



French C-ITS Deployment Coordination committee

Vro-Global-System 2422_M - Main Document

2.4.2.2_M_Vro_System

Activity 2: Studies

Sub Activity 2.4 > Specifications

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Date	Version	Author(s)	Updates & changes	Diffusion
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Quality rules

Reference to the version administration

Version number to be composed of 3 digits > vR.XY

- **R** corresponds to the release number: it is upgraded each time SC Studies validates the diffusion of a new release,
- **X** is the major version number: it is upgraded each time SC Studies validates the deliverable,
- **Y** is the minor version number: it is upgraded each time a contributor changes anything.

Once the deliverable is approved, its version number is upgraded from vR.XY to vR.(X+1)0

Once the deliverable is release, its version number is upgraded from vR.XY to v(R+1).00

As illustration:

- 0.03 > Work in progress version
- 0.10 > Del. Approved by SC Studies but not released
- 2.00 > Del. approved & released (in release 2)
- 2.05 > Del. Updated - in progress version

Requirements identification & traceability

In this document, the following verbal forms are used to indicate requirements: **Shall / Shall not**

Recommendations shall be indicated by the verbal forms: **Should / Should not**

Permissions shall be indicated by the verbal forms: **May / May not**

Possibility and capability shall be indicated by the verbal forms: **Can / Cannot**

Inevitability used to describe behaviour of systems beyond of the scope of this del. shall be indicated by: **Will / Will not**

Facts shall be indicated by the verbal forms: **Is / Is not**

In the table here below:

2.4.X.XX > is the number given to the deliverable (e.g. 2.4.4.8)

YYYY > for digit are given to identifying which component/entity the requirement is addressing (e.g. LTCA for long term certificate authority)

ZZZ > is the numeration of the requirement

W > is the number of the version of the requirement

ID	2.4.X.XX-YYYY-ZZZ (W)
Component(s)	(e.g.) Vru-ITS-S, Vro-ITS-S, R-ITS-S, PKI
Requirement	(e.g.) An ITS station SHALL be able to request and get a Long-Term Certificate (LTC) from the SCOOP Public Key Infrastructure (PKI).
Acceptance	(e.g.) CA1: Vru-ITS-S sends a LTC request to the LTCA CA2: R-ITS-S relays the LTC request CA3: The LTCA verifies the request and sends a response CA4: The R-ITS-S relays the response CA5: The response is received by the Vru-ITS-S and is valid
Additional information	

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1 Introduction

1.1 Purpose of the document

This document has two purposes:

- **Define high level requirements**
It specifies the high-level requirements of the [Vro-Global-System] that are deployed in the Scoop / Croads / InDiD Projects. Those requirements insure the covering of the functional needs of Vro-Global-System users and administrators.
- **Verify Mobile System Profile (MSP) compliance and list deviations**
It specifies the French Vro-ITS-S profile, mostly based on the European C-Roads Platform documentation. It describes the interfaces requirements allowing the French Vro-ITS-S to be interoperable with other European C-ITS equipment.

1.2 Context

In SCOOP@F wave 1, communications were only based on ITS-G5. In addition to this communication mode, the wave 2 of the project introduces the possibility to use an additional IP link (over cellular or over 802.11p). Thus, resulting in a “hybrid” architecture mixing cellular (long range) and ITS-G5 (short range) accesses.

To achieve this architecture a new component (called Nfr-ITS-S in France) is introduced in each country. Its main role is to collect all the traffic information transmitted by the various national actors in the system and to disseminate it to the user vehicles via cellular communication.

In addition, a phase called “migration” imposes the usage of new standards. The present version of the document (2.4.2.2_M_Master) complies with those new versions of standard.

The present document integrates the following evolutions:

- Addition of the communication with the Nfr-ITS-S,
- Introduction of IVI messages to manage events from Step 4 of the project,
- Modification of the VroES software architecture (introduction of a communication bus).
- Addition of use cases to match Step 5&6 of the project.

1.3 Document organisation

The behaviour of Vro-Global-System is illustrated by a Use-Case Model. In order to keep the term “use case” for the use cases defined at the project level (D4a, B1, C3, G1a, ...), the term “service” is used instead.

This highlights the expected functions of the system (service) in its environment (the actors) and the relationships between the services and the actors (use case diagrams).

Therefore, this document includes:

- A presentation of the environment of the Vro-Global-System and the actors that interfere

with it (see § 3)

- ❑ A general view of the Vro-Global-System architecture (see § 4).
- ❑ A description of the functional requirements by Vro service using UML notation (see § 5 and 6).

Services are not described in textual terms but each service is illustrated by a nominal sequence diagram and supplemented by the resulting requirements.

At the end of the service description, an activity diagram presents its realization through the flow between the software applications that compose the Vro-Global-System. This diagram helps to better understand the responsibility of each subsystem in the realization of the service.

- The services described in § 5 are the primary services. They are focusing on the VroES (Tablet with ICPU) for a better understanding of the functioning of the Vro-ITS-S. The description is made from the point of view of the end user to better understand the contribution of the service.
 - The services described in § 6 are the secondary services. They apply to the Vro-Global-system and focus on the internal services and the administrator's usage of the system.
- ❑ A description of the internal and external interfaces of the Vro-Global-System. (see § 7)
 - ❑ The MSP [DA22] applicable requirements on the ITS stack impacting the interoperability between French Vro-ITS-S and other European ITS stations. (see §8)

1.4 Bundle organisation and traceability

The present document is the master of the 2.4.2.2 bundle. It defines the services independently from the type of C-ITS message (DENM, IVI etc.).

It is completed by:

- ❑ Two specifications instantiating the VroES services based on the C-ITS message type:
 - [DA1] dedicated to messages of type DENM,
 - [DA2] dedicated to messages of type IVI.
- ❑ An HMI specification [DA3].
- ❑ A hardware specification [DA23]

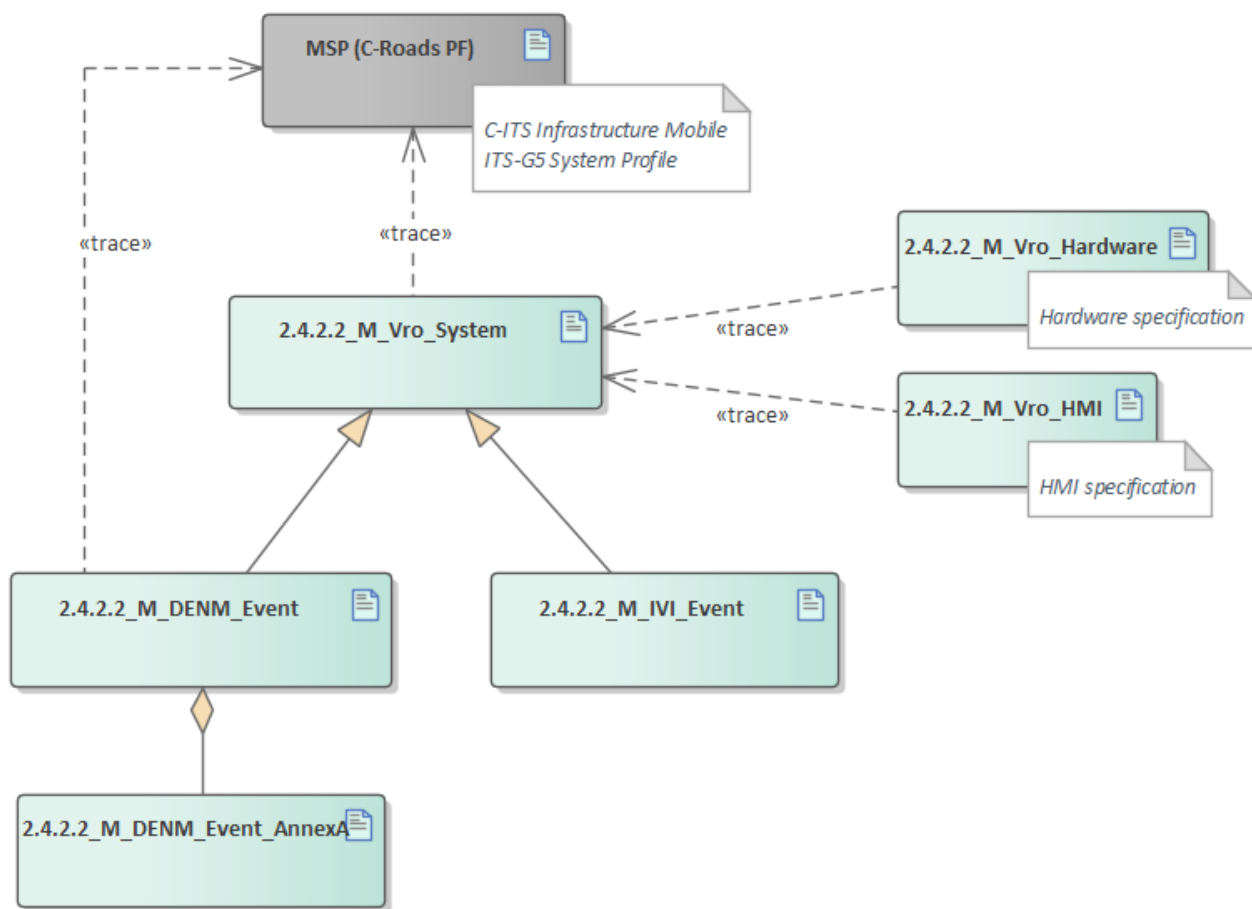


Figure 1: 2.4.2.2 Bundle organisation

The Master document is responsible for the coherence between the different versions of the bundle. Thus, the following table lists the applicable versions compatible with the present document:

Reference	Version
2.4.2.2_M_DENM_Event	V0.30
2.4.2.2_M_IVI_Event	V0.30
2.4.2.2_M_Vro_HMI	V0.40
2.4.2.2_M_Vro-ITS-S-Hardware_InDiD	V0.40

Table 1: Applicable version in the bundle

!/\ This implies that a change in one of the documents of the 2.4.2.2 bundle implies a new version of the Master document (at least to update Table 1)

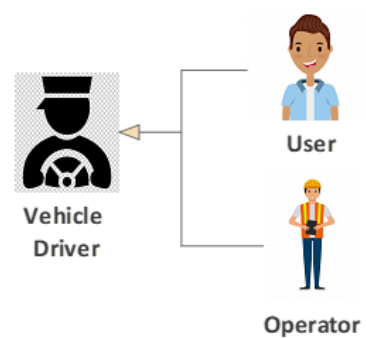
Each linked “trace” of Figure 1 is associated to a traceability matrix. Those are not referred in this document.

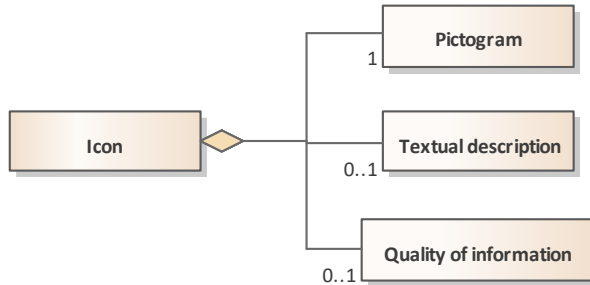
1.5 Definitions and Abbreviations

1.5.1 Abbreviations

Term	Definition
CAM	Cooperative Awareness Message
CAN	Car Access Network – standard access bus to the vehicle electronics
C-ITS	Cooperative – Intelligent Transport Systems
CRL	Certificate Revocation List
CTL	Certificate Trust List
[DAX]	Document Applicable n°x
DENM	Decentralized Environmental Notification Message
[DRx]	Document de Référence n°x
FLR	Arrow board trailer (Flèche Lumineuse de rabattement)
HSM	Hardware Secure Module
ICPU	Information and Communication Processing Unit
HMI	Human-Machine Interface
EC	Enrolment Certificate
Nfr-ITS-S	National French ITS Station
AT	Authorisation Ticket
PKI	Public Key Infrastructure
POI	Point Of Interest
PFro	Platform road operator
R-ITS-S	Roadside ITS station
SCOOP@F	French C-ITS pre-deployment project – European Project
SSP	Service Specific Permission
TMS	Traffic Management System
TSL	Trust-service Status List
V-ITS-S	Vehicle ITS station
VroES	Vro Embedded System

1.5.2 Definitions

Term	Definition
DE	Data Element. According to ITS standard TS 102 894-2, data type that contain one single data.
DF	Data Frame. According ITS standard TS 102 894-2, data type that contain more than one data element in a predefined order (it may imply presence of others DF)
Vro-Global-System	Includes: <ul style="list-style-type: none"> - Vro-ITS-S - Scoop server - Vro-ITS-S server (See § 3 Overview Description for description of above entities)
Vro-ITS-S	A road operator vehicle equipped with a VroES.
VroES	Equipment composing the C-ITS-Station that can be embedded in a road operator vehicle: <ul style="list-style-type: none"> - An ICPU - A tablet - Antennas
ICPU	Physical case that is included in the Vro-ITS-S. It is the core of the C-ITS station.
Mode	Logical gathering of functionalities depending on the driver's selected activity. Two modes are described: user and operator (see § 3.3.2)
Driver	<p>Two modes can be used in the Vro-ITS-S:</p> <ul style="list-style-type: none"> - "User mode" - "Operator mode" <p>When the mode has no impact on the behaviour of the Vro-ITS-S, the concept of "Driver" is used.</p>  <p style="text-align: right;"><i>Figure 2: Modes inheritance</i></p>
Activity	<p>Logical gathering of triggerable / displayable events which depends on the responsibilities of the driver.</p> <p>The default list of activities is:</p> <ul style="list-style-type: none"> • activity_id(0)=User • activity_id(1)=VH • activity_id(2)=Patrouille • activity_id(3)=Intervention • activity_id(4)=Travaux chantier mobile

	<ul style="list-style-type: none"> activity_id(5)=Travaux chantier fixe
Event	Corresponds to the “use cases” in the project context. e.g. D2a Animal on the Road, C3 eVMS, D7 Wrong Way Driving, D10 emergency breaking. See more details in § 3.3.1
Rx Event	Abstract concept that regroups events which are received by the Vro-ITS-S, whether they are received from the PFro, Nfr or other C-ITS-S.
Tx Event	Abstract concept that regroups events which origin is the Vro-ITS-S, whether they are automatically or manually triggered.
Icon	<p>An icon is composed following Figure 3. This concept is used for the display purpose of events on the HMI.</p>  <pre> classDiagram class Icon class Pictogram class TextualDescription["Textual description"] class QualityOfInformation["Quality of information"] Icon "1" *-- "1" Pictogram Icon "1" *-- "0..1" TextualDescription Icon "1" *-- "0..1" QualityOfInformation </pre> <p><i>Figure 3: Icon –Domain model</i></p>
Mobile R-ITS-S function	Functionality that is based on the translation “Datex ⇔ C-ITS message” and the cellular link between PFro and Vro-ITS-S. This is mainly linked to the service Communicate with PFro

1.6 Parameter naming and usage

There are 3 different levels of parameters used to implement the setting of the Vro-Global-System. All those parameters are configurable via the Scoop Server. The following table sums up their usage and meaning:

Type	Description
General (_GEN_)	<p>Those parameters allow to set up the general behavior of the application (setting of the DENMs, settings of the logs, exchange with PFro, Road Operator Specific Software...) They are relevant for the all Vro-ITS-S connected to the Scoop Server.</p> <p>Those parameters are used by the Scoop Tablet Software and Scoop ICPU Software</p>
Vehicle (_VEH_)	<p>Those parameters allow the customization of each Vro-ITS-S vehicle characteristics (vehicle dimensions, position of the antennas, Mobile-R-ITS-S identification, CAN dictionary...)</p> <p>Those parameters are used by the Scoop ICPU Software and the Basic ICPU Software.</p>
ICPU (_ICPU_)	<p>Those parameters only impact the behavior of the Basic ICPU Software. They are all set in the Scoop Server which provides a service to download this setting.</p> <p>However, contrary to the General and Vehicle setting, those parameters can also be generated and managed by the Vro-ITS-S server. The choice to either use one setting or the other is up to the road operator organizations and their ICPU sub-contractor.</p> <p>Those parameters can be either specific to each ICPU or global to all the road operator's ICPU. This is let to the discretion of the sub-contractor.</p>

Each time a parameter is used, its type is indicated: *GEN* – *VEH* – *ICPU*.

Each time a parameter is mentioned, it is completed by:

- ❑ § 6.7 which mentions the interactions between concepts and their parameters
- ❑ Annex B which defines for each parameter:
 - If it is defined for each vehicle or not, for each event or not etc,
 - The default value,
 - The type of the parameter,
 - A description.

2 Documents

2.1 Reference documents

Id.	Reference	Version	Title / Content
[DR1]	-	-	-

2.2 Applicable documents

Id.	Reference	Version	Title / Content
[DA1]	2.4.2.2_M_DENM_Event	Cf. Table 1	Vro-Global-System 2422_M - Main Document Annex - DENM handling
[DA2]	2.4.2.2_M_IVI_Event	Cf. Table 1	Vro-Global-System 2422_M - Main Document Annex - IVI handling
[DA3]	2.4.2.2_M_Vro_HMI	Cf. Table 1	Management of displays on the MMIs of road operator OBUs
[DA4]	2.4.4.8_M	0.30	SCOOP@F Security Integration Guide
[DA5]	2.4.1.4_M	4.80	Specification of DATEX II v2.3 messages in conjunction with C-ITS messages
[DA6]	Scoop.txt	3.4	ASN.1 definition of the common log file dictionary.
[DA7]	tlog-uevg.asn	3.4	ASN.1 definition for road operator T-LOG.
[DA8]	Ulog_UEVg.txt	3.4	ASN.1 definition for road operator U-LOG.
[DA9]	SecurityLogsUEVg.txt	3.4	ASN.1 definition for security records included in road operator T-LOG.
[DA10]	2.4.1.3_H_CatLog	V0.10	CatLog
[DA11]	2.4.1.3_H_LogFormat_Application_CITS	V0.01	NA
[DA12]	2.4.1.3_H_LogFormat_Communication	V0.01	NA
[DA13]	Recommendation ITU-T X.691/ISO/IEC 8825-2	(1997-12)	Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)
[DA14]	SCOOP_2.4.1.3_CatOfDataTlog_v13.xlsx	V1.3	Catalogue Of Data Tlog To Collect
[DA15]	SCOOP_2.4.1.3_Tlog_annexe Security_v4.2_fr.xlsx	V4.2	Catalogue Of Data Tlog for Security To Collect.
[DA16]	TBD	TBD	Catalogue Of Data Ulog To Collect
[DA17]	EN 302 636-4-1	V1.4.1	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for

			point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality
[DA18]	EN 302 636-5-1	V2.2.1	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol
[DA19]	2.4.1.2_M	V4.110	Master technical specifications for I2V use cases
[DA20]	2.5.2.1_H_Dossier_Conception_FC11	Version P	Communiquer entre les modules UEVg
[DA21]	BPO_SPE_Interface_SCOOP_METIER	Version L	Interface entre Applications SCOOP et Métier
[DA22]	Infrastructure mobile ITS-G5 System Profile	2.0.3_SCOM.1	Infrastructure mobile ITS-G5 System Profile
[DA23]	2.4.2.2_M_Vro-ITS-S-Hardware_InDiD	Cf. Table 1	Deliverable specifications for Vro-ITS-S : hardware
[DA24]	DATEXII-DevGuide	2.3	DATEX II V2.3 SOFTWARE DEVELOPER'S GUIDE
[DA25]	2.5.5.1	J	Spécifications techniques Plateforme SCOOP
[DA26]	TS 102 894-2	v1.3.1	Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary

Note: The listed versions of [DA19] and [DA5] are not the latest approved versions.

