# Functional Study

# TMA ACTIF

## CERTU



# ETF-CERTU TMA ACTIF-004-V1.3

# IDENTIFICATION

## INTERNAL WORKFLOW

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## CHANGES FOLLOW-UP

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## DIFFUSION CIRCUIT

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|  |  |  |  |

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# 1. PREAMBLE

## 1.1. OBJECT OF THE DOCUMENT

This document corresponds to a functional study on the Ecall project.
This study was ordered in the framework of the ACTIF maintenance mission.

# 2.    INTRODUCTION

## 2.1.  CONTEXT

Ecall project is one of the 6 priority actions from the 2010/40/UE Directive. It aims at implementing a job string of numerical emergency calls made from vehicles (in the following document, we will use the expression "cars numerical calls" or "numerical calls").

European players should adopt the specifications about the emergency automatic calls system by the end of 2012.

In this context, ACTIF has to model two Ecall implementation scenarios.

## 2.2.  ARCHITECTURE APPROACH

The architecture approach is based on the use of ACTIF "Help to the Conception of Transportation Interoperable Systems in France". ACTIF is an automatic methodological base. It enables systems designers to use functional reference table objects (such as generic representations of information processing logics, in accordance with different functional logics) that can display each system to be implemented and their interfaces working.

## 2.3.  DOCUMENT CONTENT

This document presents ACTIF's two scenarios of the Ecall implementation in France, through the following chapters:

▶ Players' goals and constraints,

▶ Architecture scenarios,

▶ Conclusions.

## 2.4. TERMINOLOGY AND ABBRÉVIATIONS

### 2.4.1. Abbreviations

| | |
|---|---|
| ACTIF | Help to the Conception of Transportation Interoperable Systems in France |
| B-Call ou bCall | Breakdown Call |
| CERTU | Transportation Networks and Town Planning Study Center |
| C-Call ou cCall | Concierge Call |
| E-Call ou eCall | Emergency Call |
| GPS | Global Position System |
| GSM | Global System for Mobile communications |
| IMA | Inter-Mutuelles Assistance |
| MSD | Minimum Set of incident Data |
| MOA | Project Ownership |
| MoU | Memorandum of Understanding |
| ORM | Mobile Network Operator |
| OSCAR | Architectures Creation Simplified Tool |
| PIN | Personal Identification Number |
| PSAP | Public Safety Answering Point |
| SDIS | Fire and Help Departmental Services |
| SVT | Stolen Vehicle Recovery |
| SUAL | Localised Help and Emergency Service |
| TIC | Information and Communication Technology |
| TPS | Third Party Service (eCall) |
| UE | European Union |

### 2.4.2. Terminology

The expression « Pan European Ecall » nowadays means: the use of the emergency call number 112. That is why we will write "Ecall" in the following document, without prejudging of the technical solution to be implemented or of the intervention type that will be required in the end.

# 3. PLAYERS GOALS AND CONSTRAINTS

## 3.1. GOALS

The goal is to reduce the number of victims in car accidents due to late interventions of help services. This initiative was the priority of the European Commission discussion group eSafety, among the different issues of this discussion group. The objective is to bring the adapted intervention resources on the accident place, as fast as possible.

## 3.2. PLAYERS

The following list presents the players involved in this chain:

▶ Car and equipment manufacturers

▶ Mobile phone operators

▶ Pre-treatment platforms that receive and handle calls, and call the emergency services, if it is necessary or if there is doubt about the situation

▶ Services of intervention (traffic police), help and emergency (fire brigades, EMERGENCY MEDICAL SERVICE)

▶ Infrastructures administrators (as for instance the Statutory companies of Highways)

▶ Users: they are the vehicle occupants who may use the emergency call system or the linked services (help). Thus, it is not only the buyer of the car, whether it is a new one or a second-hand one.

▶ The client: he is the one who bought the emergency call system and the possible services associated with a manufacturer (during the purchase of a vehicle) or of an equipment manufacturer. (Equipment of second horsemanship)

To a lesser extent, certain players can be interested: persons in charge of the road safety (analysis of the occurrence conditions of the accidents) and insurers (disasters cost cutting and rationalization of their administrative treatment).

