Working Paper

Certification Procedures for the e-Call service

Produced by the GST - CERTECS European Project
Author : Gérard Ségarra, Renault SAS
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Co-operation for Quality

This document is a first draft of the certification procedure proposed by the GST-CERTECS project to e-Call Driving Group. .

Centro de Tecnologia de las Comunicaciones, S.A.

RESEARCH

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Foreword

3GT (Third Generation of Telematics) project first and now GST (Global System for Telematics) are aiming at proposing the use of standards to open the automobile telematics market. Standards means, **public, non ambiguous, free access** specifications (free or low cost specification promoted by standard institutes) enabling the development of high level quality, interoperable products and services. However, it is not enough to say "my product or my service is conforming to such standard", it is also necessary to demonstrate it to obtain the confidence of targeted customers and public authorities in case of e-Safety services. How to demonstrate it is the object of the Certification which offers organizations, processes, tools and competencies to validate new products and services against recognised reference frameworks and qualified reference implementations.

The CERTECS (Certification of Telematics Components, Systems and Services) subproject of the European GST Integrated Project has been working on this subject for now 18 months. One of the focuses of this subproject has been the e-Call service and the system infrastructure which is requested to support it.

E.MERGE and now GST-RESCUE have been advancing the specification, prototyping and validation of the e-Call service. Moreover, during its September 2005 meeting the e-Call driving group has created several task groups in charge of progressing key subjects. Renault as CERTECS subproject co-ordinator has been charged to progress the e-Call chain and e-Call generator certification procedure (ST4). This document is a first result of this work achieved by ST4.

For more information on GST and CERTECS, refer to the projects WEB sites:

http://www.gstproject.org, http://www.certecs.net

The GST Project is Managed by ERTICO and this document has been reviewed by the current CERTECS consortium comprising the following partners.

CETECOM	**PTV**
ETSI	**RENAULT**
FIAT CRF	**TELCORDIA**
FORD	**TRIALOG**
JTEST	**TUV**
NAVTEQ	

CAUTION : This document shall only be used as an initial CERTECS contribution guiding the development and deployment of the e-Call certification procedure in western Europe.

1. Required Environment for the e-Call service Certification in Europe

Before starting the e-Call certification procedures which are proposed below, it will be necessary to deploy a certification organization, its associated operational process and to develop the e-Call certification reference framework necessary to rule and guide the certification procedures. This chapter is presenting this required certification environment.

1.1 General certification organizational structure

The e-Call service shall be using the general certification organizational structure proposed by CERTECS for the certification of telematics components, systems and services. This organizational structure which is conforming to the E.C certification global approach, when adapted to the e-Call service, can be represented on the figure 1.1.1 below.

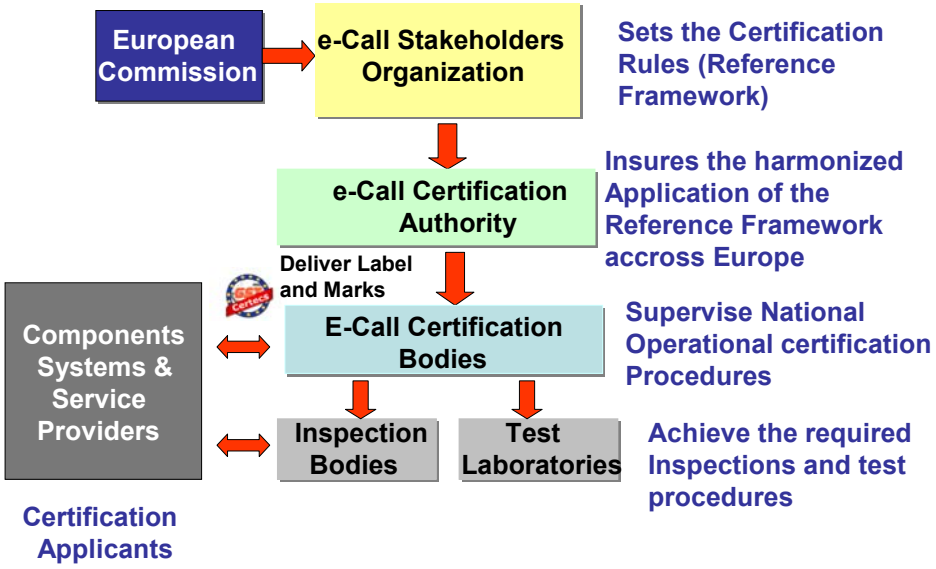

Figure 1.1.1: Overview of the proposed organization

The respective roles, missions and responsibilities of the entities belonging to this organizational structure will be described in the next sections.