3 Overview Description

3.1 Environment

The environment diagram of Vro-Global-System is as follows:

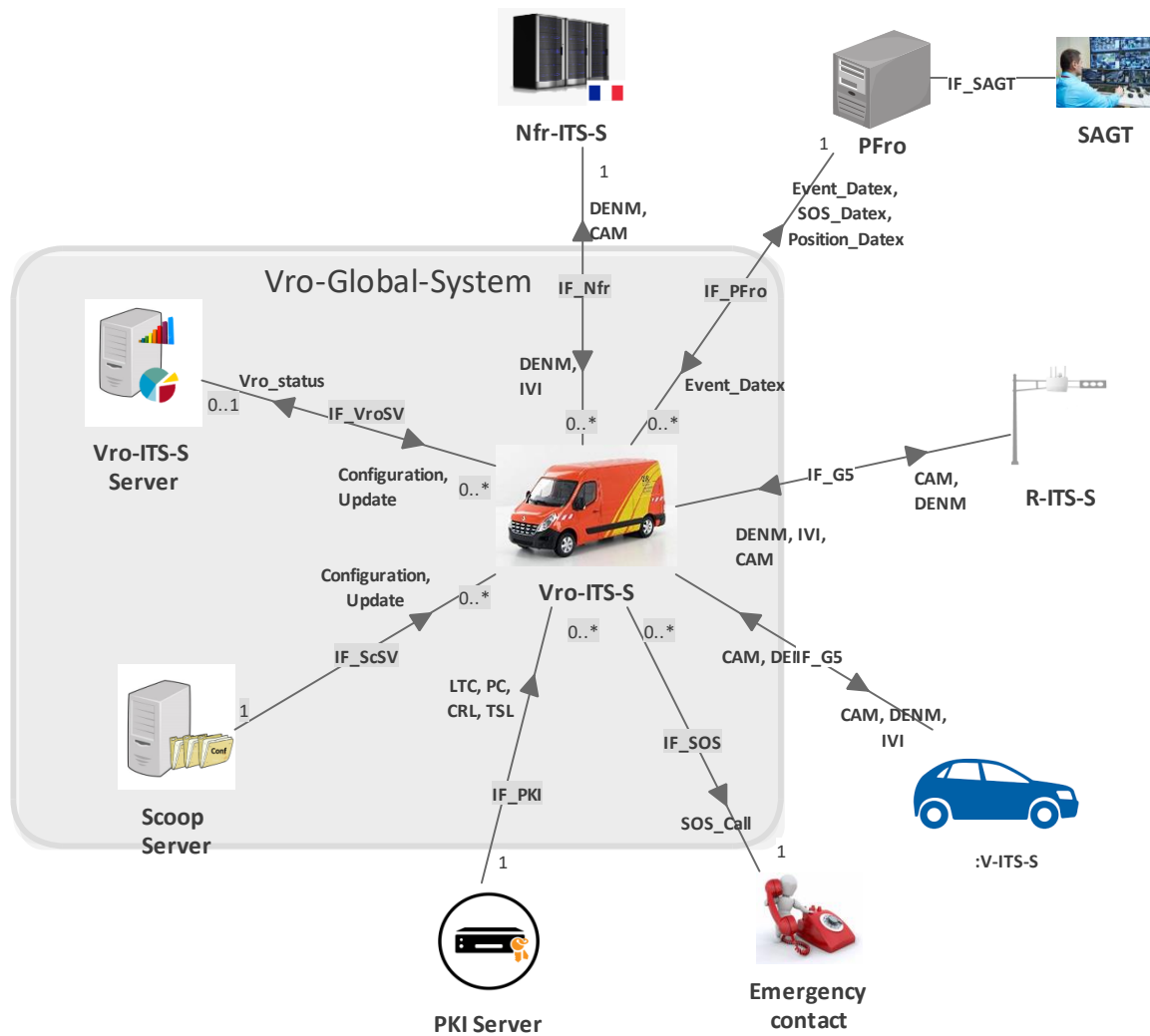


Figure 4: Vro-Global-System environment

The flow of log files is not indicated in this figure. For details on this flow, see chapter 6.1.

3.2 Actors

3.2.1 TMS /SAGT

The TMS (SAGT in France) is the central system where road operators supervise the traffic and the roads state on their sector. Those centres exist independently of C-ITS project.

In the project, the main roles of the TMS are:

- To signal detected events (e.g. accident detected via camera).
- To confirm / deny the pertinence of a received event.

3.2.2 PFro

The PFro is a server whose main role is to allow the link between the TMS and the road operator's C-ITS stations (R-ITS-S and Vro-ITS-S) as well as to the Nfr-ITS-S.

PFro software is common to all road operators. It is deployed by each individual road operator that possesses a TMS.

3.2.3 Nfr-ITS-S

The hybrid communication architecture shall allow to send and receive messages through different radio links from/to V-ITS-S.

New services are available through the usage of cellular access and a central server, called National ITS Station, which forwards information at applicative level from traffic control centres to V-ITS-S even if they are not in the range of an R-ITS-S. A National Central ITS Station is deployed in each country in order to ensure cellular interoperability.

3.2.4 R-ITS-S

An R-ITS-S is a C-ITS station of the infrastructure side which is stationary. It provides traffic, safety, or accidents' information depending on its wireless coverage and could share this information with the C-ITS infrastructures.

3.2.5 V-ITS-S

V-ITS-S are vehicles specially equipped to exchange messages in the scope of the Scoop Project. There are two categories of V-ITS-S:

- Vru-ITS-S that can exchange messages with other C-ITS-S. They handle the user events of the Scoop project.
- Vro-ITS-S, see below.

3.2.6 Vro-Global-System

3.2.6.1 Vro-ITS-S

A vehicle belonging to a road operator fleet equipped with a C-ITS station. It provides the following features:

- Handle the Scoop / C-Roads / InDiD events,
 - Exchange C-ITS-S messages via G5,
 - Display all relevant known events.
- Handle Mobile R-ITS-S function,
 - Inform TMS of nearby known events (via PFro),
 - Send on G5 events received from TMS (via PFro).
- Handle the hybridisation communication with the Nfr-ITS-S,
 - Inform Nfr-ITS-S of triggered events,
 - Send events received from Nfr via G5.
- Provide a navigation system to the driver,
- Allow the emission of a SOS in case of emergency.

3.2.6.2 SCOOP Server

The main features are:

- Handle the configuration of all Vro-ITS-S from a road operator's fleet,
- Handle the profiles for Vro-ITS-S drivers.

A unique software is developed for all road operators in France. It is then installed on local physical servers for each road operator.

3.2.6.3 Vro-ITS-S Server

The main feature is:

- Handle the supervision of all Vro-ITS-S from a road operator's fleet,
- Provide a service of configuration to supersede parameters of Scoop server (optional as mentioned in § 1.6).

A local software is developed by each road operator. It is then installed on a local physical server (it can be the same as the one used for the Scoop server).

3.3 Main concepts used

3.3.1 Activity/Events

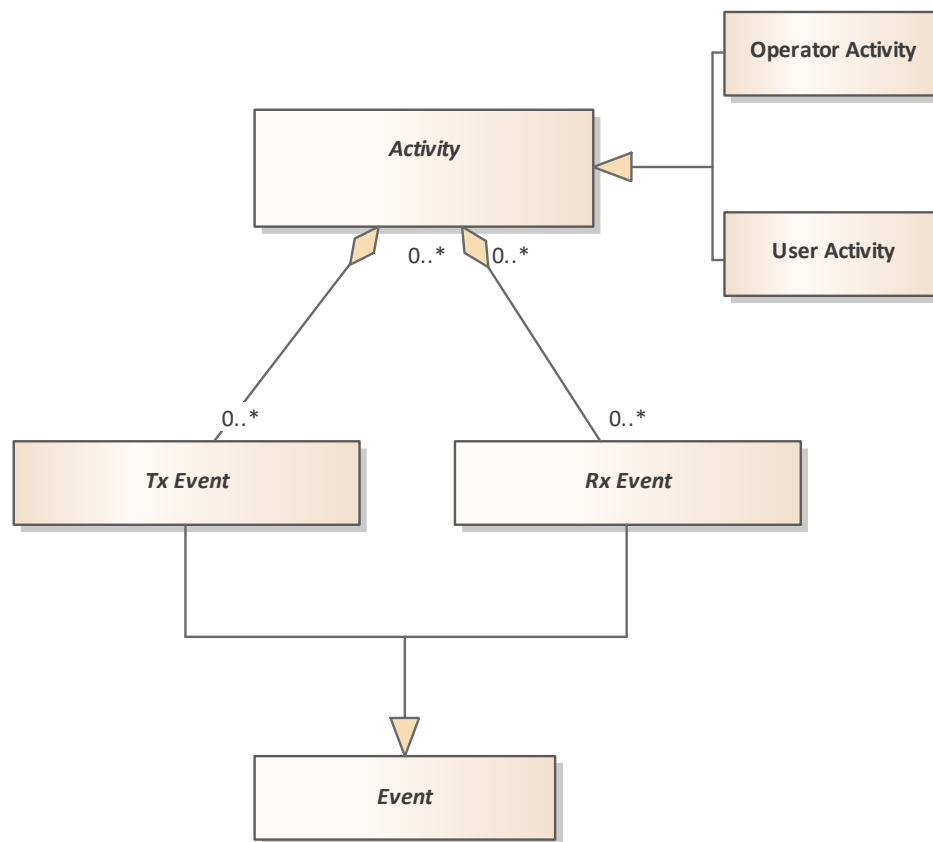


Figure 5: Activity and event main concepts - class diagram

Name	Description
Activity	See Definitions
Operator Activity	Activity that has a coherence with regards to the Road Operator line of work. When an OperatorActivity is selected, the operator mode is activated.
User Activity	Activity that has a coherence with regards to a common driver usage. When the UserActivity is selected, the user mode is activated. /\ only one user activity is allowed in the configuration.
Event	See Definitions
Rx Event	See Definitions

Tx event	<p>See Definitions</p> <p>/!\ The emission of a C-ITS message after translation of a DATEX is not considered as a triggered event, as the event is <u>received</u> from the PFro.</p>
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3.3.2 Modes

Two modes are defined in this document:

- The **user mode** (if the user activity is selected, see 3.3.1),
- The **operator mode** (if one of the operator activities is selected, see 3.3.1).

The principal differences between those modes are:

- The operator mode gives access to more functionalities than the user mode (e.g. circuits and Mobile-R-ITS-S function)
- The emitted messages are different depending on the modes (quality of the information, certificates etc.)

3.3.3 Setup

The two main setups are:

- Vro-ITS-S **with a tablet** linked to the ICPU.
- Vro-ITS-S **without a tablet**.

The behaviour of the Vro-ITS-S is slightly different between both setups. Per default in this document, the setup is with tablet. If the tablet is absent, it will be specified in the requirements.

/! The presence or not of a tablet is not detected physically, it is configured.

3.3.4 Profiles

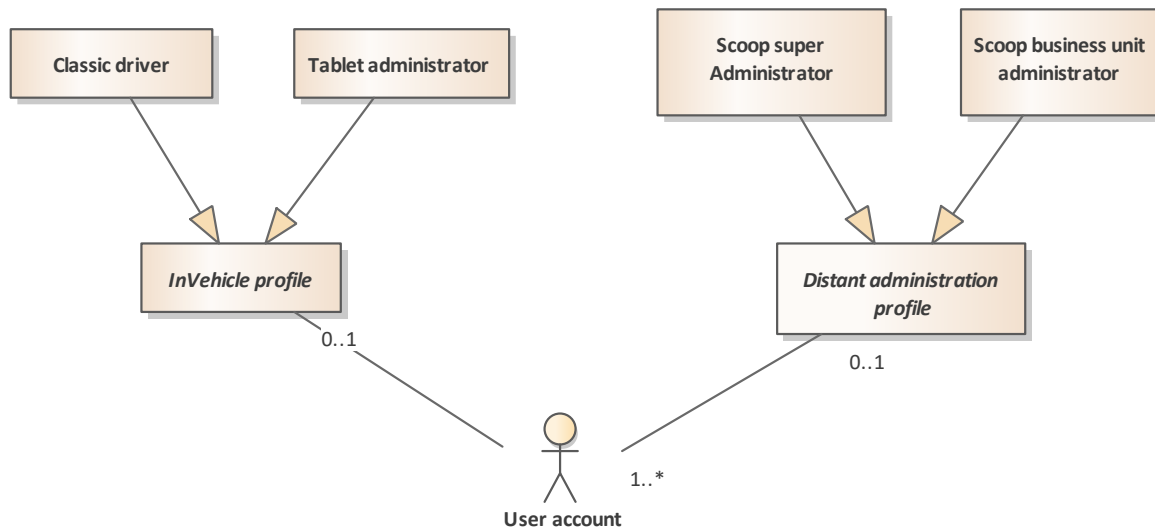


Figure 6: End User profiles - class diagram

InVehicle profile allows to define the user rights for a vehicle driver. (see 6.2)

Distant administration profile allows to define the user rights for the access to the Scoop server (see 6.7.1)

In both cases, two sub-profiles are defined:

- The vehicle user can either be a classic driver, or have additional rights on the tablet administration.
- The distant administrator can either have all the rights on the configuration, or an access limited to the business unit he is attached to.

4 Vro-Global-System Architecture

4.1 Architecture – Physical view

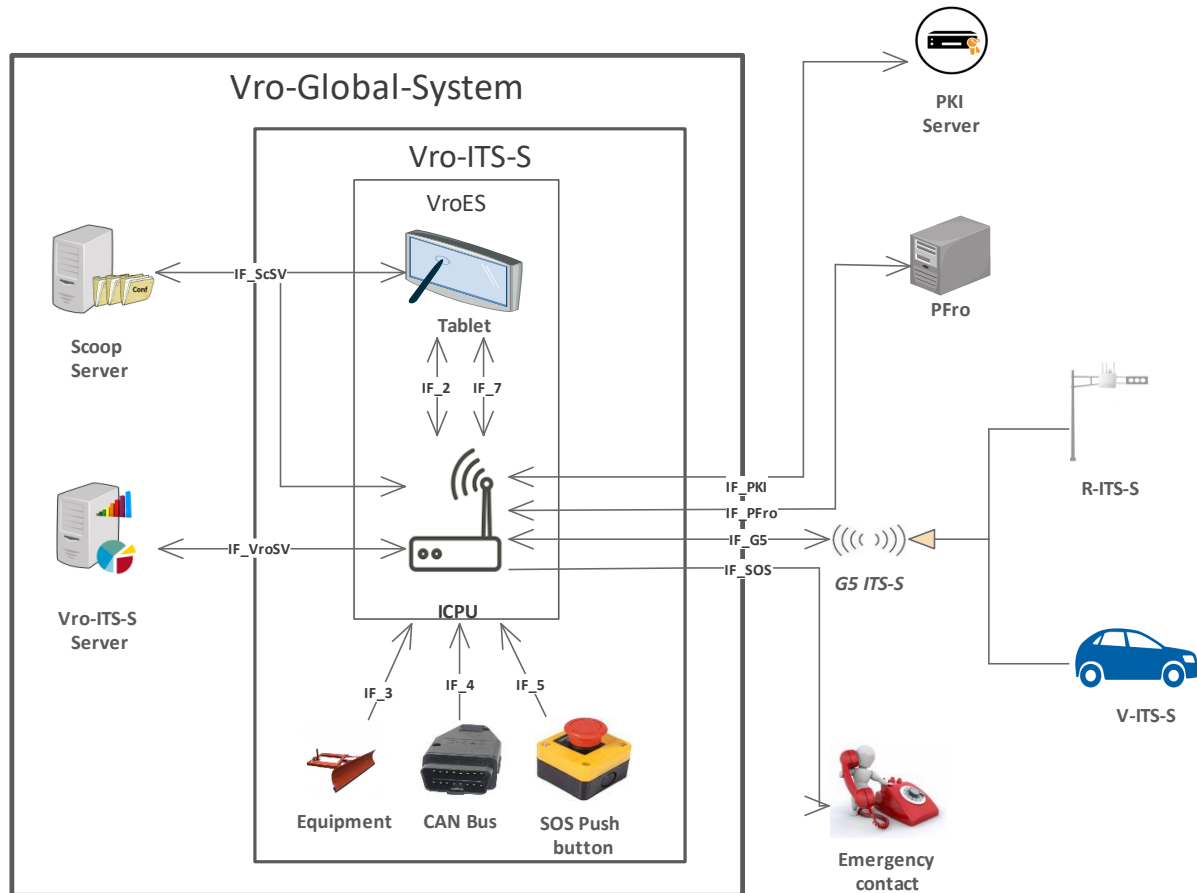


Figure 7: Overview of a Vro-Global-System components and its functional environment

The Vro-Global-System is composed of:

- ❑ **ICPU** (+antennas): unit which main feature is to centralise the communication (IP - V2X – GPIO - CAN) and to manage the treatment of a major part of the data. The § 1.4 determines where the ICPU hardware architecture is defined among the 2.4.2.2 bundle.
- ❑ **Tablet**: it holds the HMI services that allow the driver to inform / to be informed of an information in its close environment. The tablet is linked to the ICPU via a WIFI connection, IF_2 and IF_7 interfaces described in § 7.2.3.
- ❑ **Vehicle equipment** (including CAN - Equipment – SOS push button): passive or active systems with a wire connection to the ICPU. Their main role is to provide information to the VroES, e.g. CANBus => wipers on; Equipment => Snow plough active

- ❑ **Scoop Server:** Scoop Server is a local server on which resides the Scoop Server Software. The hardware does not have to be specifically dedicated for this application. Other applications like Vro-ITS-S Server can reside on it.
- ❑ **Vro-ITS-S Server:** same as Scoop Server above.