## 3.2.1. Car and equipment manufacturers

They are among the main players of the chain as they are in charge of the development of the embarked system (telematic unit) and of its integration on the vehicle. They also are in charge of the emergency call system marketing, which is mostly coupled with a bouquet of services (assistance, GPS system, hand free telephony, unbolting of the remote doors, the theft protection).

Equipment manufacturers are another important player of the device implementation, as they must be able to set up an emergency call system as a second horsemanship and to propose the related services.

### 3.2.2. The client

The client is the one who acquires an automatic system of numerical call, whether when he buys the vehicle or with a second horsemanship equipment manufacturer. Car manufacturers nowadays sell this system as a packs complement, that integrates options such as GPS system or hand free telephony.

### 3.2.3. Phone operators

They operate the communication between the telematic unity and the platforms in charge of the receiving and of the handling of the call, whether to send data or for the voice communication with the driver or the passengers, for the accident pre-qualification.

### 3.2.4. Calls receiving platforms

The expression PSAP for « public service answering point » refers to call treatment platforms in a very large sense.
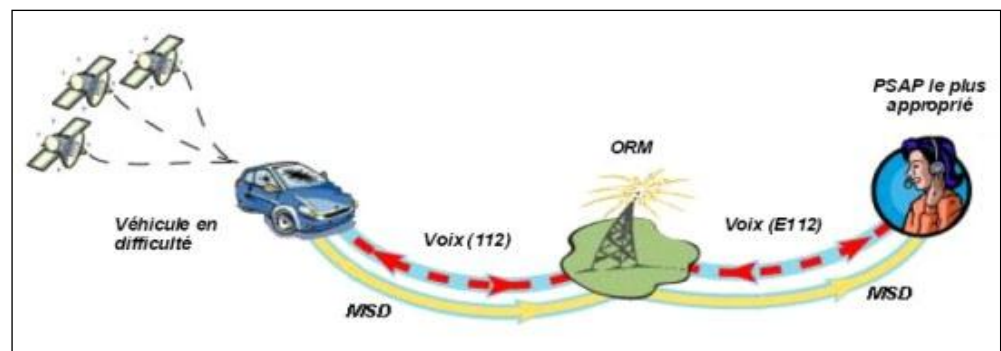


**Figure 2: Functioning principle of the eCall**

Sending systematically the calls towards 112 is one of the essential points of discussion in Europe.

Car manufacturers that developed automatic or manual call services from the vehicles nowadays lean on private platforms, in charge of the calls pre-qualification.

### 3.2.5. Emergency public services

In France, specific call numbers are used to join the emergency services: 17 for the "police or gendarmerie", 15 for "EMERGENCY MEDICAL SERVICE or SMUR" and 18 for "fire brigades or SDIS"...

In France, the implementation and the organization of 112 was led by prefects. Thus, they vary depending on departments. The calls are sent whether towards the SDIS (85 departments), whether towards the SMUR (10 departments), whether towards shared platforms. Most of the time, the caller does not precisely know where his call has been send, but he trusts the service capacity to give an adapted answer.

## 3.2.6.  Users

In this case, we have made the distinction between the customer who bought a service at the same time as his car and the service users who will make demands on it (rented car, loan). It is actually important to determine the caller's mother tongue in case of automatic release of an emergency call.

Users need to benefit from the continuity of the services that was guaranteed to the system customer (telephony, cartography, navigation, technical support and repair, etc.) and to be rescued and helped in the event of an accident. That should be done, as much as possible, in the user's mother tongue.

## 3.2.7.  Road networks administrators

Road networks administrators (DIR, Statutory Company of Highways, departments or communities services) can intervene at several levels in the job string of emergency calls. They can be sought to know exactly what emergency service has to be called, according to the localization (zones of competence for the highway statutory companies) and access conditions to the network.

Highway Statutory Companies (SCA) express, through the ASFA, that they need to get quickly the information about an accident (MSD and additional data of the handling platform) to be able to broadcast information towards users (Highway FM 107.7, PMV), to intervene on-site if necessary, and to limit, doing so, the risks of on-accident.