1.2 e-Call Reference framework

The e-Call Reference Framework will be used as a reference for the certification of e-Call components, systems and service. The Reference Framework is elaborated and maintained by the e-Call Stakeholders Organization (to be created). It shall contain the following elements:

- The description of the certification process / procedures to be achieved for class III (Safety Affecting services class) components, systems and services. Applicant guides shall be provided for each described procedure.
- The Service Level Agreement (SLA) which will specify the scope of the certification and the standard(s) which must be implemented for a service to be conforming to the e-Call. This document shall also identify the quality and

performance criteria which must be met during the recommended inspection and tests. Conformance statements shall be provided for all the elements which are in the scope of the certification.

- The System Level Specification (SLS) which contains the specification of all standards to be applied, as well as their PICS (Protocol Implementation Conformance Statement) and PIXIT (Protocol Implementation eXtra Information for Testing) associated to the required standard protocols. The SLS may also contains the test suites specifications.

1.3 e-Call certification development process

The e-Call certification development shall comprise the definition of two main following processes:

- The e-Call initial development process which consist to develop the initial e-Call Reference Framework and set up the operational certification organization having the necessary competences and resources for running the e-Call certification operational process. This includes the selection of distinguished (competent) inspection bodies and test centres.
- The e-Call certification change management procedures which shall allow some evolution of the e-Call certification operational process to take into account strategic, organizational, legal, technical,...etc. evolutions (see the figure 1.3.1 below as an example).

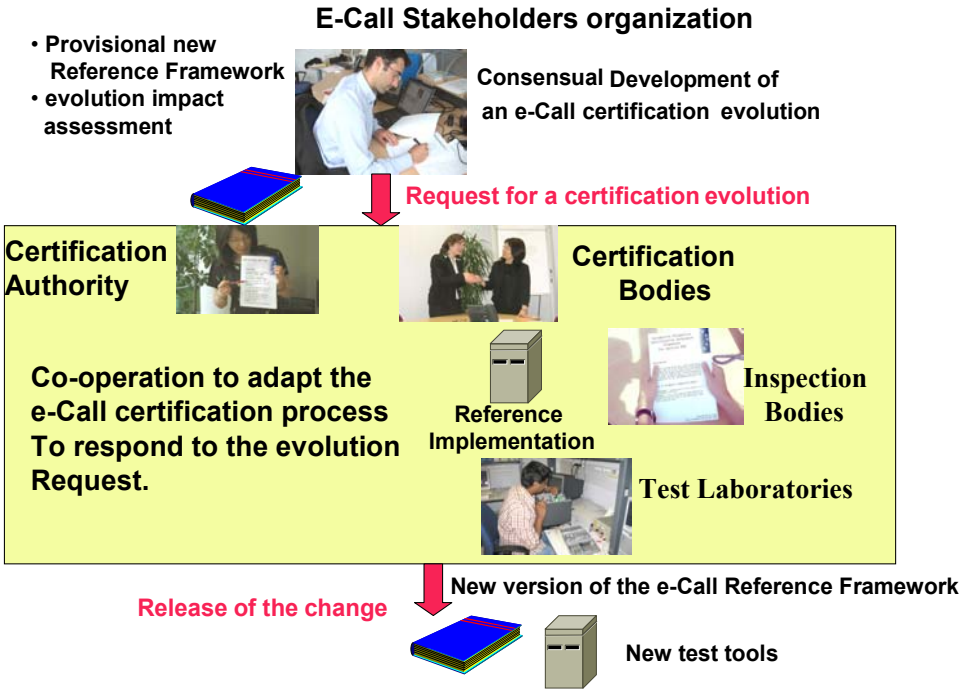

Figure 1.3.1: e-Call certification change management

1.4 e-Call certification operational process

The e-Call certification operational process comprises all the activities (see the figure 1.4.1 below) and workflow necessary to respond to a certification request originating from an e-Call component, system or service supplier (applicant). These activities shall be defined according to the SLA and its included implementation conformance

statements for all elements (components, systems, service) being in the scope of the e-Call certification.