4.2 Architecture – Component view

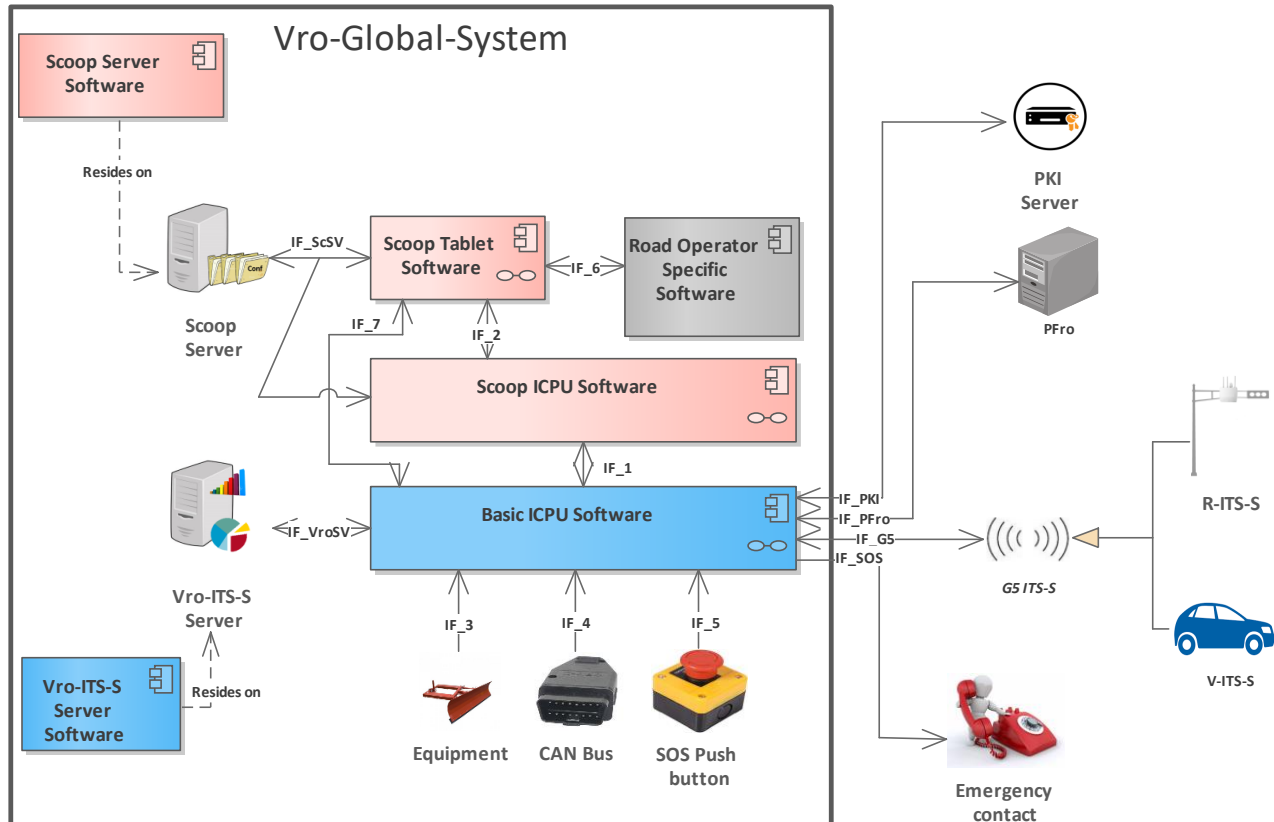


Figure 8: Overview of a Vro-Global-System software components

Figure 8 represents the Vro-Global-System in its functional environment and the interaction of its subsystems. It is to note that the “Road Operator Specific Software” is considered as an external sub-system, even if it is integrated on the same tablet as the Scoop Tablet Software.

- ❑ **Basic ICPU software:** its main features are to process the V2X stack and to handle the HSM (for secured messages). This application installed on the ICPU handles the communication means of the VroES. It principally allows the data collection, treatment and transmission.
- ❑ **Scoop Tablet software:** it allows to handle the interactions with the driver. The display rules and HMI ergonomics are described in [DA3].
- ❑ **Scoop ICPU software:** Its main features are to handle the Mobile R-ITS-S function and the applicative part of the road operator C-ITS events. This application is installed on the ICPU and is interfaced with the tablet Software and the basic ICPU software.

- ❑ **Scoop Server software:** Its main feature is to allow the configuration of all vehicles of the road operators fleet via the usage of parameters database.
This application is the same for each road operator's infrastructure. This software can reside on the same server as other application like Vro-ITS-S Server Software.
- ❑ **Vro-ITS-S Server software:** Its main feature is to provide to road operators the ability to supervise the vehicle fleet: for instance, Vro-ITS-S currently activated; status of the VroES of a certain vehicle; etc.
This software is developed and implemented by each Road operator infrastructure. It can reside on the same server as other application like Scoop Server Software.

The interactions between the different software components to realise the services are presented in the activity diagrams of § 5, in addition to [DA1] and [DA2].

4.3 Choices impact

4.3.1 Vro-Global-System split in two contracts

The development of the Vro-Global-System softwares is divided in two types of contracts:

- ❑ **A national contract**

In its scope are the development of:

- The Scoop ICPU Software
- The Scoop tablet Software
- The Scoop Server Software

Those three softwares are called “national software” as they are used by all the road operators in France.

- ❑ **Local contracts (led by each road operator)**

In its scope are the development of:

- The Basic ICPU Software
- The Vro-ITS-S Server Software
- The integration of the three national software.

The hardware is provided by the local supplier. (ICPUs, Tablets, Server(s), antennas).

Figure 9 represents the repartition of the deliveries to realize the Vro-Global-System:

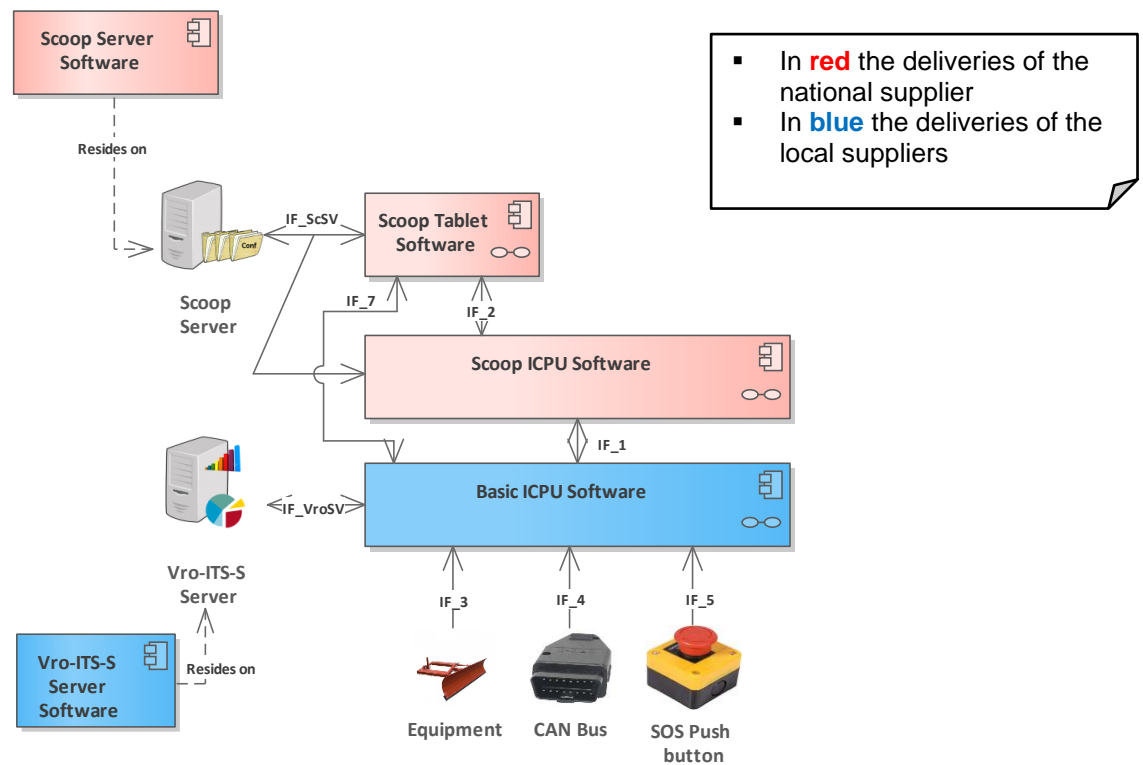


Figure 9: Repartition of the deliveries between local and national suppliers

This repartition gives flexibility to the stakeholders to choose their local supplier while assuring a consistency in the services offered by all Vro-ITS-S at the national level.

4.3.2 One tablet for all operator's tools

The VroES implies the addition of an HMI in the vehicle. In order to prevent the multiplication of screens in the Vro-ITS-S, a unique tablet should support the applications useful to the driver. Therefore, a communication between the ITS application and other road operator application are implemented (see § 7.2.3.4)

5 VroES services (and high-level requirements)

The diagram below is centred on the [VroES]. Thus, the other systems of the Vro-Global-System are considered as external actors.

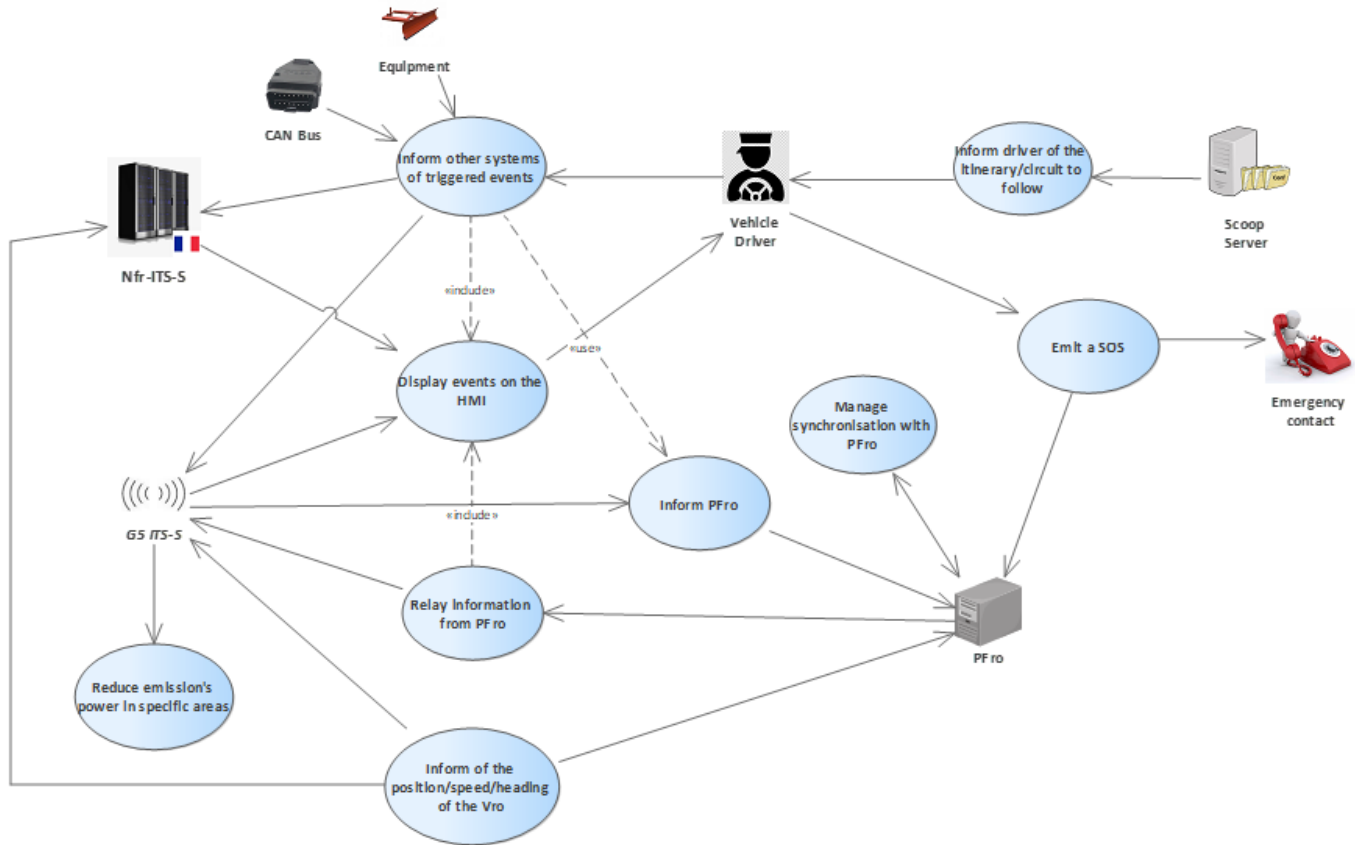


Figure 10: Principal services

The services are described in the following chapters:

- § 5.1 [\[Display events on the HMI\]](#)
- § 5.2 [\[Inform other systems of triggered events\]](#)
- § 5.3 Communicate with PFro includes:
 - [\[Inform PFro\]](#)
 - [\[Relay information from PFro\]](#)
 - [\[Manage synchronisation with PFro\]](#)
- § 5.4 [\[Inform driver of the itinerary / circuit to follow\]](#)
- § 5.5 [\[Emit a SOS\]](#)
- § 5.6 [\[Inform the position/speed/heading of the Vro\]](#)
- § 5.7 [\[Reduce emission's power in certain areas\]](#)

5.1 Display event on the HMI

As indicated in Figure 10, this service [Display events on the HMI] is called:

- when VroES receives an event from G5, Nfr or PFro via the service [\[Relay information from PFro\]](#)
- when an event is triggered by the system (see service [\[Inform other systems of triggered events\]](#))

5.1.1 Nominal case

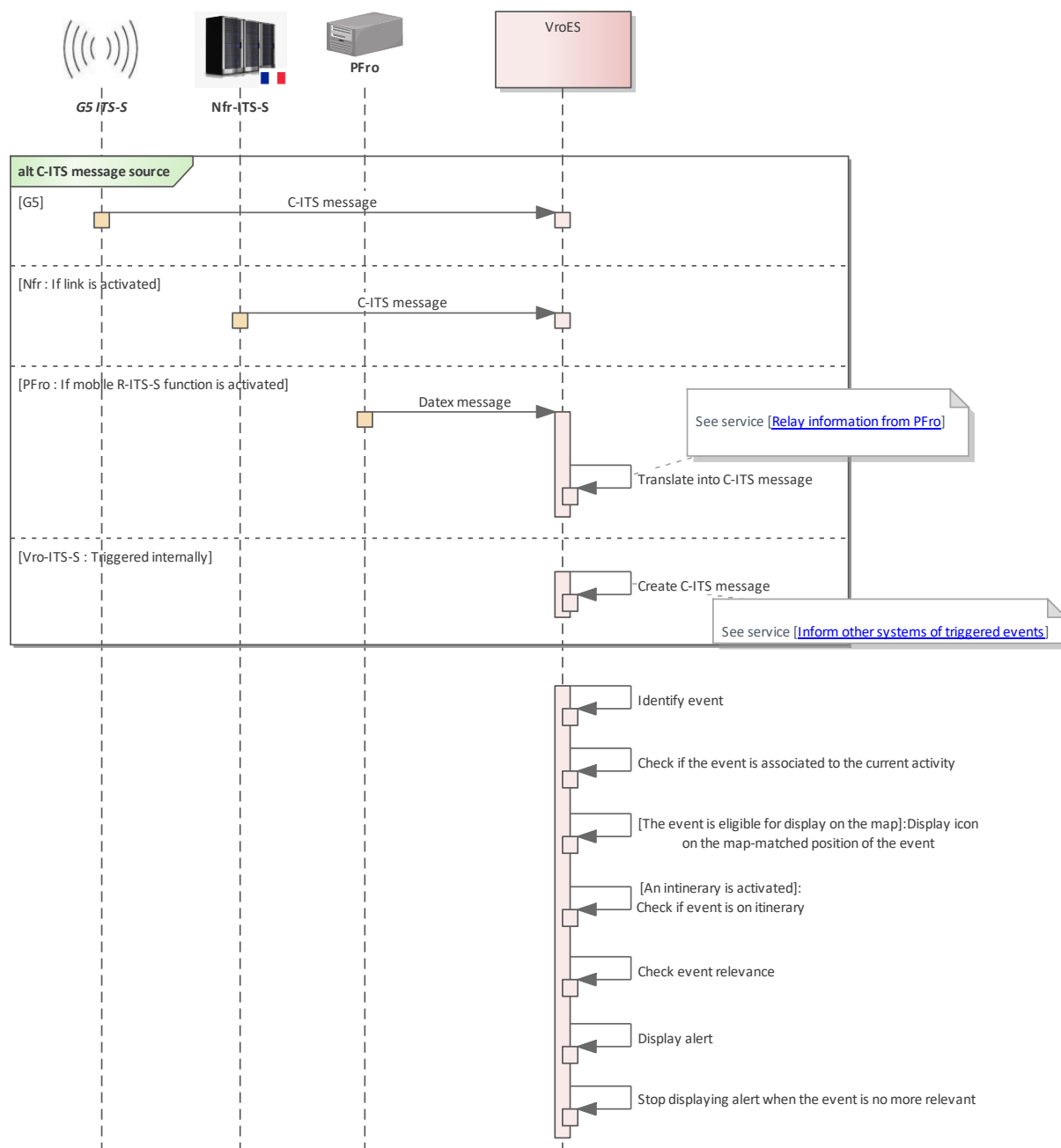


Figure 11: Display received event – nominal case – sequence diagram

ID	2.4.2.2_Master-DISPL-001(1)
Component(s)	VroES
Requirement	<p>At the reception of a C-ITS message, the Vro-ITS-S shall identify the event following:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM ▪ [DA2] if the message is an IVIM
Additional information	N/A

ID	2.4.2.2_Master-DISPL-002(1)
Component(s)	VroES
Requirement	<p>When a Datex is translated into C-ITS message (cf.§ 5.3.2), the Vro-ITS-S shall identify the event following:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM ▪ [DA2] if the message is an IVIM
Additional information	<p>When a C-ITS message is emitted after the translation from C-ITS Datex, the Vro-ITS-S is not the source of the message. Thus, the event is considered as a RECEIVED one.</p>

ID	2.4.2.2_Master-DISPL-003(1)
Component(s)	VroES
Requirement	<p>At the reception of an event, only Rx events associated to the current activity shall be display on the map.</p> <p>The association Rx events ⇔ Activity is defined in § 6.7.3 and illustrated in Figure 42</p>
Additional information	N/A

ID	2.4.2.2_Master-DISPL-004(1)
Component(s)	VroES; Scoop Server
Requirement	<p>When an event is triggered by the Vro-ITS-S, the Vro-ITS-S shall display an icon if <i>p_GEN_displayAuthorisation</i> is set to True for the Tx event.</p> <p>The displayed icon shall be distinguishable from the icon of received events.</p>
Additional information	N/A

ID	2.4.2.2_Master-DISPL-019(1)
Component(s)	VroES
Requirement	The icon of a Tx and Rx event shall be map-matched on the cartography.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-005(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall display icons as specified in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM, ▪ [DA2] if the message is an IVIM.
Additional information	<p>The composition of an Icon is described in Definitions</p> <p>Map-matching is also described in the annexes.</p>

ID	2.4.2.2_Master-DISPL-006(1)
Component(s)	VroES
Requirement	If an itinerary is active (see § 5.4) the Vro-ITS-S shall consider an event as eligible to an alert only if the event is on the itinerary.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-007(1)
Component(s)	VroES
Requirement	<p>If the event is considered as relevant, the Vro-ITS-S shall display an alert.</p> <p>The event relevance conditions and the associated alert are described in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM ▪ [DA2] if the message is an IVIM
Additional information	N/A

ID	2.4.2.2_Master-DISPL-008(1)
Component(s)	VroES
Requirement	When an event is triggered internally, the Vro-ITS-S shall consider it not relevant. Thus, Vro-ITS-S shall not display an alert.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-009(1)
Component(s)	VroES
Requirement	The Vro shall display an alert as long as the associated event is relevant. Once the relevance conditions are not fulfilled anymore, the alert shall be removed from the HMI.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-010(1)
Component(s)	VroES; Scoop Server
Requirement	In order to avoid the driver's distraction, when an event is critical (i.e. p_GEN_criticalDarkScreen is set to true), the Vro-ITS-S shall display a dark screen instead of the alert, and this during p_GEN_criticalDisplayDuration. In addition, the Vro-ITS-S shall emit once a sound alert defined per Rx Event. After this duration, the nominal scenario is resumed.
Additional information	If the event leads to multiple consecutive alerts (e.g. for linear DENM events), this only concerns the first alert to be displayed.