At the time, SCA are in charge of the management of the Emergency Call Network (RAU), through dedicated platforms. The RAU is the one that makes demands on them for emergency interventions (in case of accident) and, more often, for the users' help (breakdowns…). The role of these platforms is to qualify the call and to mobilize the appropriate services: emergency service (EMERGENCY MEDICAL SERVICE, Fire brigades), polices (Gendarmerie) and the intervention services (patrol vehicles) for protection and return to normal (viability).

## 3.3.  CONCLUSIONS

When we take into account the goals and constraints of the different players of the chain, we can observe to a set of criteria that must be analyzed at every step of the functional chain. The interfaces between actors, that are the most sensitive elements, must be considered more specifically. These criteria are:

▶ Guarantee of service
▶ Free access to the service
▶ Priority to car numerical calls
▶ Pre-qualification (filtering) before transfer to the intervention services
▶ Use of the caller's language

# 4.   ARCHITECTURE SCÉNARIOS

We are going to describe two types: one leans on the use of n°112; the other one leans on the use of a pre-treatment (or pre-qualification) platform.

► Scenario 1 : use of n°112
► Scenario 2 : use of a pre-treatment platform

**Note:** the different diagrams were produced from OSCAR v4.0 software, which is available for free on www.its-actif.org.
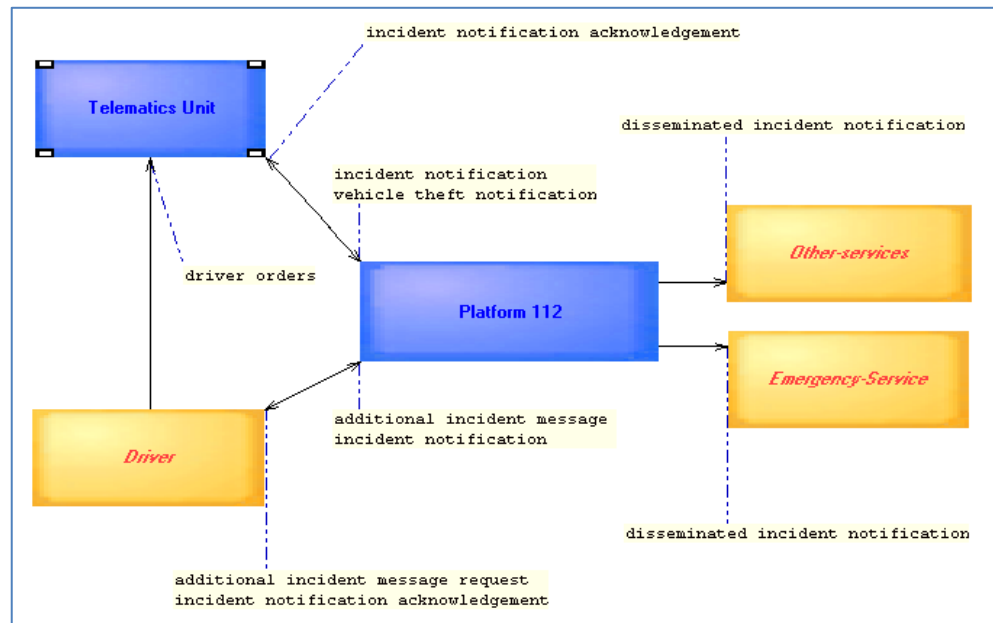
## 4.1.  SCENARIO 1

### 4.1.1.  General presentation

This scenario takes place in the hypothesis of a message broadcast towards the number 112.

### 4.1.2.  Organisational architecture

This general diagram includes four entities:

▶ Driver
▶ Telematic unity (vehicle embarked system)
▶ Emergency services or 112 platform
▶ Other services



**Figure 2: OSCAR modelling – General diagram**

This presentation stems from OSCAR software and is based on the ACTIF method and model. In this case, the entities marked in blue are functionally described based on ACTIF model functions. The orange ones show information exchanges with the blue ones.

## DRIVER

He is the person who drives the vehicle. He is not necessary the vehicle owner.