According to the concerned type and to the product / system / service implementation, one or several inspection body / test laboratory can be involved. The applicant may select its inspection body / test laboratory in a list of designated / accredited bodies / laboratories proposed by the Certification Authority. Then, the applicant may sign a service contract with the selected body / laboratory in such a way to get a clear commitment relatively to QCD (Quality, Cost, Delivery) elements of the service.

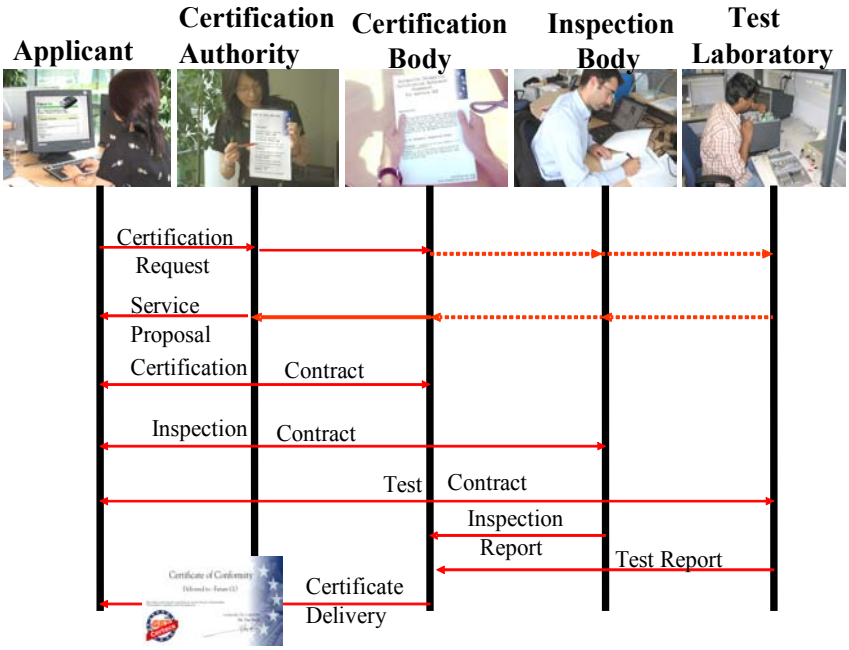

Figure 1.4.1: e-Call Certification operational process

1.5 e-Call certification results

As shown on the figure 2.2 below, the certification can be applied to several types of products / system during several phases of their life cycle. So the results of the certification procedures can be the following :

- Type examination certificate stating that a given Product Type (e-Call TCU, e-Call equipped vehicle, PSAP e-Call Terminal) is conforming to the e-Call SLA and SLS.
- Conformity to type certificate stating that a given implementation of a product type is conforming to the referred certified type.
- Type interoperability certificate stating that a given e-Call system type composed of conforming product types is interoperable.
- Implementation interoperability certificate stating that a given implementation of an interoperable e-Call system type (replicated implementation) is itself interoperable.
- Renewed implementation interoperability certificate stating that a given interoperable operational e-Call system implementation is still conforming to reference SLA / SLS. Indeed, practically, this means that a given certified e-Call

system implementation is certified during a specified time period (e.g. one year) and that the certificate will be automatically renewed provided that the quality of the considered e-Call system stays at an acceptable level (to be specified in SLA).

2. e-Call certification procedures

The certifications procedures to be applicable are summarized on the figure 2.1 below and are related to the type of considered e-Call chain element. They are also related to the life cycle of the considered element (end of design, end of manufacturing, in service).

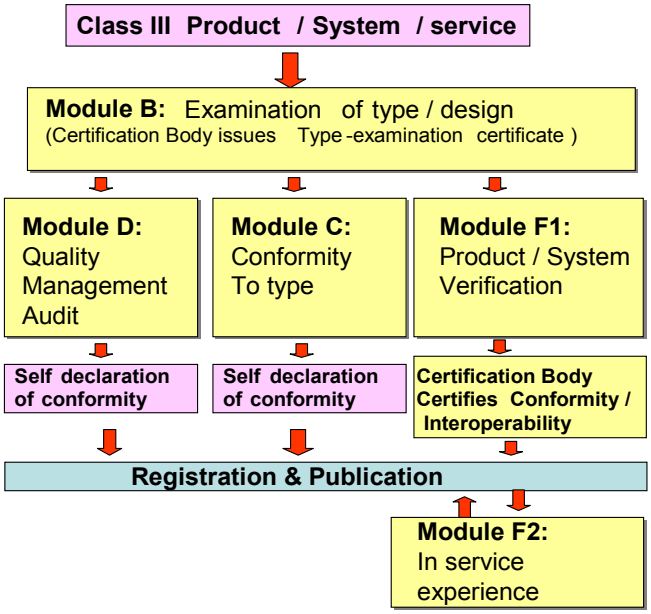

Figure 2.1: Summary of procedure modules for e-Call certification

Certification procedures are related to the nature of the product / system to be considered but also to its step in its life cycle (see the figure 2.2 below).