5.1.2 Alternative case

ID	2.4.2.2_Master-DISPL-011(1)
Component(s)	VroES
Requirement	At the reception of an update of a displayed event, the Vro-ITS-S shall update: <ul style="list-style-type: none"> the icon on the map, the alert if active.
Additional information	The critical display shall not be displayed again if already showed off once for this event. /!\ An update may impact the identification of the event (mostly coseCode/SubCauseCode for DENM or content for container structure for IVI).

ID	2.4.2.2_Master-DISPL-012(1)
Component(s)	VroES
Requirement	At the reception of a cancellation of a displayed event, the Vro-ITS-S shall remove: <ul style="list-style-type: none"> the icon from the map, the alert if active.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-013(1)
Component(s)	VroES
Requirement	If the driver changes from an activity to another, the Vro-ITS-S shall refresh the displayed events according to the new selected activity, i.e display only authorised events.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-014(1)
Component(s)	VroES
Requirement	When several icons are superimposed on the map, the Vro-ITS-S shall display on the foreground the icon with the highest display priority.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-015(1)
Component(s)	VroES
Requirement	When several alerts are activated simultaneously, the Vro-ITS-S shall display on the foreground the alert with the highest display priority.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-016(1)
Component(s)	VroES; Scoop Server
Requirement	<p>The display priority level shall depend on:</p> <ul style="list-style-type: none"> ▪ The nature of event (D2a Animal on the Road, ...) ▪ The source of the event: <ul style="list-style-type: none"> ○ Triggered by Vro-ITS-S (<i>p_GEN_TxDisplayLevel</i>) ○ Triggered from TMS (from PFro (<i>p_GEN_RxDisplayLevelFromDatex</i>)) ○ Received from other sources (G5, Nfr...) (<i>p_GEN_RxDisplayLevelFromITS</i>) <p>The display priority level shall be configurable.</p>
Additional information	N/A

ID	2.4.2.2_Master-DISPL-017(1)
Component(s)	VroES
Requirement	If multiple icons with the same display priority level are superposed, the Vro-ITS-S shall display the last one received in the foreground.
Additional information	N/A

ID	2.4.2.2_Master-DISPL-018(1)
Component(s)	VroES
Requirement	In the degraded mode where the connection between Tablet and ICPU is lost (e.g. from unexpected extinction of the Scoop Tablet Software) then: At the reconnection the VroES shall synchronise the displayed events with the known events in the ICPU. (see Figure 12)
Additional information	N/A

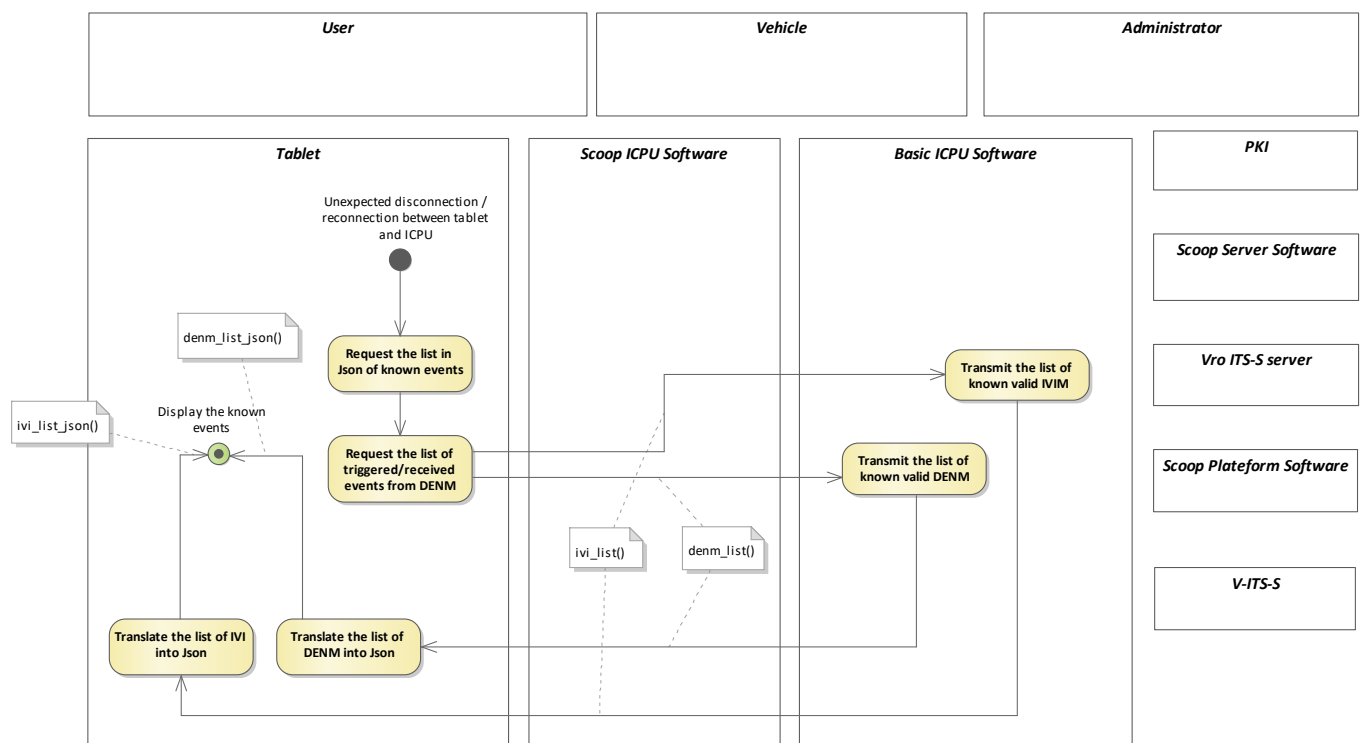


Figure 12 : Unexpected disconnection / reconnection between Scoop Tablet and ICPU– activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3.

The table below specifies certain behaviours of those methods in the activity diagram context. (list of parameters mentioned is not exhaustive compared to the definition of the method.)

Method	Specificities and parameters
[denm_list]	N/A
[ivi_list]	N/A
[denm_list_json]	Scoop Tablet Software internal
[ivi_list_json]	Scoop Tablet Software internal

5.2 Inform other systems of triggered events

The Vro-ITS-S offers two ways to trigger an event:

- Manually via the HMI (see § 5.2.1),
- Automatically when predefined triggering conditions are fulfilled (see § 5.2.2).

The following requirements apply no matter the triggering way. They describe the interfaces to respect when sending an event.

ID	2.4.2.2_Master-TRIG-001(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall respect the interface IF_G5 to transmit the created C-ITS messages over G5.
Additional information	This includes the dissemination rules and the associated parameters.

ID	2.4.2.2_Master-TRIG-002(1)
Component(s)	VroES
Requirement	The Vro-ITS shall respect the interface IF_Nfr to transmit the created C-ITS messages to the Nfr.
Additional information	N/A

ID	2.4.2.2_Master-TRIG-003(1)
Component(s)	VroES
Requirement	The Vro-ITS shall execute the service [Inform PFro] to inform the SAGT of sent event.
Additional information	N/A

5.2.1 Manual triggering

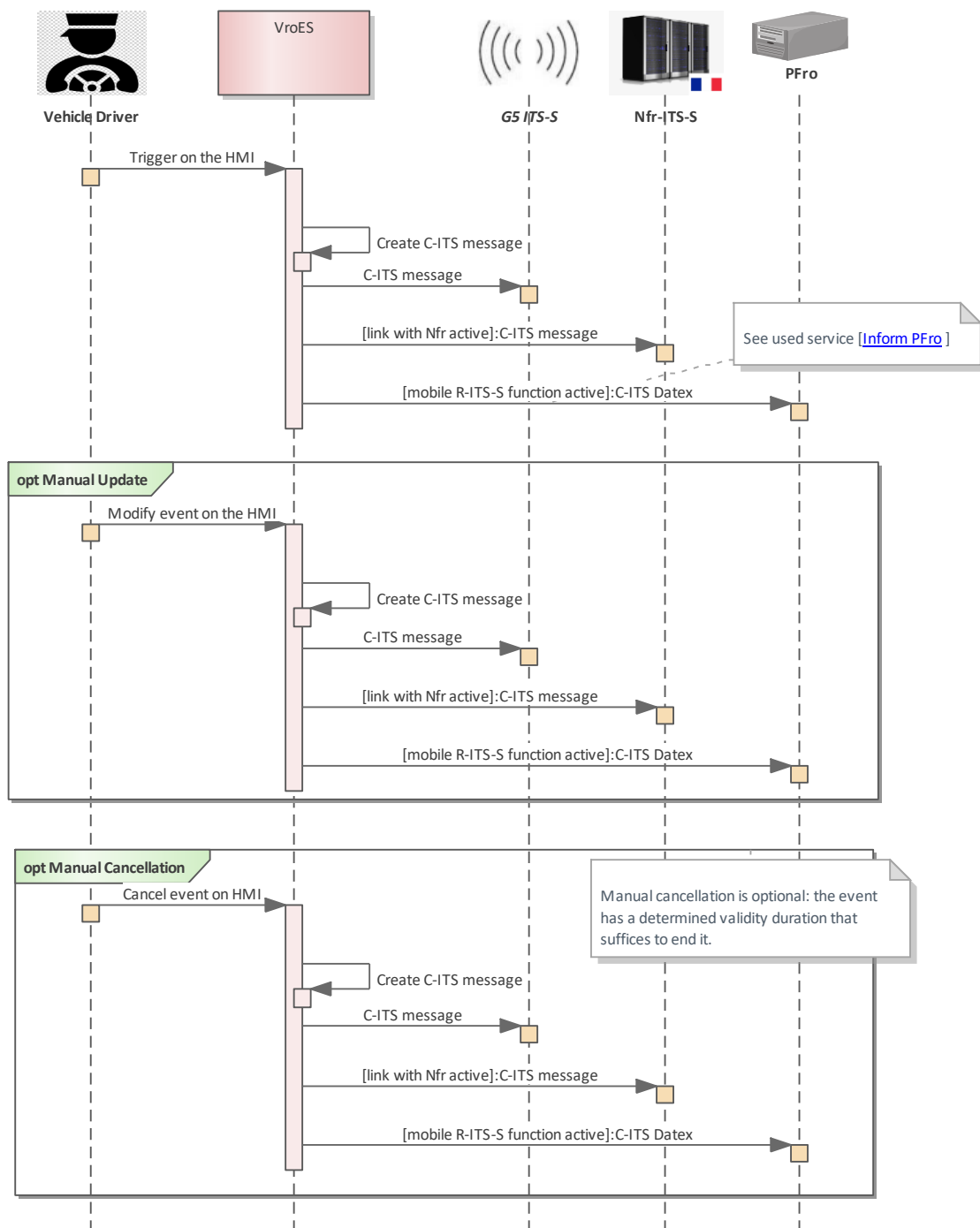


Figure 13: Manual triggering nominal case - sequence diagram

ID	2.4.2.2_Master-TRIG-004(1)
Component(s)	VroES
Requirement	The driver shall be able to trigger manually via the Vro-ITS-S HMI an event. Those events are listed in: <ul style="list-style-type: none"> - [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-TRIG-005(1)
Component(s)	VroES; Scoop Server
Requirement	Only Tx events associated to the current activity shall be manually triggerable. The association Tx events ⇔ Activity is defined in § 6.7.3 and illustrated in Figure 42.
Additional information	N/A

ID	2.4.2.2_Master-TRIG-006(2)
Component(s)	VroES
Requirement	At each trigger / update / cancel of a manually triggered Tx event, the Vro-ITS-S shall create a C-ITS message that complies with <u>field filling rules</u> defined in: <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-TRIG-007(1)
Component(s)	VroES
Requirement	The driver shall be able to update a Tx event manually triggered via the HMI.
Additional information	The allowed modifications are described in: <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM

ID	2.4.2.2_Master-TRIG-008(1)
Component(s)	VroES
Requirement	The driver shall be able to cancel a Tx event manually triggered via the HMI.
Additional information	N/A

Note: the activity diagrams for this service are spread in the annexes: [DA1] and [DA2].

5.2.2 Automatic triggering

5.2.2.1 Nominal case

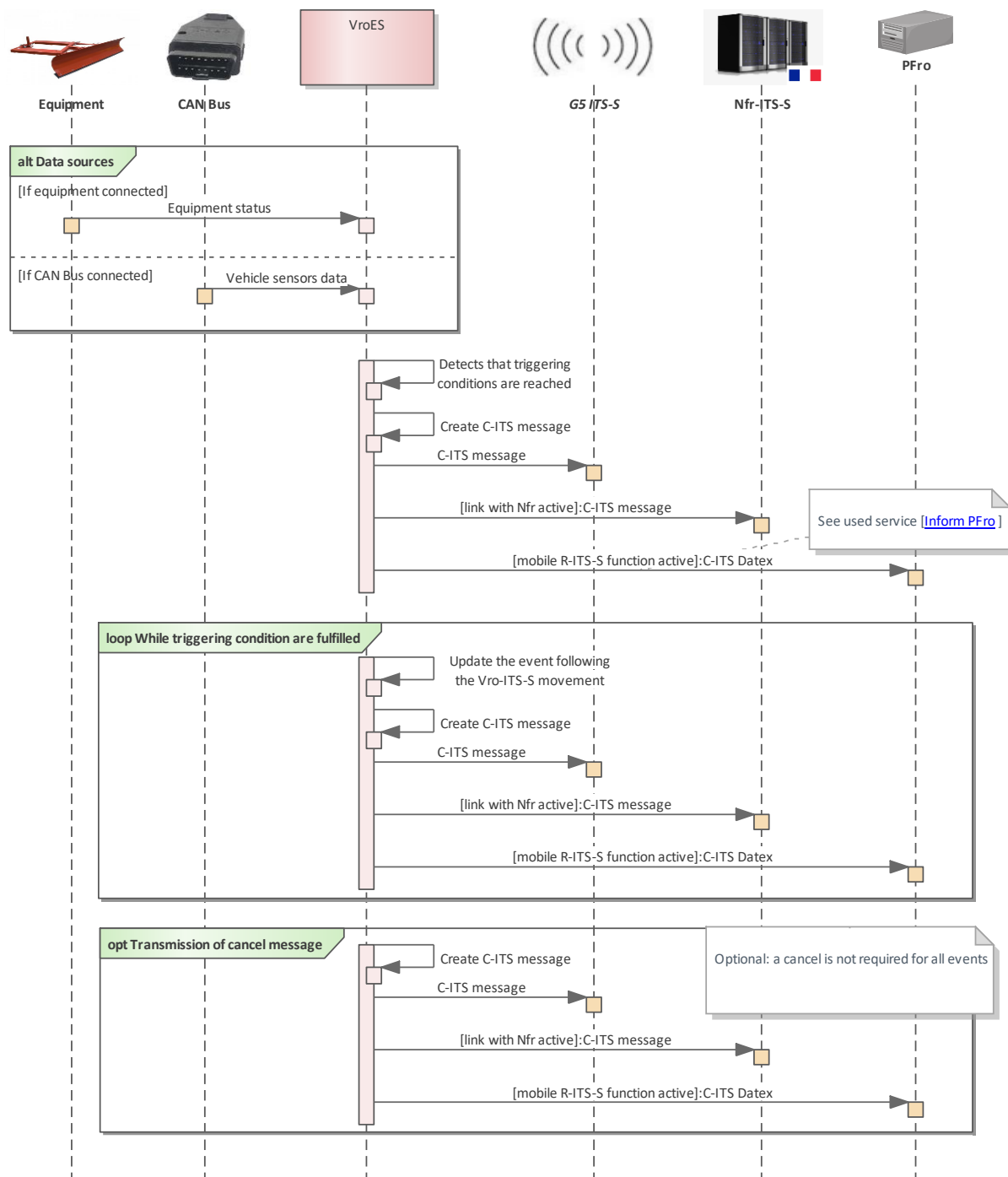


Figure 14: Automatic triggering nominal case - sequence diagram

ID	2.4.2.2_Master-TRIG-009(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall be able to automatically trigger Tx event.</p> <p>Those events are listed in:</p> <ul style="list-style-type: none"> - [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-TRIG-010(2)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall be able to check the triggering conditions of automatic Tx event at the reception of:</p> <ul style="list-style-type: none"> ▪ vehicle's CAN Bus data, ▪ equipments status. <p>The triggering conditions are described in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM <p>The triggering conditions are not configurable.</p>
Additional information	N/A