## TELEMATIC UNITY

This entity's main functions are:

▶ Collecting the driver's data (name, first name…)
▶ Collecting intra-vehicle data (model, motorisation)
▶ Determining the vehicle position (GPS)
▶ Storing the Vehicle / Driver data
▶ Drafting the vehicle data
▶ Producing the vehicle data
▶ Broadcasting the vehicle data
▶ Analyzing the vehicle data
▶ Implement vehicle management measures
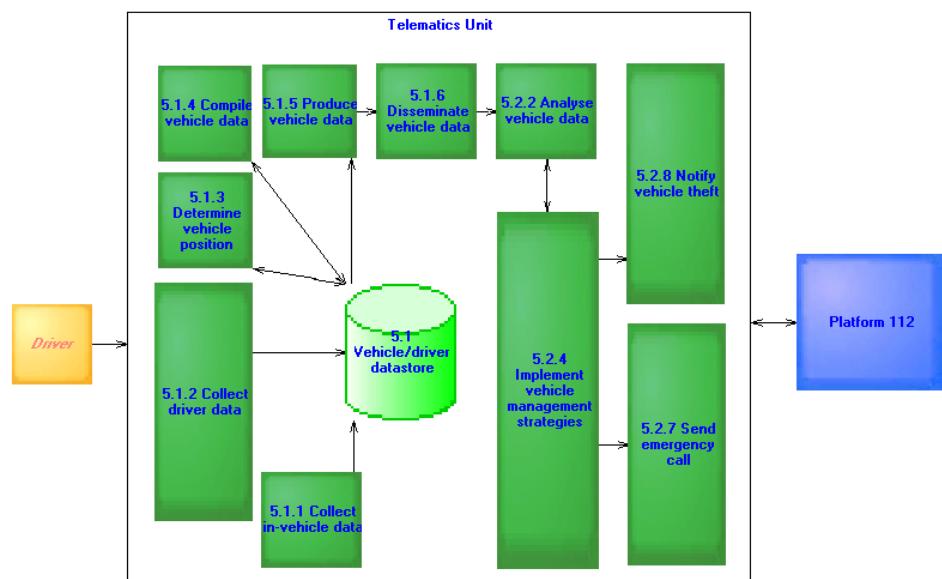▶ Sending the emergency call (automatic or manual one, towards 112)



**Figure 3: OSCAR modelling – Telematic unity**

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## 112 PLATFORM

Emergency calls are forwarded. It implies the implementation of computer systems (reception of the sent messages, geographical localization) and a strengthened organization to handle these automatic or manual calls. This entity's main functions are:

▶ Collecting the Incidents messages
▶ Qualifying the Incidents messages
▶ Forwarding the Incidents messages
▶ Storing the Messages / Incidents data
▶ Preparing the Messages / Incidents data
▶ Broadcasting the Messages / Incidents data
▶ Analyzing the Incident and Emergency data
▶ Storing the Emergency Management Strategy
▶ Implementing emergency management strategies
▶ Evaluating the efficiency of the emergency management strategies
▶ Activate / deactivate an emergency management strategy
▶ Storing the running Emergency Management Strategy data
▶ Implementing emergency management measures
▶ Leading the emergency interventions
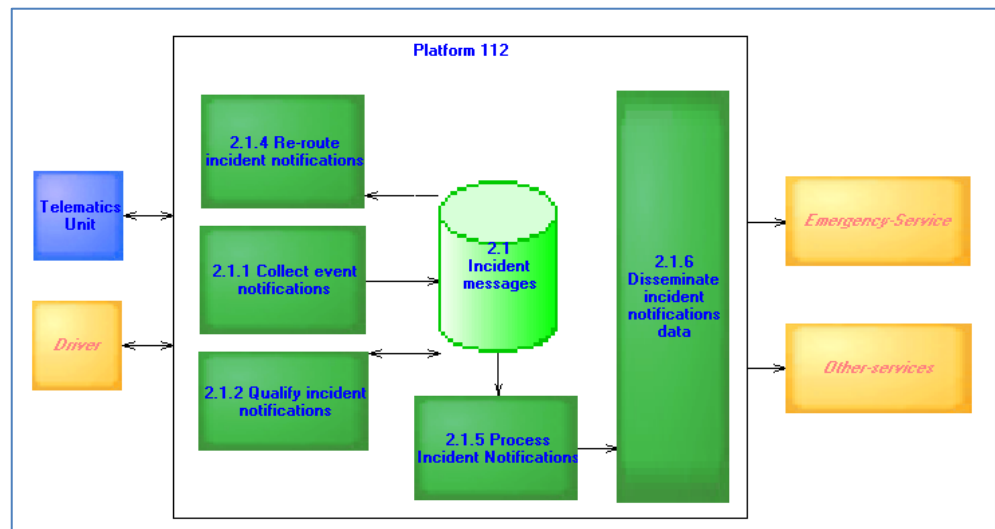