The nature of the product / system is related to the e-Call system supply chain organization which distinguishes mainly the five following stakeholders!

- The e-Call equipment suppliers which are developping and producing the Telematics Control Units (called **e-Call TCU**) in charge of processing the e-Call trigerring events and executing the e-Call functions conforming to standards. Such component will be fully integrated in a car and can become part of the In-Vehicle system.
- The car manufacturers (OEM)or e-Call system suppliers (for the after market) which are integrating an e-Call TCU in an In-Vehicle system (connection to the vehicle electronics to detect an incident event; connection to the vehicle HMI, mainly the audio chain; connection to the roof antennas; ...etc.). OEM are then producing **e-Call equipped vehicles**.
- The PSAP e-Call Terminal suppliers which are developping and producing terminals having the capability to receive, process and present an e-Call in

conformity with the e-Call standards. PSAP e-Call Terminal suppliers are then producing **PSAP e-Call Terminals**.

- The PSAPs (Public Service Access Point) which are operating the e-Call service and as such have to integrate their e-Call terminal in their legacy emergency systems.
- The Telecom Operators which are insuring the transport of e-Call messages in conformity to the e-Call transport standards. The Telco are providing **Global Transport Networks**.

All these components and systems will be integrated to form the **end to end e-Call system** which shall be finally, the real object of the certification.

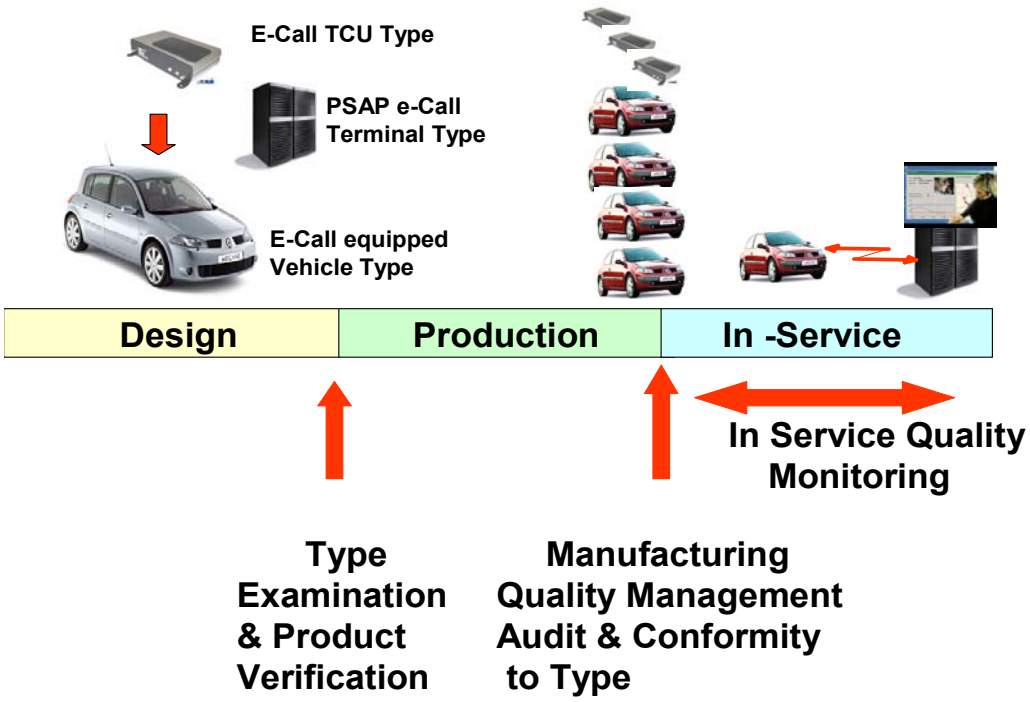

Figure 2.2 : e-Call components / system and their life cycle

New e-Call TCUs as well as new PSAP e-Call Terminals and new equipped vehicles will have to pass a Type examination (procedural module B) and a Product verification (procedural module F1) before being launched on the market and then produced.