ID	2.4.2.2_Master-TRIG-011(1)
Component(s)	VroES
Requirement	<p>If the triggering conditions of an automated Tx event are satisfied and this event is associated to the current activity, the Vro-ITS-S shall trigger this event.</p> <p>The association Tx events ⇔ Activity is defined in § 6.7.3 and illustrated in Figure 42.</p>
Additional information	N/A

ID	2.4.2.2_Master-TRIG-012(2)
Component(s)	VroES
Requirement	<p>At each trigger / update / cancel of an automatically triggered Tx event, the Vro-ITS-S shall create a C-ITS message that complies with <u>field filling rules</u> defined in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-TRIG-013(1)
Component(s)	VroES; Scoop Server
Requirement	As long as the triggering conditions of a Tx event are fulfilled, the Vro-ITS-S shall update the corresponding message each <i>p_GEN_UpdateInterval</i> .
Additional information	N/A

ID	2.4.2.2_Master-TRIG-014(1)
Component(s)	VroES
Requirement	When the triggering conditions of an automatic event are not satisfied anymore, the Vro-ITS-S shall terminate the event. Depending on the event, a cancellation message may be transmitted. This is defined in: <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-TRIG-015(1)
Component(s)	VroES
Requirement	A driver shall not be able to manually modify nor cancel an automatically triggered event.
Additional information	N/A

5.2.2.2 Alternative case

As the VroES may not have access to equipment and/or CAN bus data in the primary stages of the project (i.e. 2.4.2.2_Master-TRIG-010(2) not fulfilled), an alternative usage of the automatic triggering is implemented. It allows the driver to trigger an automatic event manually via the Vro-ITS-S HMI. This bypasses the nominal triggering conditions

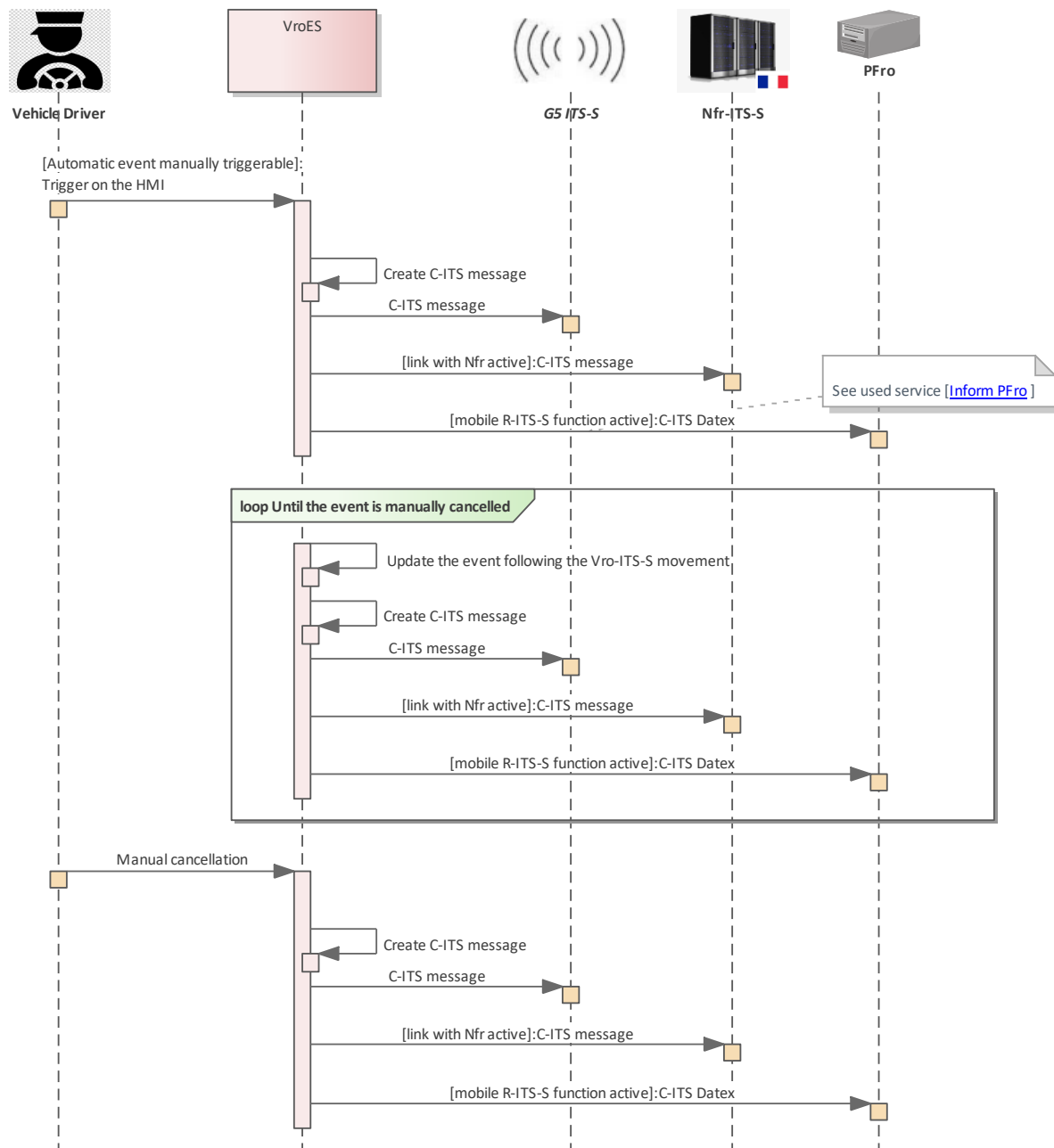


Figure 15: Automatic triggering alternative case – sequence diagram

ID	2.4.2.2_Master-TRIG-016(1)
Component(s)	VroES; Scoop Server
Requirement	In a degraded usage of the automated triggering, the driver shall be able to trigger manually an automatic event if <i>p_GEN_DegradedAutoTrig</i> is activated.
Additional information	N/A

ID	2.4.2.2_Master-TRIG-017(1)
Component(s)	VroES; Scoop Server
Requirement	At each trigger / update / cancel of an event with <i>p_GEN_DegradedAutoTrig</i> actif, the Vro-ITS-S shall create a C-ITS message that complies with field filling rules defined in: <ul style="list-style-type: none"> [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-TRIG-018(1)
Component(s)	VroES; Scoop Server
Requirement	After the manual trigger of an automatic event, and until its cancellation, the Vro-ITS-S shall update the event each <i>p_GEN_UpdateInterval</i> .
Additional information	The same parameter as for the nominal case is used.

ID	2.4.2.2_Master-TRIG-019(1)
Component(s)	VroES
Requirement	The driver shall be able to manually cancel via the Vro-ITS-S HMI an automatic Tx event manually triggered.
Additional information	As described in Figure 15 and contrary to manual triggering, a manual cancellation is mandatory in this alternative case of automatic triggering.

ID	2.4.2.2_Master-TRIG-020(2)
Component(s)	VroES
Requirement	When an event, automatically triggered in the nominal case, is manually triggered (alternative case when <i>p_GEN_DegradedAutoTrig</i> active), the driver shall not be able to modify it via the Vro-ITS-S HMI.
Additional information	N/A

Note: the activity diagrams for this service are spread in the annexes: [DA1] and [DA2].

5.2.3 Alternative case

The following requirements are associated with alternatives that relate to the two ways of triggering an event (manually or automatically).

ID	2.4.2.2_Master-TRIG-021(1)
Component(s)	VroES
Requirement	If a change of mode occurs (operator to user and <i>vice versa</i>) the Vro-ITS-S shall stop all transmission and start “freshly” in the new mode.
Additional information	<p>This prevents the conflicts when changing mode (e.g. change of ActionID for the same event). This implies that no cancellation message of the previously triggered event(s) are emitted.</p> <p>As the change of mode should not occur too often, this solution fits the usage on the field.</p>

ID	2.4.2.2_Master-TRIG-022(1)
Component(s)	VroES
Requirement	<p>If the driver changes from an operator activity to another, the Vro-ITS-S shall check that the currently sent events (new or update) are allowed for triggering in the new chosen activity.</p> <p>If not, they shall be cancelled.</p> <p>The association Tx events ⇔ Activity is defined in § 6.7.3 and illustrated in Figure 42.</p>
Additional information	N/A

5.3 Communicate with PFro

ID	2.4.2.2_Master-MRSU-001(1)
Component(s)	VroES
Requirement	When an operator activity is selected, the Mobile R-ITS-S function shall be activated.
Additional information	N/A

ID	2.4.2.2_Master-MRSU-002(3)
Component(s)	VroES; Scoop Server
Requirement	For the user mode, the Mobile R-ITS-S function shall be deactivated.
Additional information	Historically, there is a parameter allowing to activate or not the Mobile R-ITS-S function in user mode. This parameter, p_GEN_UBRMobActiveUser, can be kept for debug purposes only with the default value "not activated".

5.3.1 Inform PFro

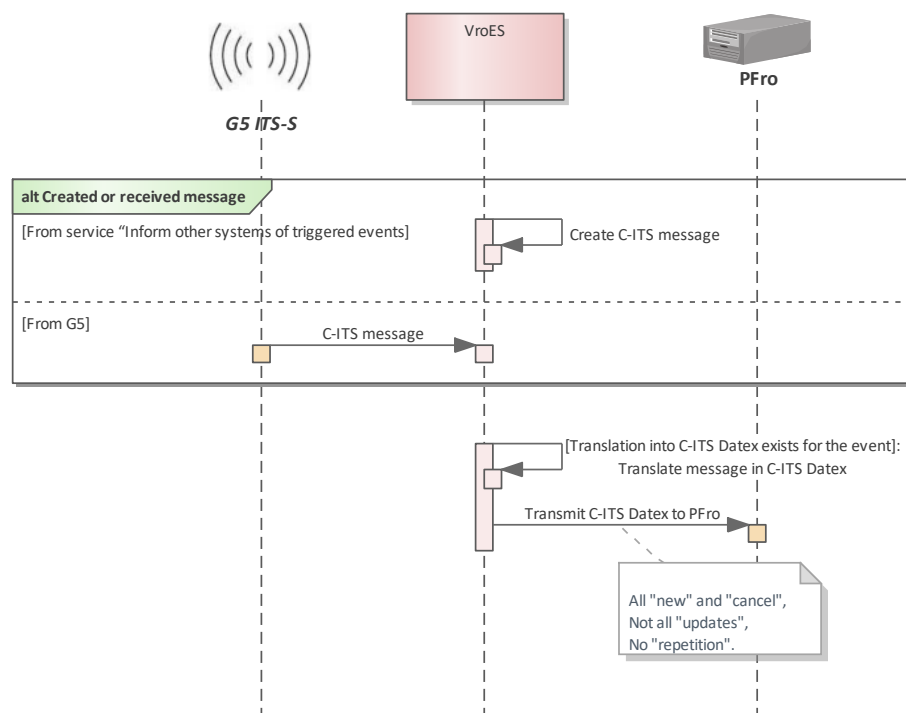


Figure 16: Inform PFro – sequence diagram

ID	2.4.2.2_Master-MRSU-003(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall translate C-ITS messages, received from G5 or created from the service [Inform other systems of triggered events], if [Mobile R-ITS-S function] is activated and a translation rule is known.</p> <p>Rx events with a C-ITS message to C-ITS Datex message translation rule are defined in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-MRSU-019(1)
Component(s)	VroES. Scoop Server
Requirement	<p>After the update of an event (received or triggered), the Vro-ITS-S shall translate the update into C-ITS Datex only if the last created C-ITS Datex for this event was created more than <i>p_GEN_DelayUpdateDatex</i>.</p>
Additional information	This prevents from saturating the VroES in case of an event updated each 250ms.

ID	2.4.2.2_Master-MRSU-004(1)
Component(s)	VroES. Scoop Server
Requirement	Datex messages created by the Vro-ITS-S shall be transmitted to the PFro following 7.1.2.
Additional information	N/A

ID	2.4.2.2_Master-MRSU-005(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall not translate and upload to the PFro the repetition of received or triggered events.
Additional information	N/A

ID	2.4.2.2_Master-MRSU-006(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall not translate a C-ITS message into C-ITS Datex if the event was already received as a C-ITS Datex.
Additional information	This prevents from sending to PFro events already received from it.

ID	2.4.2.2_Master-MRSU-007(1)
Component(s)	VroES
Requirement	<p>The translation from C-ITS message into C-ITS Datex shall respect the rules defined in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM
Additional information	N/A

ID	2.4.2.2_Master-MRSU-008(1)
Component(s)	VroES; Scoop Server
Requirement	<p>At the emission of a C-ITS Datex based on a <situation> field and in order for it to be accepted by the PFro, the Vro-ITS-S shall build the C-ITS Datex with supplierIdentification.nationalIdentifier set to p_VEH_MobileRSUDatexName</p>
Additional information	N/A

ID	2.4.2.2_Master-MRSU-009(1)
Component(s)	VroES
Requirement	<p>If the Vro-ITS-S cannot emit a C-ITS Datex to the PFro, it shall be able to keep it in memory and try to emit it again when the connection is re-established.</p> <p>This shall be realised at least for 10 C-ITS Datex messages describing events.</p>
Additional information	<p>This is realised by the Basic ICPU Software.</p> <p>If this emitting queue is full, the Vro-ITS-S shall discard the newly received request to emit the Datex.</p>

Note: the activity diagrams for this service are spread in the annexes: [DA1] and [DA2].

5.3.2 Relay information from PFro

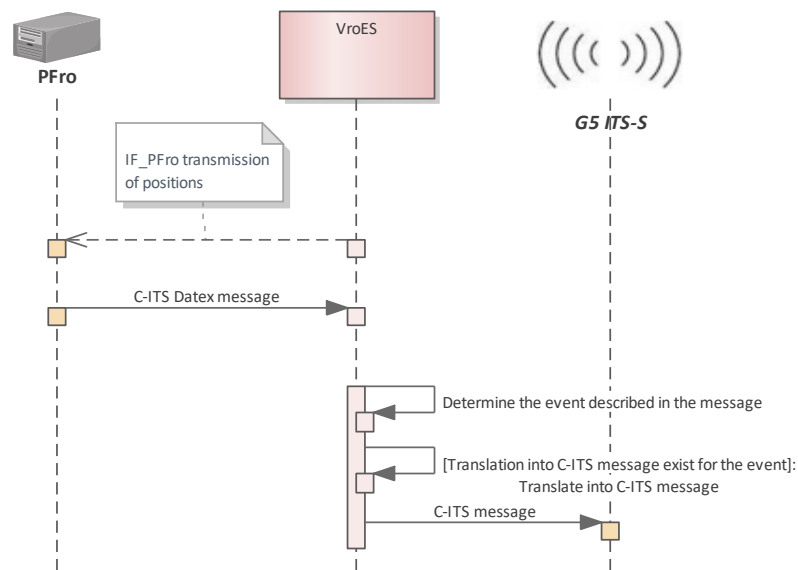


Figure 17: Relay information from PFro – sequence diagram

ID	2.4.2.2_Master-MRSU-010(1)
Component(s)	VroES; Scoop Server
Requirement	In order to receive C-ITS Datex messages describing only events close to the Vro-ITS-S, the Vro-ITS-S shall send each <i>p_GEN_DatexPosFreq</i> its position to the PFro.
Additional information	N/A

ID	2.4.2.2_Master-MRSU-011(1)
Component(s)	VroES
Requirement	To send its position to the PFro, the Vro-ITS-S shall create a C-ITS Datex following the requirements defined in [DA5] § 10.1.
Additional information	N/A

ID	2.4.2.2_Master-MRSU-012(1)
Component(s)	VroES; Scoop Server
Requirement	In order to check the origin of the C-ITS Datex, the Vro-ITS-S shall confront the value of <supplierIdentification.nationalIdentifier> of the received C-ITS Datex with <i>p_GEN_AuthorisedPFro</i> .
Additional information	N/A

ID	2.4.2.2_Master-MRSU-013(2)
Component(s)	VroES
Requirement	<p>If the [Mobile R-ITS-S function] is activated, the VroES shall translate into C-ITS message any received C-ITS Datex which has a translation rule.</p> <p>Rx event with a C-ITS Datex to C-ITS message translation rules are defined in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the message is a DENM, ▪ [DA2] if the message is an IVIM.
Additional information	N/A

ID	2.4.2.2_Master-MRSU-014(1)
Component(s)	VroES
Requirement	Any C-ITS message which is created after a translation from a received C-ITS Datex shall comply with [DA19] and its annexes.
Additional information	N/A

ID	2.4.2.2_Master-MRSU-015(1)
Component(s)	VroES
Requirement	At each translation of a C-ITS Datex, the Vro-ITS-S shall apply on the resulting C-ITS message the dissemination rules associated to interface IF G5 .
Additional information	N/A

Note: the activity diagrams for this service are spread in the annexes: [DA1] and [DA2].

5.3.3 Manage synchronisation with PFro

ID	2.4.2.2_Master-MRSU-016(1)
Component(s)	VroES
Requirement	At the reception of a snapshot request from the PFro in a Datex, the Vro-ITS-S shall respond with a C-ITS Datex with all known events to the PFro. This only concerns events based on <situationRecord> field of the C-ITS Datex.
Additional information	The snapshot request from the PFro is realised via a PULL method as mentioned in [DA5] §2.2.6.