**Figure 4: OSCAR Modelling – 112 platform**

**OTHER SERVICES**

Services such as infrastructures administration or breakdown service can be directly called. Their intervention might be enough. They can also be specific platforms of services which activity is to answer the users' non urgent demands. That can be for instance a technical or mechanical assistance proposed by the car builders:

- ▶ bCall: breackdown call. This can be for instance a assistance call following a mechanical breakdown
- ▶ cCall : Concierge call. These are services such as the remote diagnosis of the vehicle (also see RVD) or the doors unbolting of a remote vehicle.
- ▶ eToll Collect
- ▶ Fleet Management
- ▶ SVT : Stolen Vehicle Tracking
- ▶ PAYD : Pay As You Drive
- ▶ RVD : Remote vehicle diagnostics

# 4.1.3. Examples of implementation

This kind of organization can be found in Finland and, to a lesser extent, in the Netherlands. Finland committed to develop eCall services in the country through a very strong policy.

## 4.2. SCENARIO 2

## 4.2.1. General presentation

We describe in this part the functional and organizational architecture that is based on the implementation of pre-treatment platforms. Their role is to pre-qualify the accident, before activating the intervention of the emergency services. Most of the time, this service is combined with a package of services (assistance, etc.).

## 4.2.2. Organisational architecture

This general diagram includes five entities:

▶ Driver
▶ Telematic unity
▶ Calls reception platform
▶ Emergency services
▶ Other services

The following diagram shows the five entities and the flows between them.
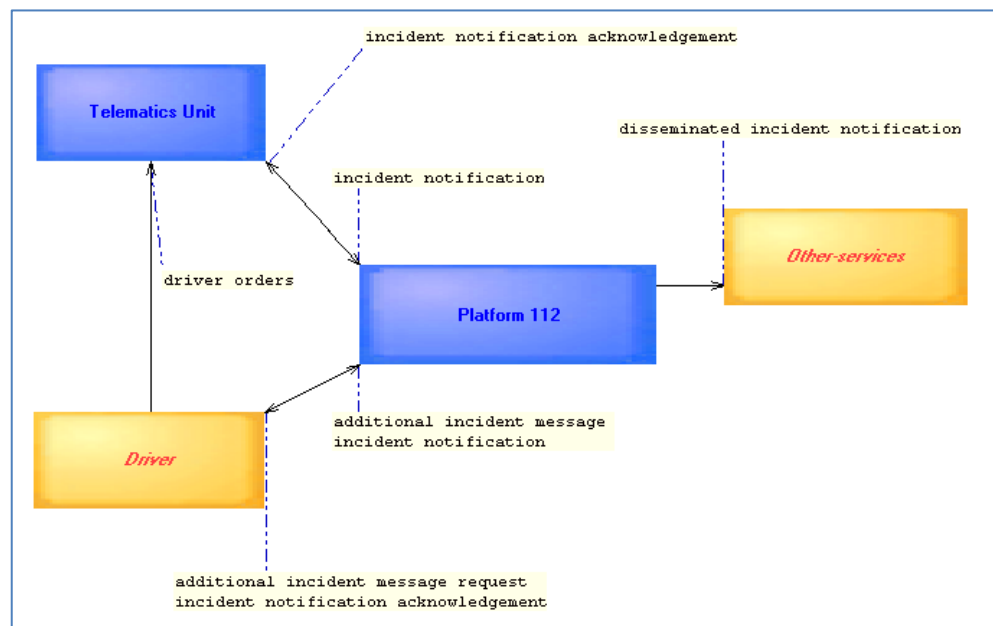


**Figure 5: OSCAR Modelling – General diagram**

As in the previous diagram, the entities in orange are not functionally described. In this case, it did not seem useful to describe the functions of the emergency services: they receive information about an event an intermediate platform has qualified. This platform is structured to receive and to handle automatic calls (emergency calls or calls coming from other services).

