Europe related to PTW safety (SAFERIDER, PISa, MOSAFIM, etc.) and by the increasing number of Smartphone applications that implement eCall for PTWs solutions.</td>
<td>Testing solutions for eCall for PTW, then work on the standards building on the results of the tests.</td>
</tr>
</tbody>
</table>

Table 4: Barriers and solutions for PTW
8.2 Heavy Goods Vehicles and dangerous goods

Definition of the standard for integration of dangerous goods information into the eCall was discussed together with the Dutch partners and first drafts introduced to the standardisation bodies (challenge 4.25 of Table 1).

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<tr>
<th>Barriers</th>
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| 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 incident information – this usage has been defined by GLONASS |
| 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 |
| 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. |
| Logistic companies are the main stakeholders for the tracking service. However they are reluctant to provide the service for privacy issues. | If the logistic companies are not forced to support the eCall dangerous goods mechanism either by their customers (the sender) or by the EU regulation, they will not support this. |
| 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. |

Table 5: Barriers and solutions for HGV and Dangerous goods
8.3 Retrofit Devices

This section provides an overview of the different barriers identified for the use of retrofit devices for eCall and presents possible solutions to deal with those obstacles. The main barriers can be summarised as follows:

- False Calls
- Installation quality
- Adherence to the published standards
- Testing and certification

Retrofit device providers affirm that the main challenge is the certification and standardisation of interfaces, especially when speaking about devices which have a direct impact on safety. For example, retrofit on-board devices need to have access or connection to specific in-vehicle systems/interfaces (e.g. CAN bus) for specific purposes involve a barrier for the deployment of aftermarket eCall devices. Generally, OEMs will not be open to let an external device to connect to specific in-vehicle systems and this might have an impact on safety aspects, for example in case of failure of the system, if the IVS is series equipment, the car manufacture has responsibility. In the case of retrofit devices, it is not clear who has the liability. Moreover the correct functionality of the IVS cannot be fully guaranteed without an appropriate installation on the vehicle.

This is a critical issue in case of retrofit devices. The installation must guarantee good antenna reception and the IVS have to communicate with the vehicle getting somehow the information from the airbag. The key point is to define the requirements on the retrofit IVS installation. Its position in the vehicle is very important for good antenna reception. But the electrical installation is the main challenge. The information on the condition of the airbag could be used for the installation of retrofit devices. However, it has to be noted that there are no sensors specified for eCall, it is only recommended that after market devices have internal sensors and should not interface with the vehicle.

In order to ensure that the device is working properly, motion sensors could be a solution. Some kind of accelerometer set could be programmed to generate an event of crash when a threshold of acceleration is achieved. However this solution could cause a lack or an excess of emergency Calls generation due to the lack of communication with the vehicle.
Radio and GPS signal in retrofit devices is, in general, a problem. For the commercialisation, it should look nice and it should be hidden in order the make the people used it.

Installation of retrofit devices is a key point. A possibility is that insurance companies take the responsibility for the installation of the device and guarantee the correct IVS functioning. As an exchange, the insurance company could obtain information from its customers like mileage or vehicle use.

<table>
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<th>Barrier</th>
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| Radio and GNSS signal in retrofit devices is a problem. The correct functionality of the IVS cannot be fully guaranteed without an 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. |
| 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. |
| 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. |
| Design and requirements. 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 6: Barriers and solutions for retrofit devices

Another possible solution is to offer a discount for vehicle insurance if the retrofit device is installed by a certified company. This system could ensure that retrofit devices are installed
in the correct way. In different MS there are many dealers of electronic devices. These companies could be the certified installer of retrofit devices for eCall. They know how to install IVS such that the system works. Discussion with the certification task force of HeERO 2 is taking place on this subject.

In general there is no relation between the vehicle manufacturer and the company installing the IVS. The installation of retrofit device should be performed by skilled people. However standards, requirements or guidelines are missing. Finally, the introduction of an independent body that certifies retrofit devices is highly recommended.
9 Discussion of results

The approach of this deliverable is based on the methodology developed within HeERO1 activities which consists in the systematic identification and collection of the main challenges and enablers identified by pilot sites representatives. This deliverable required an additional effort which consisted in the comparison between the findings reported in D6.2 of HeERO1 with the results of HeERO2. The result of this comparison has allowed to determine whether the challenges identified in HeERO1 have been solved or not and the reasons why they have been not solved.

This procedure is the only difference with D6.2 of HeERO1 in which the consequences and the impact of the challenges and the level of criticality have been taken into account to prepare the recommendations for eCall deployment.

Another difference with the deliverable produced by HeERO1 participants relies on the analysis of the challenges and solutions related to the new emerging topics of HeERO2 (P2W, HGV and dangerous goods, retrofit devices). This additional analysis allows to introduce new recommendations dealing with the new emerging topics.

The results reported in this deliverable come from the experience of the participants in the pilots organized within HeERO2 project so that the list of challenges and solutions may be not complete. Most importantly the limitations of the pilots may have produced results that should be studied in more detail. In other cases cross border eCall was not successfully implemented so that issues identified in these areas need to be further analysed.

An important difference between the two project phases, relies on the use of aftermarket devices, that were largely used within HeERO2 in line with the project plan. Therefore careful attention should be paid when reading the deliverable.

The results of HeERO2 activities indicates the need to complete regulation on new type approval. This is seen as a proof of commitment of the European Commission in the process that will lead to the full deployment of eCall.
10 Conclusions

The deliverable has documented and listed the barriers and enablers for the eCall implementation. The identified barriers and solutions are reported from the D6.2 of HeERO1 when the challenges have been identified by at least one HeERO2 partner.

The amount of resources available for this task did not allow an in-depth analysis of the challenges ans solutions. Furthermore the limitations of the test site did not always allow to include results of a real testing situation. This challenge has been identified in HeERO1 and confirmed by HeERO2 partners. Specifically, HeERO2 partners could not perform cross border testing and it has been highlighted that issues such as the one of network coverage could not be tested.

The introduction of regulations dealing with several aspects of eCall is seen as the best approach to ensure the full deployment. The most urgent is the completion of the new type-approval regulation which is expected in the next few months. New solutions have been tested in this second phase of the HeERO project and the filtering instance is the main innovative solution introduced by the Belgium partners to reduce the number of false calls. Also in this case there is the need for a new regulation on the certification of the filtering instance. MNOs should implement eCall Flag by December 2014 and a regulation that forces them is currently seen as a possible solution.

With reference to P2W, the technology is not mature and new solutions that imply the combined used of a wearable system and an IVS should be developed. The main challenge related to P2W eCall deals with the determination of the number of occupants and the need to use several sensors placed on the vehicle to detect the incident which could be too costly.

The eCall for P2W is currently under development.

The eCall for HGV and dangerous goods has been tested by the participants from Luxembourg. The main difference with the eCall for light vehicles relies on the type of information that need to be transmitted. Specifically, information on the type of load should be sent and continuously updated to be able to provide exact information on the type but also on the quantity of load.

Finally, the technology for retrofit devices have proved not to be mature and the interoperability is not ensured. A possible solution is to provide different configurations of retrofit devices and vehicles in order to ensure that the device is correctly installed. In any case, the resolution on these devices is still need.
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