[datex_snapshot_req] N/A

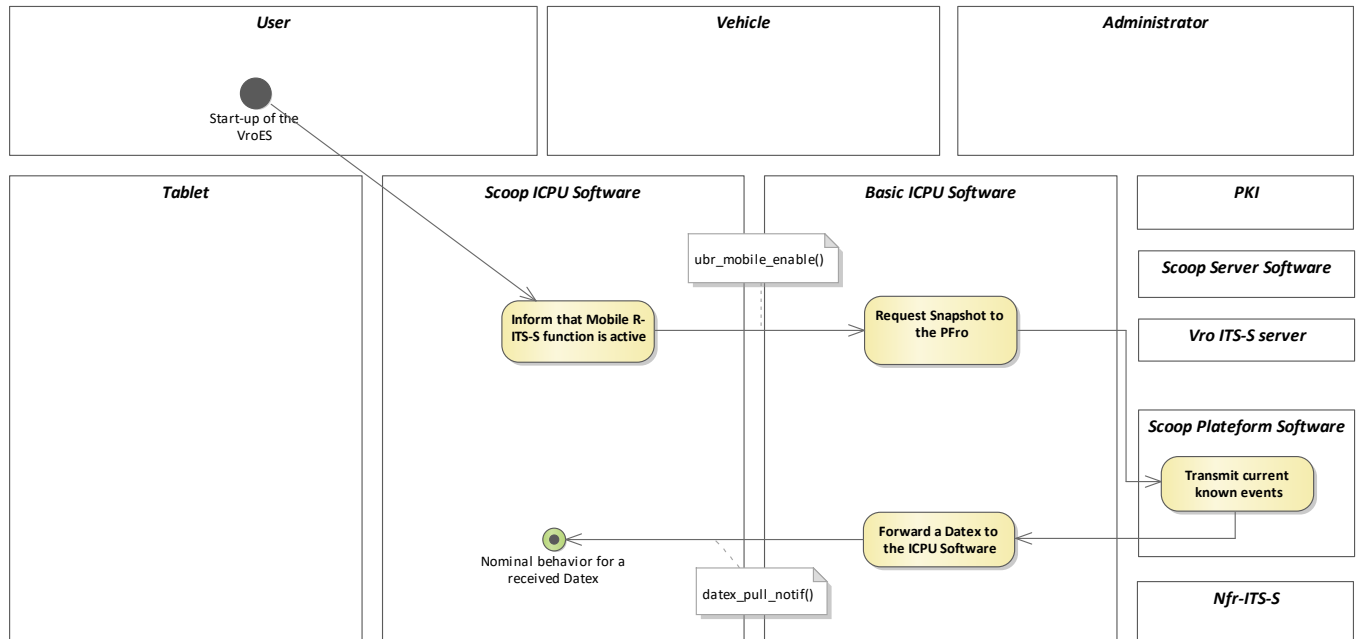


Figure 19: : Relay road events – Snapshot downstream – activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context. (list of parameters mentioned is not exhaustive compared to the definition of the method).

Methode	Specificities and parameters
[ubr_mobile_enable]	N/A
[datex_pull_notif]	N/A

5.4 Inform driver of the itinerary / circuit to follow

The Vro-ITS-S allows to:

- display a route on the map, after the user has entered a destination
- display a road operator specific circuit on the map, as part of the user's activity (e.g., patrol).

ID	2.4.2.2_Master-GUID-001(1)
Component(s)	VroES; Scoop Server
Requirement	<p>The driver shall be able to follow an itinerary by either:</p> <ul style="list-style-type: none"> - Entering an address in the navigation system. - Select a Point Of Interest in a pre-registered list (the list is configurable at the Scoop server level) <p>As an answer, the Vro-ITS-S shall offer an itinerary to reach the destination that represents the shortest travel time.</p>
Additional information	N/A

ID	2.4.2.2_Master-GUID-002(1)
Component(s)	VroES
Requirement	<p>When an itinerary is selected, the HMI shall provide guidance to the driver. This guidance shall constantly be adjusted to the trajectory of the vehicle.</p>
Additional information	N/A

ID	2.4.2.2_Master-GUID-003(1)
Component(s)	VroES; Scoop Server
Requirement	<p>When an operator selects an activity, the Vro-ITS-S shall offer to select circuit(s) if:</p> <ul style="list-style-type: none"> - The vehicle is affiliated to a local business unit which possesses circuit(s). - The activity is associated to the local business unit's circuit(s). <p>The association Local Business Unit ⇔ Circuit ⇔ Activity is configurable and illustrated in Figure 42</p>
Additional information	Compared to an itinerary, a circuit will not be the fastest way to join two points, but a followed path to go through critical parts of the operator's network.

ID	2.4.2.2_Master-GUID-004(1)
Component(s)	VroES
Requirement	When a circuit is selected, the HMI shall provide guidance to the driver and adjust the itinerary regularly.
Additional information	N/A

ID	2.4.2.2_Master-GUID-005(1)
Component(s)	VroES
Requirement	At any time, the driver shall be able to stop an itinerary or a circuit.
Additional information	N/A

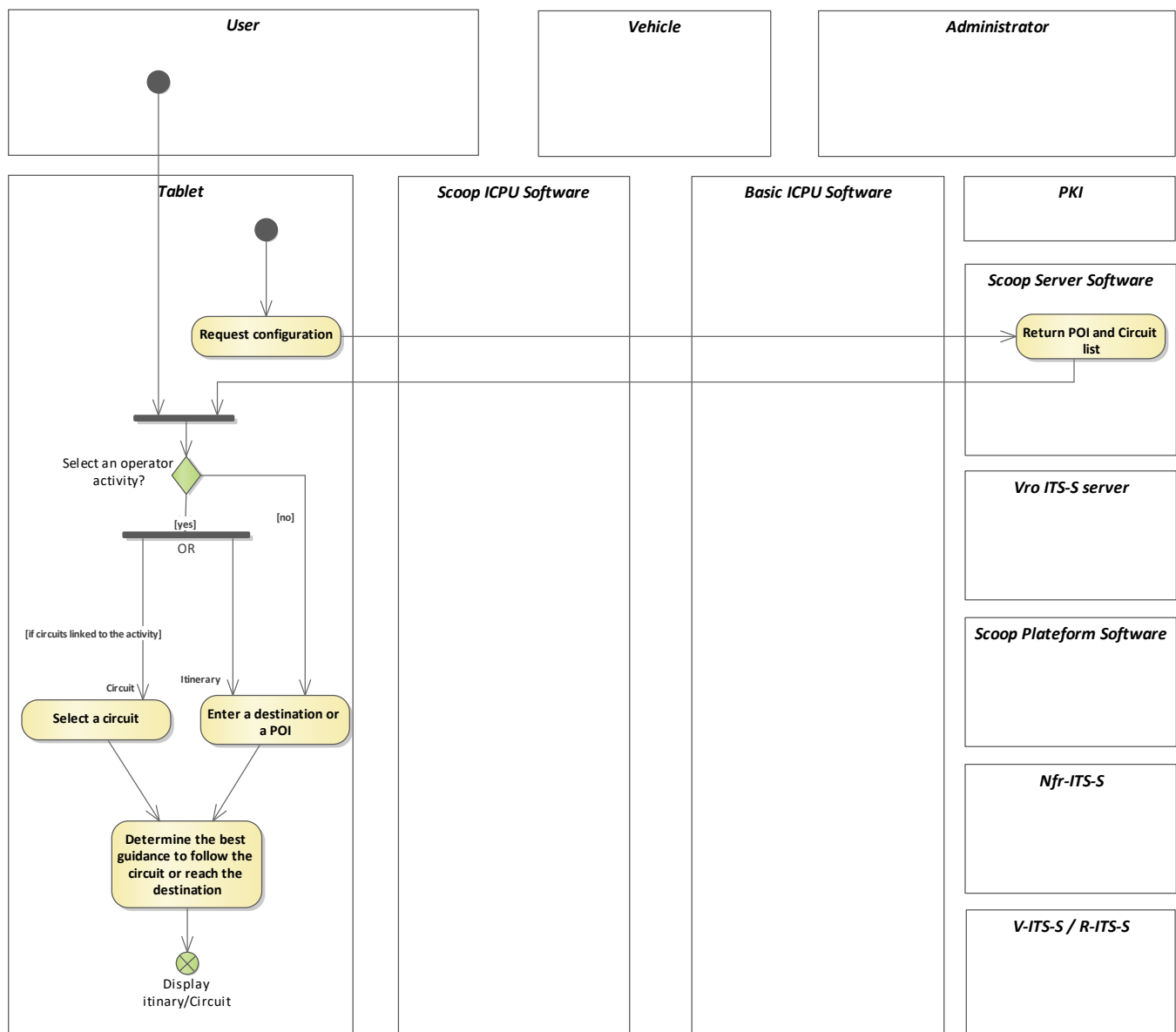


Figure 20 : Inform driver of the itinerary / circuit to follow – activity diagram

5.5 Emit a SOS

The Vro-ITS-S allows the user to send an emergency call by pressing the SOS button. In this part, when the term SOS is used, it includes:

SOS_Call	Vocal message sent to on-call number
SOS_Datex	SOS sent in Datex format to PFro
SOS_SMS	SMS message sent to on-call number

ID	2.4.2.2_Master-SOS-001(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall allow the driver to emit a SOS via:</p> <ul style="list-style-type: none"> • A SOS icon on the Tablet. • A physical SOS push button.
Additional information	N/A

ID	2.4.2.2_Master-SOS-002(1)
Component(s)	VroES
Requirement	<p>To avoid miss-manipulation of the SOS, a minimum pressing duration on the icon shall be mandatory before SOS emission.</p> <p>If the driver presses not long enough on the SOS tablet icon, an information shall be displayed, informing the driver that a longer pression is required.</p>
Additional information	N/A

ID	2.4.2.2_Master-SOS-003(1)
Component(s)	VroES
Requirement	<p>If the physical SOS push button is activated at the start of the Vro-ITS-S, no SOS will be transmitted</p> <p>A message shall inform the driver to disengage it.</p>
Additional information	N/A

ID	2.4.2.2_Master-SOS-004(1)
Component(s)	VroES; Scoop Server
Requirement	<p>If [Mobile R-ITS-S function] is activated when a SOS is declared by the driver, the VroES shall create a SOS_Datex to the PFro following the requirements defined in [DA5] § 10.2, and transmit it to the PFro.</p> <p>When a SOS is declared by the driver, the VroES should send a</p> <ul style="list-style-type: none"> a SOS_Call to an on-call number (<i>p_GEN_SosPhoneNumber</i>). <p>and/or</p> <ul style="list-style-type: none"> a SOS_SMS to an on-call number (<i>p_GEN_SosPhoneNumber</i>). <p><i>p_GEN_SosPhoneNumber</i> is associated to the local business unit as illustrated in Figure 42.</p>
Additional information	The interface with the on-call number is defined in §7.1.4.

ID	2.4.2.2_Master-SOS-005(1)
Component(s)	VroES
Requirement	<p>No registration shall be required to emit an SOS.</p> <p>The emission of SOS shall be available in both user and operator modes.</p>
Additional information	N/A

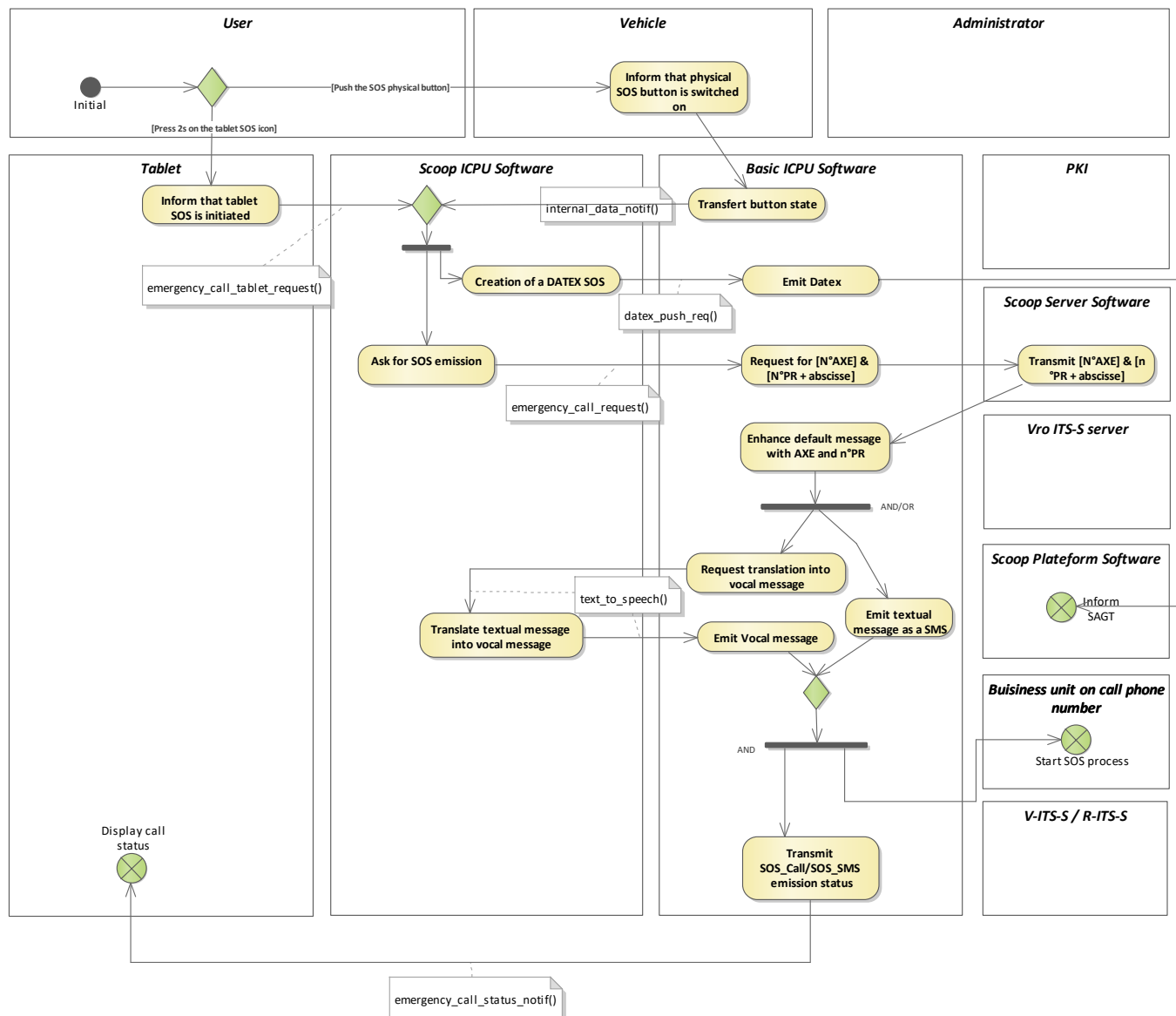
ID	2.4.2.2_Master-SOS-006(2)
Component(s)	VroES; Scoop Server
Requirement	<p>The SOS_Call and/or SOS_SMS message shall be as follow:</p> <p>"Le conducteur du véhicule [MATRICULATION] a enclenché son bouton d'urgence. Il se trouve sur l'axe [N°AXE], au PR [N°PR]".</p> <p>Where :</p> <ul style="list-style-type: none"> [MATRICULATION] is a parameter <i>p_VEH_matriculation</i> of the VroES as defined in Annex B and illustrated in Figure 42. [N°AXE] and [N°PR] are available in SCOOP server. see Figure 21 <p>If [N°AXE] and/or [N°PR] are not available, the message shall be as follow:</p> <p>"Le conducteur du véhicule [MATRICULATION] a enclenché son bouton d'urgence."</p>
Additional information	N/A

ID	2.4.2.2_Master-SOS-007(1)
Component(s)	VroES
Requirement	<p>The status of the SOS_Call / SOS_SMS shall be displayed as well as the on-call number.</p> <p>The allowed statuses are:</p> <ul style="list-style-type: none"> • “appel en cours” while trying to emit the SOS_Call/SOS_SMS • “appel échoué” if the SOS_Call or SOS_SMS failed to be transmitted • “appel émis” if the SOS_Call/SOS_SMS confirmation was received
Additional information	N/A

ID	2.4.2.2_Master-SOS-008(1)
Component(s)	VroES
Requirement	If the on-call number does not answer the phone directly, the SOS_Call shall be renewed three times before declaring the call as a failure.
Additional information	N/A

ID	2.4.2.2_Master-SOS-009(1)
Component(s)	VroES
Requirement	When the SOS status is “Appel en cours”, the driver shall be able to stop the SOS declaration via the tablet.
Additional information	This is implemented via the method [emergency_call_cancellation] directly between Scoop Tablet and Basic ICPU Software. See ([DA21])

ID	2.4.2.2_Master-SOS-010(1)
Component(s)	VroES
Requirement	<p>If:</p> <ul style="list-style-type: none"> • the WIFI does not work between the Tablet and the ICPU, And/or • the ICPU has no cellular connection, <p>then the SOS Bouton is not accessible on the tablet.</p>
Additional information	N/A



The different interface methods which names are written in notes in the diagrams are described in § 7.2.3.

The table below specifies certain behaviours of those methods in the activity diagram context.
(list of parameters mentioned is not exhaustive compared to the definition of the method.)

Method	Specificities and parameters
[emergency_call_tablet_request]	N/A
[internal_data_notif]	<code>emergencyButton</code> set to 1 if physical button on .
[datex_push_req]	N/A
[emergency_call_request]	N/A
[emergency_call_status_notif]	Used at each evolution of the SOS emission status (call in progress, cancel, success).
[text_to_speech]	Only used if vocal message is transmitted.

5.6 Inform the position/speed/heading of the Vro

ID	2.4.2.2_Master-CAM-001(1)
Component(s)	VroES; Scoop Server
Requirement	<p>The Vro-ITS-S shall fill the DE <i>stationType</i> of the CAM as follow:</p> <p>If the user mode is active</p> <p>➔ <i>stationType</i> = <i>p_VEH_userStationType</i></p> <p>If the operator mode is active,</p> <p>➔ <i>stationType</i> = <i>specialVehicle</i> (10)</p>
Additional information	<p><i>p_VEH_userStationType</i> can have the following values:</p> <ul style="list-style-type: none"> passengerCar (5), lightTruck (7), heavyTruck (8).

ID	2.4.2.2_Master-CAM-002(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall set the CAM DE <i>vehicleRole</i> to:</p> <ul style="list-style-type: none"> default(0) if the user mode is active roadOperator(11) if the operator mode is active.
Additional information	No additional containers are associated to both roles.

ID	2.4.2.2_Master-CAM-003(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall respect the requirements listed in Table 2 extracted from [DA22] concerning the CAM creation and pathHistory filling.
Additional information	N/A

MSP requirements	Requirement's topic
RS_MSP_067(1)	Standard
RS_MSP_068(1)	Creation condition
RS_MSP_069(1)	Creation frequency
RS_MSP_070(1)	Creation frequency
RS_MSP_071(1)	PathHistory
RS_MSP_072(1)	PathHistory
RS_MSP_073(1)*	PathHistory Max point
RS_MSP_073(1)*	PathHistory PathDeltaTime
RS_MSP_074(1)	PathHistory
RS_MSP_075(1)	PathHistory

Table 2: MSP applicable requirements for CAM filling

*: MSP has two requirements identified with ID MSP_073.