All produced equipment (e-Call TCUs, PSAP e-Call Terminals, e-Call aquipped vehicles) will have to be produced according to some quality rules (procedural module D) and be able to be verified in term of conformity to type (procedural module C).

A Complete e-Call system formed of complying equipment shall be able to pass system Type examination (procedural module B) and system verification (procedural module F1) before being put operational. If a complete system type is replicated, this one will have to answer to some given quality rules (procedural module D) and be declared conforming to system type (procedural module C).

Once operational, a complete e-Call system shall be monitored to verify that it is still conforming to the SLA criteria used during its certification (procedural module F2). If deviating from these criteria, some immediate correction have to be undertaken to restore the system quality and be able to maintain it in the "e-Call system certified catalogue".

2.1 e-Call TCU type examination and product verification

Three categories of e-Call TCU can be considered (see the figure 2.1.1 below):

- e-Call specialised vehicle embedded unit (box dedicated to this single function),
- Multi-services vehicle embedded TCU (including the e-Call service),
- Hybrid bluetooth e-Call TCU composed of a car embedded component and a customer portable component (Nomadic Device) linked by means of a bluetooth standard interface.

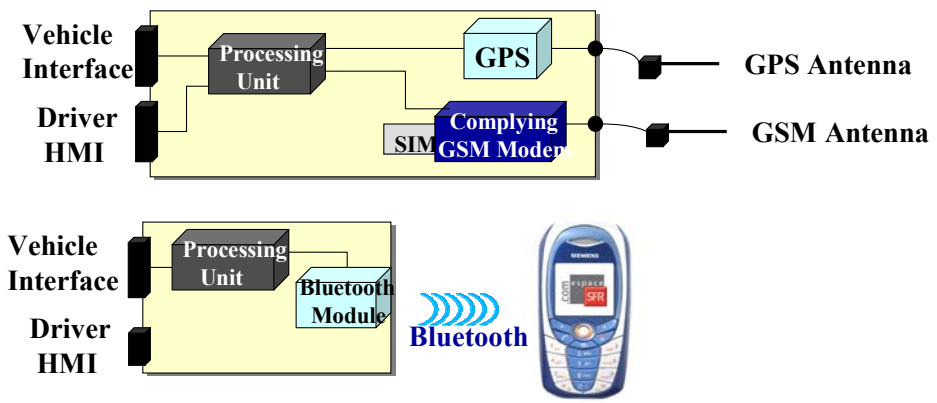

Figure 2.1.1 : Possible categories of e-Call TCUs

For all categories of TCU, the following examination and test procedures shall be achieved:

- Examination of the technical file provided by the TCU equipment supplier. This includes all elements related to risk management and data quality (e.g. enhanced GPS accuracy).
- e-Call Transport protocol conformance testing (e.g. E112+USSD conformance).
- e-Call application protocol conformance testing (e.g. MSD / CANCEL / ACK / EOS application messages sequences, structures and syntaxes).
- Performance conformance testing (e.g. Maximum time necessary to issue a 112 call following the simulation of a crash detection or a manual action, and an MSD message following a 112 circuit switched establishment).

2.2 e-Call equipped vehicle type examination and product verification

Once a given e-Call TCU has been certified as complying to the e-Call TCU type SLA, this one can be integrated into a given e-Call equipped vehicle type (see the figure 2.2.1 below).This integration shall include:

- The installation of the GSM and GPS antennas on the vehicle and their liaisons to the e-Call TCU.
- The integration of the audio chain and the other elements of the car HMI with the e-Call TCU.
- The integration of the In-Vehicle electronic system (providing the crash notification) with the e-Call TCU.
- The provisioning of the information and parameters necessary to activate and execute the e-Call service at the car level.

For an e-Call equipped vehicle type examination, the following inspection and test procedures shall be achieved:

- Examination of the technical file provided by the applicant car manufacturer. This includes all elements related to risk management and data quality. This technical file can be referring to the e-Call TCU type being certified, adding information about its integration in the considered car type.
- e-Call transport protocol conformance testing including the complete, integrated In-Vehicle e-Call chain.
- e-Call application protocol conformance testing including the complete, integrated In-Vehicle e-Call chain.
- e-Call In-Vehicle performance conformance testing (e.g. Maximum time necessary to issue a 112 call following a crash detection or a manual action, and an MSD message following a 112 circuit switched establishment).