## TELEMATIC UNITY

This entity's main functions are:

- ▶ Collecting the driver's data (name, first name…)
- ▶ Collecting intra-vehicle data (model, motorisation)
- ▶ Determining the vehicle position (GPS)
- ▶ Storing the Vehicle / Driver data
- ▶ Drafting the vehicle data
- ▶ Producing the vehicle data
- ▶ Broadcasting the vehicle data
- ▶ Analyzing the vehicle data
- ▶ Implement vehicle management measures
- ▶ Notifying a vehicle theft
- ▶ Sending the emergency call (automatic or manual one, towards a specific emergency platform, depending on the driver)
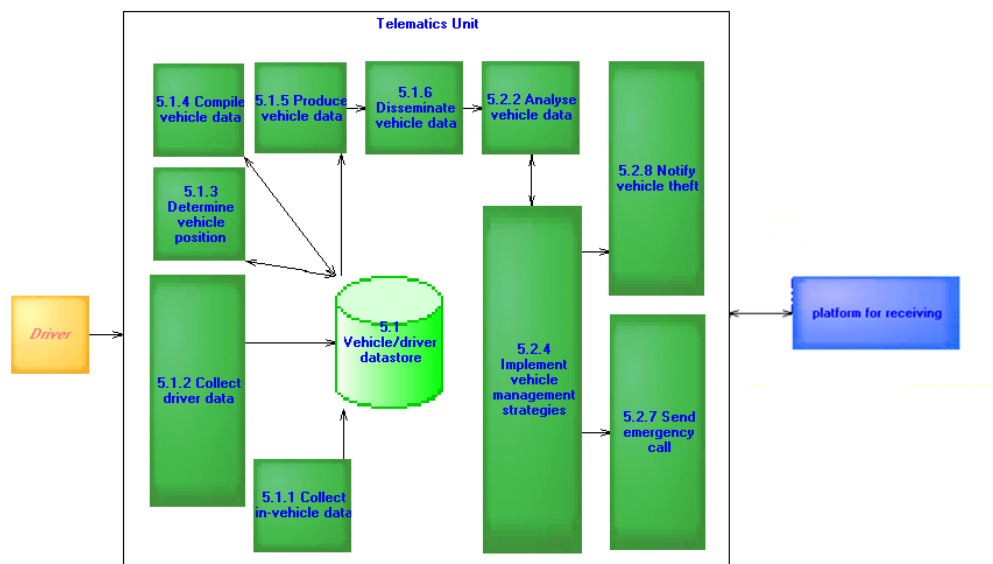


**Figure 7: OSCAR Modelling – Telematic unity**

## PRE-TREATMENT PLATFORM

This entity's main functions are:

▶ Collecting the Incidents messages
▶ Qualifying the Incidents messages (doubt removing)
▶ Forwarding the Incidents messages
▶ Storing the Messages / Incident data
▶ Preparing the Messages / Incident data (mobilizing the emergency services)
▶ Broadcasting the Messages / Incident data
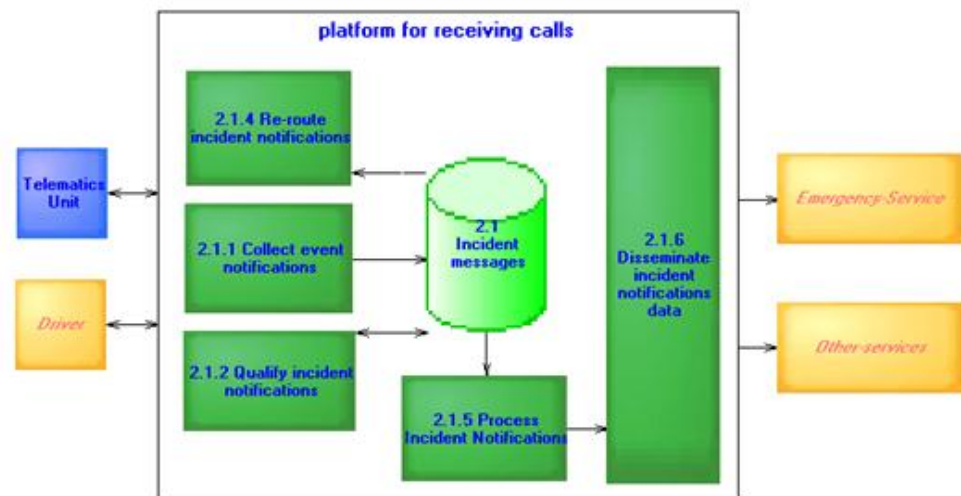