ID	2.4.2.2_Master-CAM-004(1)
Component(s)	VroES
Requirement	The optional requirements RS_MSP_065(1) and RS_MSP_066(1) extracted from [DA22] are still optional in the present document. Their implementation optimises the usage of pathHistory.
Additional information	N/A

ID	2.4.2.2_Master-CAM-005(1)
Component(s)	VroES
Requirement	If the Vro-ITS-S has not access to CAN Bus data, it shall fill the following CAM DE/DF with their equivalent value of "unavailable": <ul style="list-style-type: none"> longitudinalAcceleration curvature curvatureCalculationMode yawRate exteriorLights
Additional information	N/A

ID	2.4.2.2_Master-CAM-006(1)
Component(s)	VroES
Requirement	In order to inform close vehicles of its position, the Vro-ITS-S shall transmit regularly CAM messages following IF_G5 .
Additional information	N/A

ID	2.4.2.2_Master-CAM-007(1)
Component(s)	VroES
Requirement	In order to receive C-ITS messages (DENM, IVI, POI, MAP and SPAT) from the Nfr, the Vro-ITS-S shall send regularly a CAM to the Nfr following IF Nfr .
Additional information	N/A

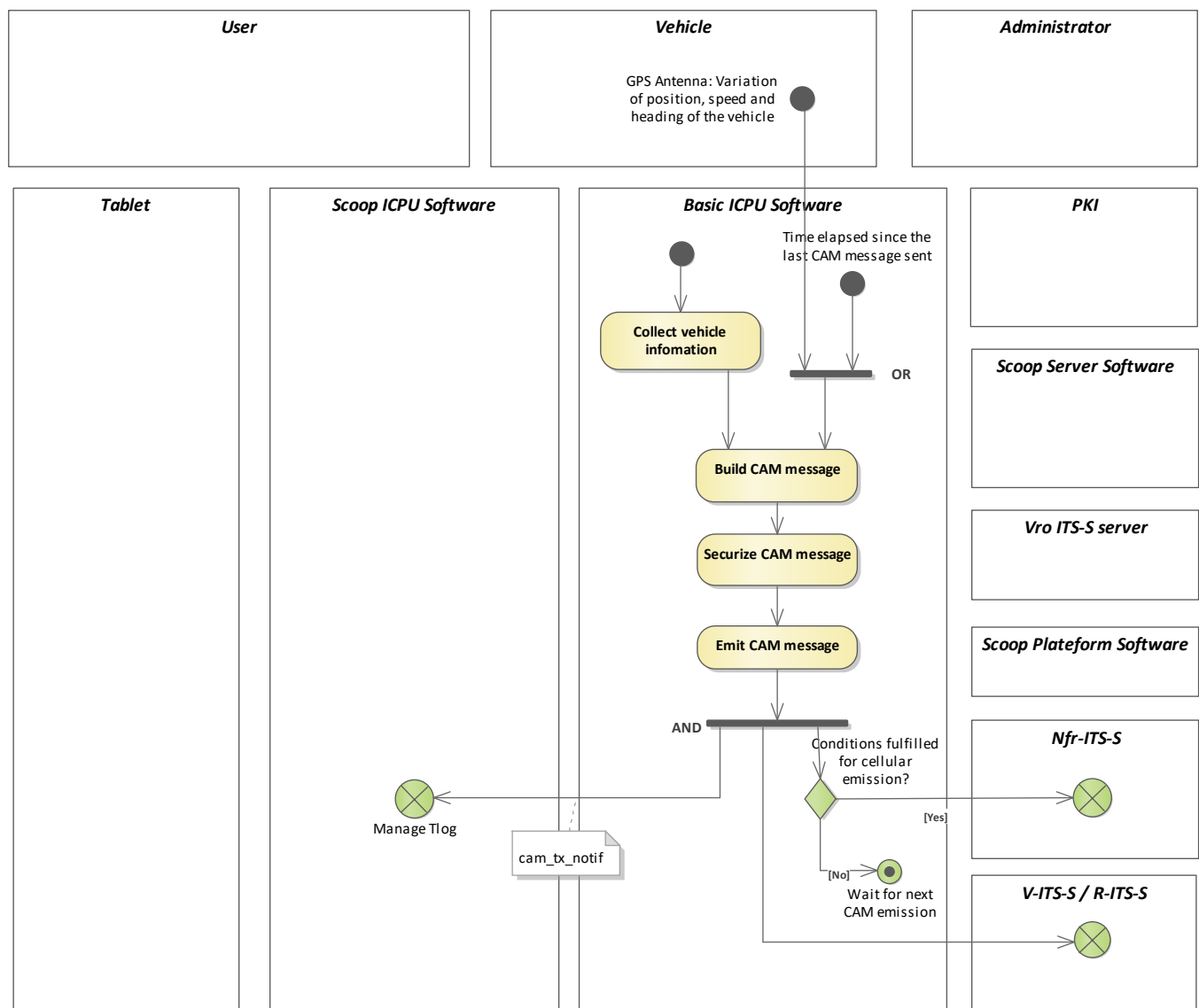


Figure 22 : Inform the position/speed/heading of the Vro-ITS-S – activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3.

The table below specifies certain behaviours of those methods in the activity diagram context. (list of parameters mentioned is not exhaustive compared to the definition of the method.)

Methode	Specificities and parameters
[internal_data_notif]	heading , speed , posVector at least are filled regularly
[cam_tx_notif]	N/A

5.7 Reduce emission's power in certain areas

In order to avoid disturbing the electronic toll systems (using CEN DSRC standards and operating in frequency bands close to those of ITS-G5), an interference reduction mechanism must be implemented in the Vro-ITS- S.

ID	2.4.2.2_Master-MITI-001(1)
Component(s)	VroES
Requirement	To implement the interference reduction mechanism, the Vro-ITS-S shall comply with the requirements listed in Table 3 extracted from [DA22]
Additional information	N/A

MSP requirements	Requirement's topic
RS_MSP_029(1)	Mitigation
RS_MSP_030(1)	Mitigation
RS_MSP_031(1)	Mitigation
RS_MSP_032(1)	Mitigation
RS_MSP_033(1)	Mitigation

Table 3: MSP applicable requirements for mitigation

ID	2.4.2.2_Master-MITI-002(1)
Component(s)	VroES
Requirement	The VroEs can use the protected zone database of ASECAP to comply with the requirement of RS_MSP_029 to applied mitigation.
Additional information	<p>The content of the database can be accessed at https://www.asecap-pzdb.com.</p> <p>Road operators are able to contribute and maintain the geolocation of this protected zone database.</p>

6.1 Manage log

Within C-ITS project, data are collected by different actors of the cooperative system in order to allow:

- The evaluation of the impact of ITS messages on driver behaviour,
- The technical evaluation of the ITS system (performance measures) and its efficiency.

SCOOP logs are described in the chapter 6.1.1. Since these logs didn't support IVI information, the log format defined in [DA10] is applied for IVI and requirements associated are described in chapter 6.1.2.

6.1.1 General logs

The data to be collected are grouped under two terminologies U-LOG and T-LOG. These data are intended for different actors of the consortium.

Error report, specific to the tablet, are collected via the Tablet-LOG.

Term	Mean
T-LOG	Technical logs will be used to check system performance level (communication).
U-LOG	Usage logs will be used to analyse impact on driving security of C-ITS-S system and to optimize driver functional logics according to real life events that occurred.
Tablet-LOG	Technical logs will be used to analyse problems on the tablet (as part of the maintenance of the Vro-ITS-S).

The sub-services associated with the log management are shown below.

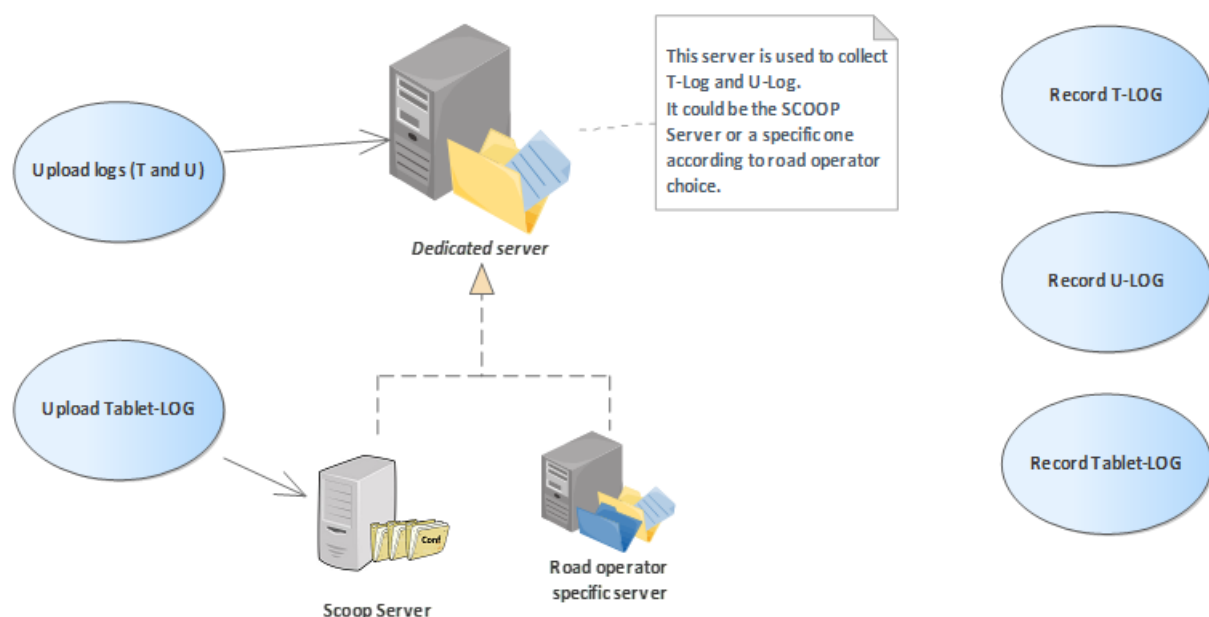


Figure 24 : Manage log – use cases diagram

Chapters 6.1.1.1 to 6.1.1.3 present the content and structure of the records of the different types of logs ([T-LOG](#), [U-LOG](#) and [Tablet LOG](#)).

The [file format](#) and [management principles](#) are described respectively in chapter 6.1.1.4 to 6.1.1.6 and activity diagram in Figure 27.

6.1.1.1T-LOG

22 types of records are associated with technical logs. Each record is characterized by its list of attributes (see [DA7]).

T-LOG record type	Description
CAMSent	Record associated to the CAM sent by the Vro-ITS-S.
CAMReceived	Record associated to the reception of a CAM by the Vro-ITS-S when the type of the originating ITS-S is not RSU ITS-S.
CAM_I	Record associated to the reception of a CAM by the Vro-ITS-S when the type of the originating ITS-S is RSU ITS-S.
DENMReceived	Record associated to the reception of a DENM by the Vro-ITS-S.
DENMSent	Record associated to the DENM sent by the Vro-ITS-S.
DriverRequestSending	Record associated to declaration of specific events by the user (driver, front passenger ...) through the SCOOP Tablet software.
DriverRequestReception	Record associated to C-ITS-S message displayed to the driver and triggered by the system as pop-up, picto on the map ...
DataStation	Record associated to continuous data coming from CAN bus.
MapProjectionContextDENMReceived	Record associated to map matched position of the ego vehicle when a DENM is received.
ClimaticEnvironmentalContext	Record associated to vehicle information about climatic environment.
NetworkAccessPerformance	Record associated to G5 network access.
FaultyMessage	Record associated to all non-exploitable messages by the facilities layer and received by the Vro-ITS-S.
Radio	Record associated to transmission power and receiver signal strength indication for each channel used.
StateChangement	Record associated to road operator current activity and status of vehicle equipment (FLR, FLU, ...)
GeneralWorking	Record associated to general operating condition of VroES.
ModulesWorking	Record associated to operating condition of major modules which compose the VroES.
Configuration	Record associated to modification in the configuration of the VroES.
DatexIIISituationReception	Record associated to the reception of a DATEX by the VroES.
DatexIIISituationSending	Record associated to the DATEX sent by the VroES.
ObjetsPKI	Records associated to security management.
Security	
SecurityIncident	

A T-LOG file is made up of all of these recordings. The logical structure of the file is shown in the following figure.

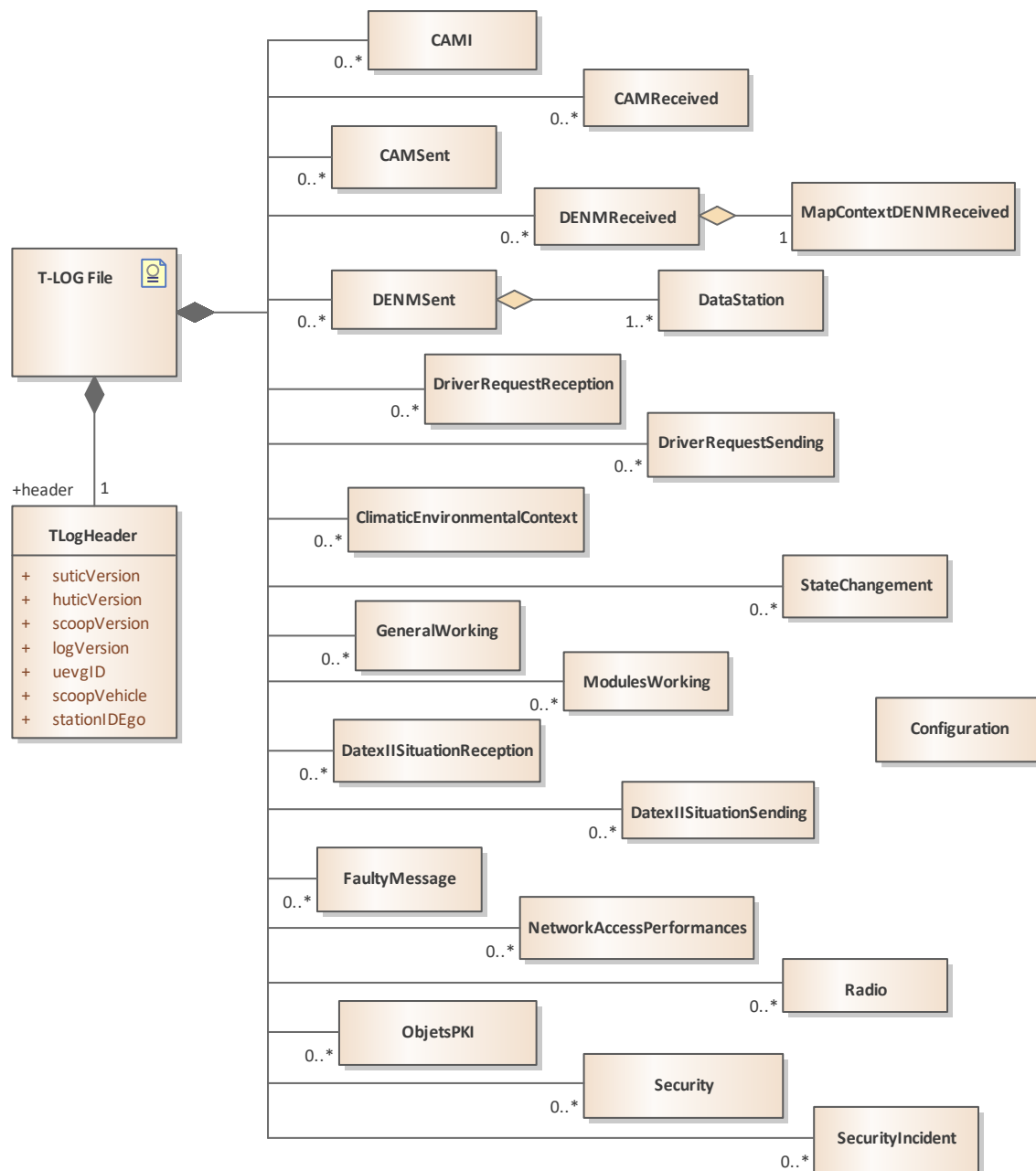


Figure 25 : T-LOG file – logical view

ID	2.4.2.2_Master-LOG-001(1)
Component(s)	VroES, SCOOP Server
Requirement	The Vro-ITS-S shall separate “public” records and “private” records in dedicated public T-LOG files and private T-LOG files.
Additional information	“Public” T-LOG can be made available to VroES suppliers (to facilitate supervision / maintenance operations if necessary).

ID	2.4.2.2_Master-LOG-002(1)
Component(s)	VroES
Requirement	<p>The following T-LOG records shall be considered as public:</p> <ul style="list-style-type: none"> ▪ CAM_I ▪ ClimaticEnvironmentContext ▪ NetworkAccessPerformance ▪ FaultyMessage ▪ Radio ▪ StateChangement ▪ GeneralWorking ▪ ModulesWorking ▪ Configuration ▪ DatexII SituationReception ▪ DatexII SituationSending
Additional information	N/A

ID	2.4.2.2_Master-LOG-003(1)
Component(s)	VroES
Requirement	<p>The following T-LOG records shall be considered as private:</p> <ul style="list-style-type: none"> ▪ CAMSent ▪ CAMReceived ▪ DENMReceived ▪ DENMSent ▪ DriverRequestSending ▪ DriverRequestReception ▪ DataStation ▪ MapProjectionContextDENMReceived ▪ ObjetsPKI ▪ Security ▪ SecurityIncident
Additional information	N/A

ID	2.4.2.2_Master-LOG-004(1)
Component(s)	VroES
Requirement	<p>In order to create a T-LOG record, the Vro-ITS-S shall:</p> <ul style="list-style-type: none"> respect the log recording conditions associated to each type of record (when and for how long), follow the way to fill the different attributes of the record, <p>as defined in [DA14] and [DA15].</p>
Additional information	[DA14] and [DA15] describe collection method and data contents for Vru-ITS-S (UEVu), Vro-ITS-S (UEVg) and R-ITS-S (UBR).

ID	2.4.2.2_Master-LOG-005(1)
Component(s)	VroES, Scoop Server
Requirement	<p>For each T-LOG record type, a parameter (<i>p_GEN_Tlog[recordType]On</i>) shall be configurable in order to authorize or not its creation.</p> <p>The scope of these parameters shall be global (not configurable by vehicle).</p>
Additional information	For example, parameter <i>p_GEN_TlogCAMSentOn</i> authorize or not the log by the Vro-ITS-S of the CAMSent record.