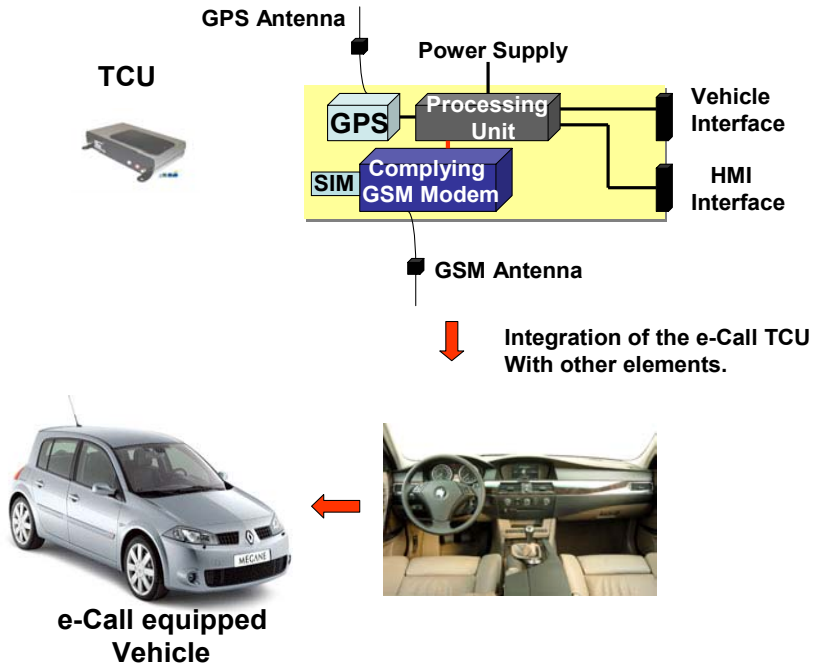

Figure 2.2.1: e-Call equipped vehicle type

2.3 PSAP e-Call terminal type examination and product verification

At this level, the scope of the e-Call certification shall be clearly delimiting the functions which are included in the certification (see the figure 2.3.1 below). For a PSAP e-Call terminal type, the following minimum inspection and test procedures shall be achieved:

- Examination of the technical file provided by the applicant PSAP. This includes all elements related to risk management associated to the PSAP terminal (reliability, dependability, security).
- e-Call transport protocol conformance testing such as specified at the PSAP interface level.
- e-Call application protocol conformance testing (E112 establishment, MSD / CANCEL reception, ACK transmission, EOS transmission).
- e-Call PSAP terminal performance conformance testing (e.g. Maximum time to issue an ACK upon reception of an MSD).

The scope of the PSAP e-Call terminal type examination could be extended to the PSAP operator HMI (ergonomics quality criteria including the received audio quality) and to the data quality criteria related to the geographical MAP data quality and the MAP matching quality (related to the GPS position accuracy).