**Figure 8: OSCAR Modelling – Calls reception platform**

## DRIVER

He is the person who drives the vehicle. He is not necessary the vehicle owner.

## EMERGENCY SERVICES

In this architecture, they are the services as they exist nowadays. The calls reception platform screens and qualifies the accidents; then it requests the emergency services intervention.

The activation of the emergency services is done through telephone contact. Additional information is given to the emergency services (vehicle type, localization, fuel type…).

**OTHER SERVICES**

They are specific services platforms which activity is to answer the users' non urgent demands. That can be for instance a technical or mechanical assistance proposed by the car builders:

▶ bCall: breakdown call. This can be for instance an assistance call following a mechanical breakdown

▶ cCall: Concierge call. These are services such as the remote diagnosis of the vehicle (also see RVD) or the doors unbolting of a remote vehicle.

▶ eToll Collect

▶ Fleet Management

▶ SVT : Stolen Vehicle Tracking

▶ PAYD : Pay As You Drive

▶ RVD : Remote vehicle diagnostics

# 4.2.3.    Examples of implementation

Among the offer car manufacturers propose, emergency call services are often associated with a package of services, as for instance: technical assistance, doors bolting or unbolting of a remote vehicle, vehicle location in case of theft…

These different offers are based on the implementation of private platforms.

▶ PSA Peugeot Citroën (SUAL – Peugeot : WIP Com ; Citroën : NaviDrive)

● Available since January 2003 ; the emergency system is integrated to a telematic unity included in a package of services

● « Emergency call » service: the system was marketed indicating that the "emergency call button" would enable to contact the emergency services. This function is also automatically provided when a choc was detected and that the deceleration was analyzed. The driver can actually directly enter into contact with the private PSA Peugeot Citroën platform (actually Inter-Mutuelles Assistance, in France), wherever in Europe, in his mother tongue.

● Additional services: the telematic unity includes other services, such as moving help (guidance information and personalized and real-time traffic), touristic information, assistance, breakdown service, repairing, Peugeot or Citroën call centers (remote diagnosis, remote maintenance, customer relations),…

● This system is available in 9 countries (such as France, Spain, Italy, Benelux, Germany, and Portugal).

▶ Volvo (On Call System)

● Available since the 1st January of 2006. This system has two main functions: safety and security.

● SOS and breakdown service: for the "emergency call" function, the system can start automatically after an accident or after the driver's manual action. The system sends an MSD to the Volvo private platform. Then this platform communicates with the appropriate emergency services and gives them the information the telematic unity sent. The system also had a breakdown service function that can send the « Volvo Assistance » services if there is a problem.

● Stolen car location service: if a theft activates the car alarm, the alert is sent to the platform, which then calls the vehicle back to remove the doubt. If it receives no answer, the platform calls the owner's private number to confirm the theft and to locate the car. The platform informs the police and gives them the vehicle location.

● Other additional services are proposed, such as remote unbolting when the keys were forgotten inside the car, etc.

● The system is available in 10 European countries (France, Germany, Belgium, Switzerland, Denmark, Spain, UK, Italy, Luxemburg and Sweden).

▶ BMW (Assist)

● BMW proposes a telematic service that integrates the automatic emergency call, the emergency service and the assistance.

● Crash Automatic Notice (ACN): the BMW Assist Centre is automatically warned *if the shock sensors detect the car involvement in an accident*. A BMW Assist specialist notes the vehicle location and other useful data. Then he establishes the direct communication with the driver or with a car passenger. *If no one answers, the Centre sends on the accident place the appropriate emergency services.*

● Emergency services: if the driver or a passenger selects the "emergency" option on the monitor screen or presses on the "SOS" button, the vehicle location and other important data are sent to the BMW Assist Centre. Then, a specialist tries to join the car occupants to coordinate the emergency services, to join the relatives and to connect them with the BMW Road Assistance, if necessary. He can also give the emergency road indications.

● Road assistance service: in case of puncture, breakdown or other mechanical problems, BMW Assist Center can connect with the Road Assistance Center. Once in contact, a Road Assistance Center specialist coordinates the repair services needed, according to the precise vehicle location.

● The system is available in the following countries : France, Germany, Australia, Canada, United Arab Emirates, Italy, Kuwait and UK.

▶ Fiat (Blue&Me Nav)

- During the Geneva International Automobile Show, in 2007, Fiat presented its Blue&Me Nav solution, which fits in some of it vehicle models. This solution offers characteristics such as:

- SOS Service: the SOS Service can be activated either manually by the driver, or automatically after an airbag setting off. An SMS is then sent to the implementation service telematic platform, in partnership with Telecom Italia; an answer in the caller's language is given.

- Location service (LBS: location-based service) thanks to the Services Info option, which enables to talk to an operator. This service costs 1.44 €/min, without annual subscription.

- Insure Service: this service gives the possibility to follow a stolen car and to determine the number of km the car covered, in order to adjust the insurance rate.

**Note :** *these services are based on a technical solution joinly developed by Fiat Group Automobiles and Microsoft, in order to operate – in transparency – the connexion, the integration and the functionning of a wide range of mobile phones, GPS browsing solutions and bulk storage peripherals.*

# 4.3. COMPARISON OF THE TWO ARCHITECTURES

The following table shows how the two architectures handle the requirements and constraints of a numerical calls automatic system.

| | Scenario 1 | Scenario 2 |
|---|---|---|
| **Guarantee of service**<br>**-Access to the service**<br>**-Technical interoperability** | = (European directives, certified services in every country, EU Commission and member states watch, responsibilities sharing out to be set)<br><br>= | = (Client contract)<br><br>= |
| **Free emergency calls** | + | - or = (association with a package of services) |
| **Calls priority** | + | = or + (depending on agreements between telephone operators and car manufacturers) |
| **Calls pre-qualification** | - | + |
| **Answer in the mother tongue** | - or = (translation serivces) | + |
| **Robustness** | + | + |

**Note** : *the graduation used is : -, =, +. « - » means the scenario does not permit to reach the goals or demands required. « = » indicates the goals or demands are partly reached. « + » means the goals or demands required are successfully reached.*

# 5. CONCLUSIONS

Nowadays organization of 122 in France, as well as in other countries, is limited or fails at fulfilling the expected e-Call services:

▶ Data receiving of the standard numerical message sent: SDIS platforms need an adaptation to be able to receive and handle these messages ;

▶ Dealing with calls in the vehicle occupants' language: when the platform calls the vehicle back in order to analyze the situation, the conversation should be quickly led in the persons in need's language. Thus, that language must be at first identified which might be a problem if the accident victim is unconscious or shocked. The situation analyze might then take a longer time;

▶ Platforms resizing or reorganization to deal with the increasing number of calls and qualification (doubt removing): a technical adaptation is necessary to receive SMS messages. Moreover, the amount of calls toward the 112 platforms will increase because of double calls coming from a two vehicles collision and of calls coming from witnesses. The doubt removing and the need to clearly identify the event might increase the processing time and hamper the service.

Considering the French context and the functional demands (pre-qualification, calls handling in the driver's language…), the use of 112 for emergency calls would at first need considerable adaptations:

▶ Modification of the organization of calls handling centres for emergency services (18 and 15): nowadays, SDIS are financed by General Councils;

▶ Implementation of a national handling platform for the "numerical" 112.