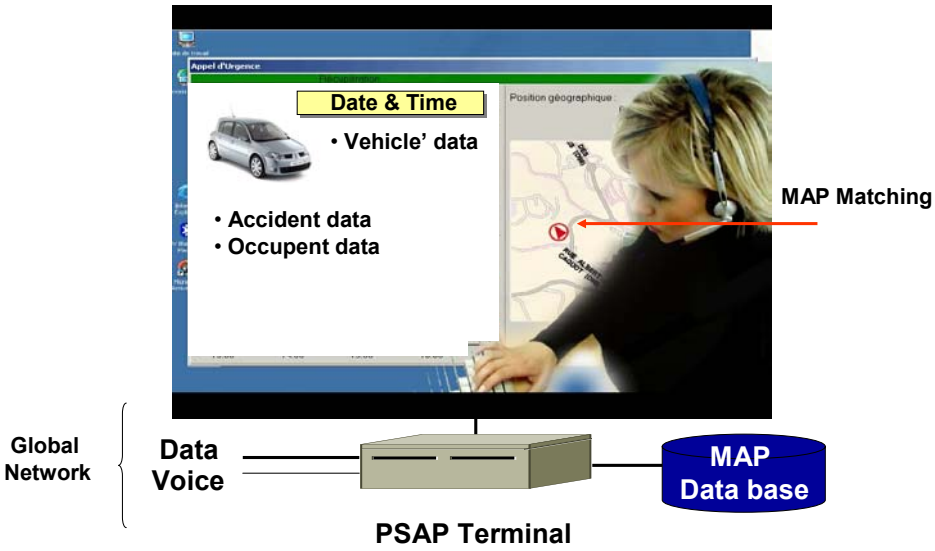

Figure 2.3.1: Delimitation of the e-Call PSAP Terminal certification

2.4 Global e-Call transport network type examination and verification

The Global e-Call transport network type examination and verification shall consider an aggregation of networks including at least one GSM network (e-Call equipped vehicle interface) and one terrestrial network (e-Call PSAP terminal interface). The Global e-Call transport network shall be complying to its two interfaces specifications (e-Call equipped vehicle and e-Call PSAP terminal) and other SLA criteria. For a Global e-Call transport network type, the following minimum inspection and test procedures shall be achieved:

- Examination of the technical file provided by the applicants MNO (Mobile Network Operator) and TELCO. This includes all elements related to risk management associated to the considered global network (network coverage, availability, dependability, security).

- e-Call transport protocol conformance testing such as specified at the PSAP interface level.
- e-Call transport protocol conformance testing such as specified at the e-Call equipped vehicle interface.
- e-Call Transport conformance (adding the vehicle cell position to MSD) and performance testing (e.g. Maximum time to establish an E112 switched circuit, Maximum time to transfer the MSD / CANCEL / ACK / EOS messages once the E112 is established).

2.5 End to End e-Call system type examination and verification

The End to End e-Call system type examination and verification shall consider the complete e-Call chain integrating at least one type of each element here before considered (see the figure 2.5.1 below). This step will allow to certify the full interoperability of the global e-Call chain and will allow to assess the global risk of not achieving the e-Call service as it is required in SLA.

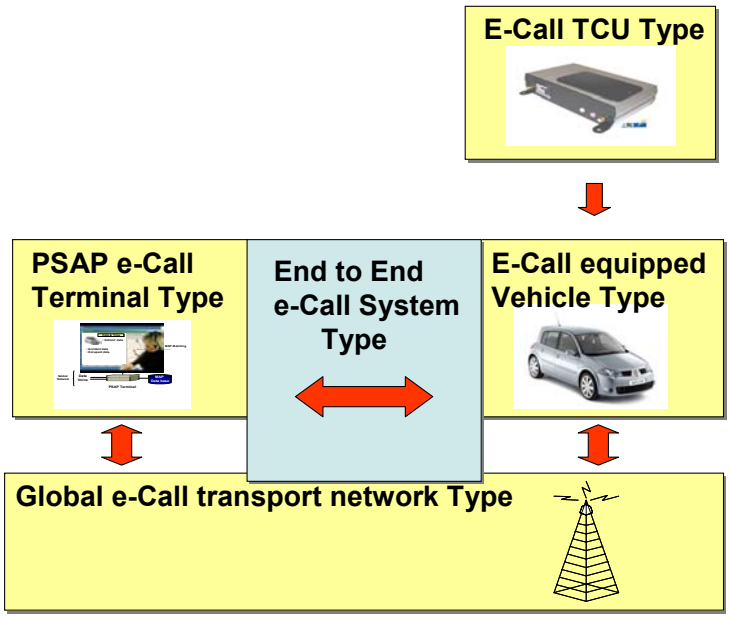

Figure 2.5.1: End to End e-Call system type

For an End to End e-Call system type, the following minimum inspection and test procedures shall be achieved:

- Examination of the technical file provided by the applicants Car Manufacturer / PSAP / Global Network Operator. This includes all elements related to risk management associated to the End to End e-Call system, building on examination of aggregated types.
- e-Call End to End application protocol conformance and interoperability testing (establishment of the end to end voice circuit, transmission and reception of the MSD /CANCEL messages, transmission and reception of the ACK, transmission and reception of the EOS, closing of the voice circuit).

- e-Call End to End performance conformance testing (e.g. Maximum time to establish an E112 switched circuit, Round Trip Time Delay for the transfer of MSD and receiving an ACK).

2.6 e-Call TCU manufacturing quality management audit

This e-Call TCU manufacturing quality management audit will consist to the following inspection procedure:

- Analysis of the technical file supplied by the e-Call TCU equipment supplier according to the relevant module D guide.
- Self declaration of conformity of the e-Call TCU manufacturing system quality.

2.7 e-Call equipped vehicles manufacturing quality management audit

This e-Call equipped vehicles manufacturing quality management audit will consist to the following inspection procedure:

- Analysis of the technical file supplied by the e-Call equipped vehicle supplier according to the relevant module D guide.
- Self declaration of conformity of the e-Call equipped vehicles manufacturing system quality.

2.8 PSAP e-Call terminal manufacturing quality management audit

This PSAP e-Call terminal manufacturing quality management audit will consist to the following inspection procedure:

- Analysis of the technical file supplied by the PSAP e-Call terminal supplier according to the relevant module D guide.
- Self declaration of conformity of the PSAP e-Call terminal manufacturing system quality.

2.9 e-Call TCU product verification (conformity to type)

This e-Call TCU product verification will consist to the following inspection procedure:

- Self declaration of conformity to type issued by the e-Call TCU equipment provider for each e-Call TCU produced.
- Delivery of a certificate (marking) of conformity for each e-Call TCU included in the manufacturing quality management audit period.

2.10 e-Call equipped vehicle verification (conformity to type)

This e-Call equipped vehicle verification will consist to the following inspection procedure:

- Self declaration of conformity to type issued by the e-Call equipped vehicle supplier for each e-Call equipped vehicle produced.
- Delivery of a certificate (marking) of conformity for each e-Call equipped vehicle included in the manufacturing quality management audit period.

2.11 PSAP e-Call Terminal verification (conformity to type)

This PSAP e-Call TCU terminal product verification will consist to the following inspection procedure:

- Self declaration of conformity to type issued by the PSAP e-Call terminal supplier for each PSAP e-Call terminal produced.

- Delivery of a certificate (marking) of conformity for each PSAP e-Call terminal included in the manufacturing quality management audit period.

2.12 End to End e-Call system verification (conformity to type)

This End to End e-Call system verification will consist to the following inspection procedure:

- Interoperability test of the End to End e-Call service chain when a new implementation (E-Call equipped vehicle or PSAP e-Call terminal shall be included in an e-Call chain). This interoperability test will be achieved against certified e-Call equipped vehicles or against certified test PSAP e-Call terminal.
- Self declaration of conformity to type issued by all the partners of the End to End e-Call system.
- Delivery of a certificate (marking) of conformity for the End to End e-Call system under consideration.

2.13 In-service quality monitoring

The e-Call in-service quality monitoring will consist to the execution of the following procedures:

- Monitor the performances of end to end e-Call systems according to SLA requirements.
- Achieve at specified time intervals end to end e-Call system interoperability tests.
- Reports at specified time intervals and on pre-defined events to the certification body.
- Renewal of certificates of conformity at specified time intervals.

Annexes

– **Abbreviations and Acronyms**

- **ACK :** Acknowledgement
- **ASN.1 :** Abstract Syntax Notation One
- **CB :** Certification Body
- **CERTECS :** Certification of Telematics Components and Services
- **EC :** European Commission
- **E.Call :** Emergency Call
- **EMC :** Electro-Magnetic Compatibility
- **EOS :** End of Service
- **GPS :** Global Positioning System
- **GST :** Global System for Telematics
- **IUT :** Implementation Under Test
- **MNO :** Mobile Network Operator
- **MSC :** Message Sequence Chart
- **MSD :** Minimum Set of Data (part of E.Call)
- **OEM :** In this context "Car Manufacturer"
- **PCO :** Point of Test and Observation
- **PICS :** Protocol Implementation Conformance Statement
- **PIN :** Personal Identification Number
- **PIXIT :** Protocol Implementation eXtra Information for Testing
- **POI :** Point of Interest
- **PSAP :**Public Service Access Point
- **QRI :** Qualified Reference Implementation
- **RI :** Reference Implementation
- **SLA :** Service Level Agreement
- **SLS :** System Level Specification
- **CA :** Certification Authority
- **IB :** Inspection Body
- **TCU :** Telematics Control Unit
- **TELCO :** Telecom Operator
- **TL :** Test Laboratory
- **TTCN-3 :** Testing and Test Control Notation version 3
- **UML :** Unified Mark-up Language
- **VIN :** Vehicle Identification Number