6.1.1.2U-LOG

7 types of records are associated with usage logs. Each record is characterized by its list of attributes (see [DA8]).

Type	Description
MessagesDisplayedDriverStart	Record associated to message displayed to the driver and triggered by the system as pop-up, picto on the map ...
MessagesDisplayedDriverEnd	Record associated to the end of the display of a message.
SCOOPFunctionsSettingDriver	Record associated to major interactions of the driver with the SCOOP Tablet.
DENMReceived	Record associated to the reception of a DENM by the Vro-ITS-S.
DENMSent	Record associated to the life cycle of the DENM sent by the Vro-ITS-S. The same record is used for manual and automatic DENM.
EventReportingContext	Record associated to continuous data coming from CAN bus and multimedia interactions. This record allows creating a context in which the event appears.
MultimediaReportingData	Record associated with the triggering of a SOS.

A U-LOG file is made up of all of these recordings. The logical structure of the file is shown in the following figure.

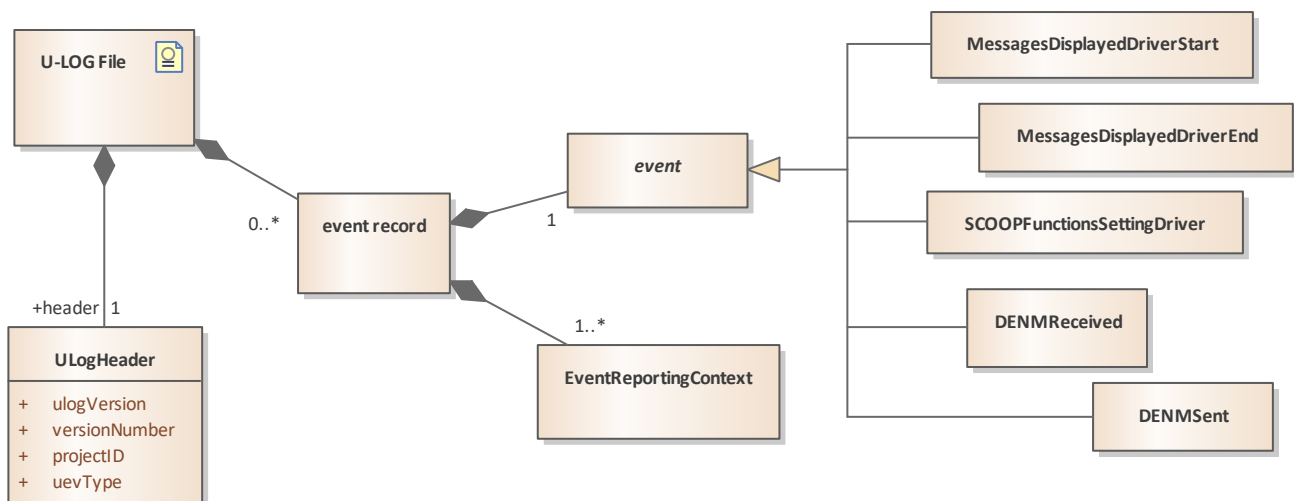


Figure 26 : U-LOG file - logical view

ID	2.4.2.2_Master-LOG-006(1)
Component(s)	VroES
Requirement	<p>In order to create a U-LOG record, the Vro-ITS-S shall:</p> <ul style="list-style-type: none"> respect the log recording conditions associated to each type of record (when and for how long), follow the way to fill the different attributes of the record, <p>as defined in [DA16].</p>
Additional information	[DA16] describes collection method and data contents for Vru-ITS-S (UEV _u), Vro-ITS-S (UEV _g)

ID	2.4.2.2_Master-LOG-007(1)
Component(s)	VroES; Scoop Server
Requirement	<p>For each U-LOG record type, a parameter ($p_GEN_Ulog[recordType]On$) shall be configurable in order to authorize or not its creation.</p> <p>The scope of these parameters shall be global (not configurable by vehicle).</p>
Additional information	For example, parameter $p_GEN_UlogDENMSentOn$ authorize or not the log by the Vro-ITS-S of the DENMSent record.

6.1.1.3 Tablet LOG

ID	2.4.2.2_Master-LOG-008(1)
Component(s)	VroES
Requirement	<p>In the event of a software execution problem (unexpected application termination), SCOOP Tablet must build a "crash report" log file containing:</p> <ul style="list-style-type: none"> - the error triggering the unexpected termination of the SCOOP Tablet application - the context information at the time of this shutdown (version of the application, etc.).
Additional information	This file can then be used to analyze the problems (as part of the maintenance of the Vro-ITS-S).

6.1.1.4 File format

The log file format for U-LOG and, T-LOG is presented in ASN.1.

The file format makes use of the common data dictionary as defined in [DA26] and a common log file dictionary as defined in [DA6].

The log file format for Tablet-LOG is defined by the supplier of the SCOOP Tablet application.

ID	2.4.2.2_Master-LOG-009(1)
Component(s)	VroES
Requirement	Unaligned packed encoding rules (PER) as defined in [DA13] shall be used for log file encoding and decoding.
Additional information	N/A

ID	2.4.2.2_Master-LOG-010(1)
Component(s)	VroES
Requirement	The ASN.1 representation of T-LOG file shall be as specified in [DA7] and [DA9].
Additional information	N/A

ID	2.4.2.2_Master-LOG-011(1)
Component(s)	VroES
Requirement	The ASN.1 representation of U-LOG file shall be as specified in [DA8].
Additional information	N/A

ID	2.4.2.2_Master-LOG-012(1)
Component(s)	VroES
Requirement	The Tablet-log file should be readable with a text editor.
Additional information	<p>A text editor like notepad++ for example.</p> <p>The log file format for Tablet-LOG is defined by the supplier of the SCOOP Tablet application.</p>

6.1.1.5File name

ID	2.4.2.2_Master-LOG-013(2)
Component(s)	VroES
Requirement	<p>The T-LOG / U-LOG file name shall respect the following syntax [TimeStamp]_[Pseudo]_G.[Ext] with:</p> <ul style="list-style-type: none"> TimeStamp – Time at which the file is created (see TimeStampIts defined in [DA26]) in format YYYYMMDDHHMMSSnnn (nnn representing milliseconds on 3 digits), Pseudo – stationID (4 bytes) expressed in hexadecimal in format FFFFFFFF. Ext – indicates the type of log file. Shall be one of the following: <ul style="list-style-type: none"> ulog in case of U-LOG file, tlog in case of T-LOG file. <p><u>Example</u>: 20151215180010100_F9D8E432_G.ulog</p>
Additional information	The letter G after the [Pseudo] indicates that the file is provided by road operator's car, not a user car (letter U) or a road side unit (letter R). For project reasons, ASN.1 syntax is different for each kind of provider.

ID	2.4.2.2_Master-LOG-014(1)
Component(s)	VroES
Requirement	Tablet log file name shall be constructed in order to avoid conflict between different Scoop Tablet software producers and time of generation.
Additional information	N/A

6.1.1.6Management and upload

ID	2.4.2.2_Master-LOG-015(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall create a log file (private T-LOG or public T-LOG or U-LOG file) and transmit it to the dedicated server:</p> <ul style="list-style-type: none"> when the maximum authorized size for the file is reached, when the time interval since the last sending of a file is exceeded, before entering in off mode.
Additional information	The record implying the exceedance of the log file size may be included in the current file or in the next one.

ID	2.4.2.2_Master-LOG-016(1)
Component(s)	VroES; Scoop Server
Requirement	<p>The parameters associated to the creation of a log file shall be configurable for T-LOG file (private or public) and also for U-LOG.</p> <p>The scope of these parameters (<i>p_GEN_TlogMaxSize</i>, <i>p_GEN_TlogIntervallSend</i>, <i>p_GEN_UlogMaxSize</i>, <i>p_GEN_UlogIntervallSend</i>) shall be global (not configurable by vehicle).</p>
Additional information	The trigger thresholds can be different for the 2 types of logs.

ID	2.4.2.2_Master-LOG-017(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall store files which fail to be uploaded for retransmission. When the storage space dedicated to log files is not sufficient to save the new file, the oldest files shall be erased to free space.</p>
Additional information	It's important to limit the loss of T-LOG and U-LOG information.

ID	2.4.2.2_Master-LOG-018(1)
Component(s)	VroES, SCOOP Server
Requirement	When the SCOOP Server is used as a log server, then the Vro-ITS-S shall respect the interface IF_ScSV.
Additional information	N/A

ID	2.4.2.2_Master-LOG-019(1)
Component(s)	SCOOP Server, dedicated server
Requirement	The dedicated server shall allow a third party to have access to the T-LOG files and U-LOG files.
Additional information	This will allow the evaluation of the Scoop projects via the study of logs.

ID	2.4.2.2_Master-LOG-020(1)
Component(s)	SCOOP Tablet software, SCOOP Server
Requirement	Each time a Tablet-LOG is built, SCOOP Tablet software shall save it in tablet memory and send it to the SCOOP server when the SCOOP Tablet application is started next time.
Additional information	Only one log file is managed in memory. It is not necessary to store them for later retransmission (because not critical).

ID	2.4.2.2_Master-LOG-021(1)
Component(s)	SCOOP Tablet software, SCOOP Server
Requirement	To upload the tablet-log file to the SCOOP server, the Vro-ITS-S shall respect the interface IF_ScSV.
Additional information	N/A

6.1.1.7 Activity diagrams

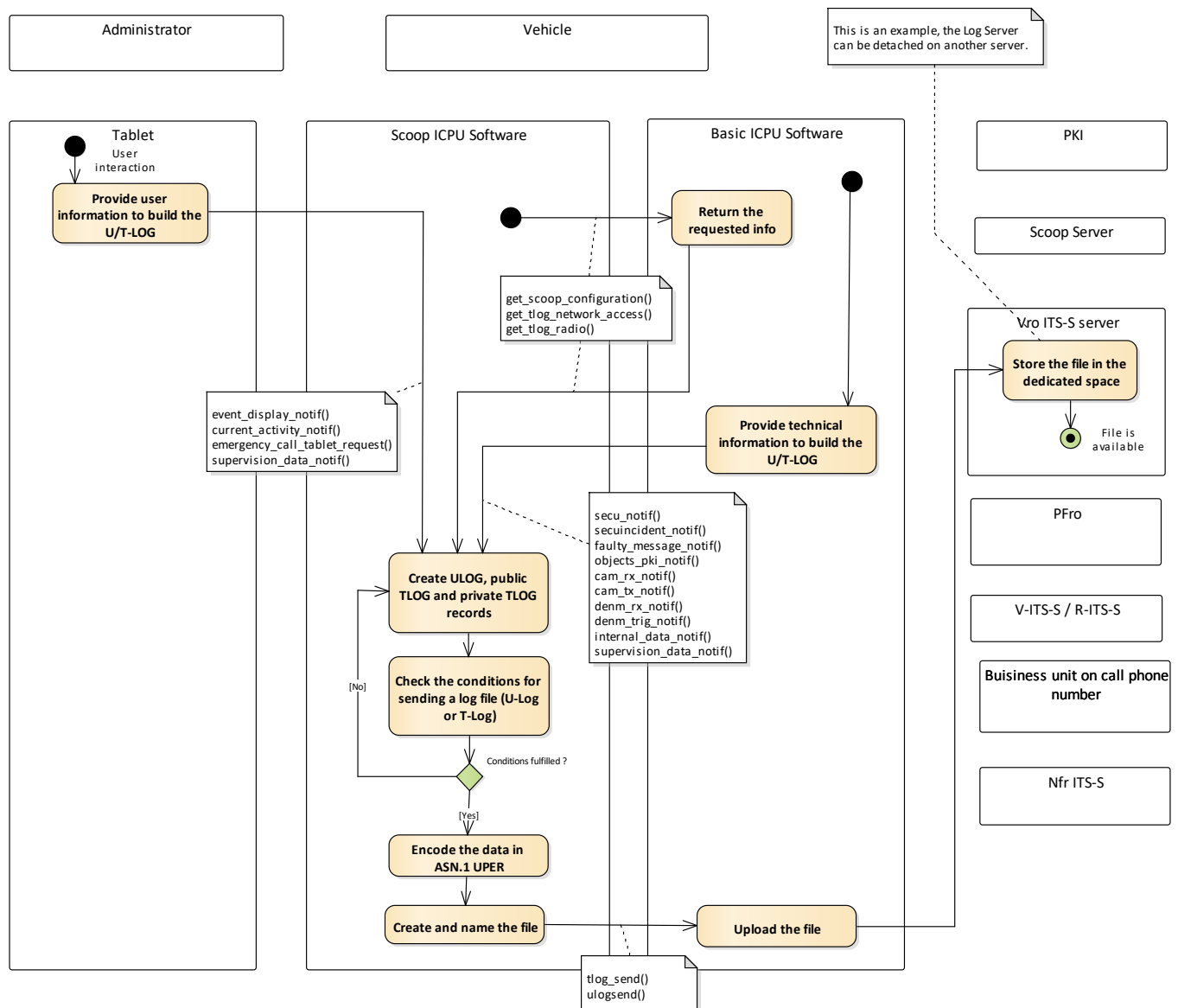


Figure 27 : Manage U-LOG and T-LOG – activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context. (list of parameters mentioned is not exhaustive compared to the definition of the method.)

Methode	Specificities and parameters
[event_display_notif]	Only used for Logs
[current_activity_notif]	N/A
[emergency_call_tablet_request]	Cf. § 5.5
[get_scoop_configuration]	To know which Tlog/Ulog is allowed to be generated or not
[get_tlog_network_access]	Only used for Logs
[get_tlog_radio]	Only used for Logs

[secu_notif]	Only used for Logs
[secuincident_notif]	Only used for Logs
[faulty_message_notif]	Only used for Logs
[objects_pki_notif]	Only used for Logs
[cam_rx_notif]	Only used for Logs
[cam_tx_notif]	Only used for Logs
[denm_rx_notif]	Cf. § [DA1]
[denm_trig]	Cf. § [DA1]
[internal_data_notif]	N/A
[supervision_data_notif]	N/A
[tlog_send]	Only used for Logs
[ulog_send]	Only used for Logs

6.1.2 Logs for IVI

Log strategy defined in [DA10] is based on the general layered architecture of a C-ITS station. Logs are separated in the following two major categories:

- Communication,
- Application which includes HMI layer.

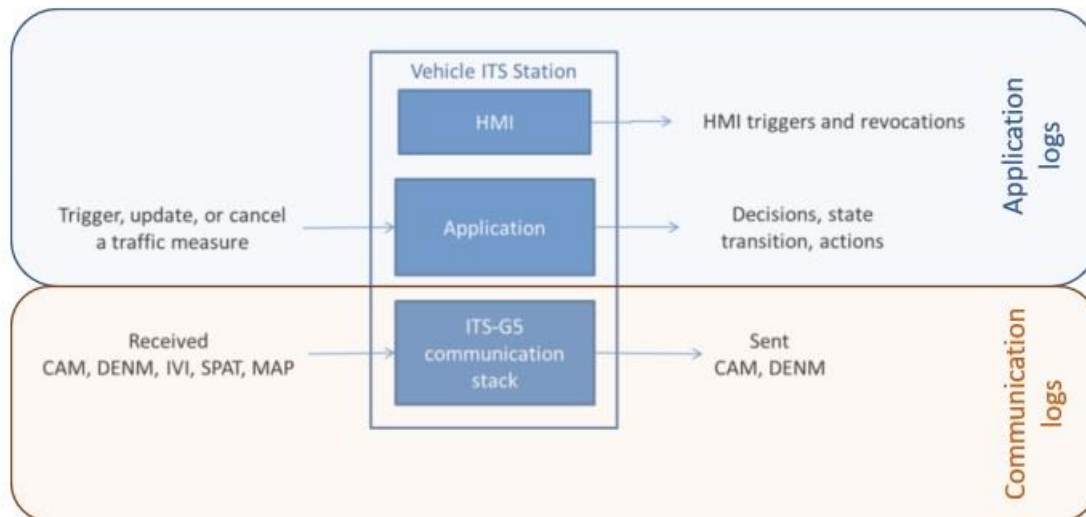


Figure 28 : IVI logs strategy and C-ITS-S layers

Communication logs are composed of the messages that are sent or received by a station via any communication medium, path or channel.

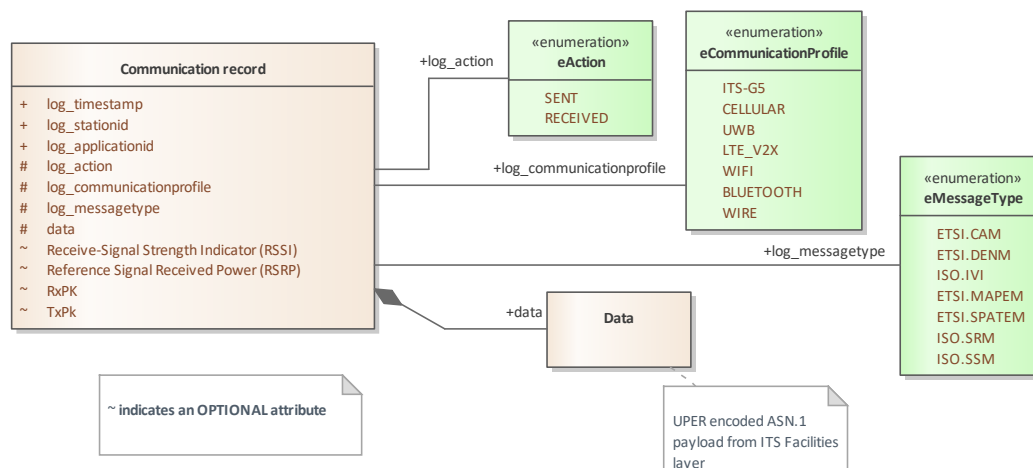


Figure 29 : Communication record

Application logs are based on the concept of event model.

This model, once instantiated, defines the list of actions that can be associated with an event. These actions are identified by a double key <eventmodelid, eventactionid> (EventType, ActionType).

Every occurrence or detection of a specific type of events is considered as an event. A unique identifier, eventid, is associated with each event. The purpose of the eventid is to trace all actions across all applications of a station that are related to a single event. In case of IVI message, the eventid is based on <serviceProviderId, iviidentificationNumber>.

Depending on the instantiated model (IVI model in our case), event and action records are extended with attributes that are specific to the model.

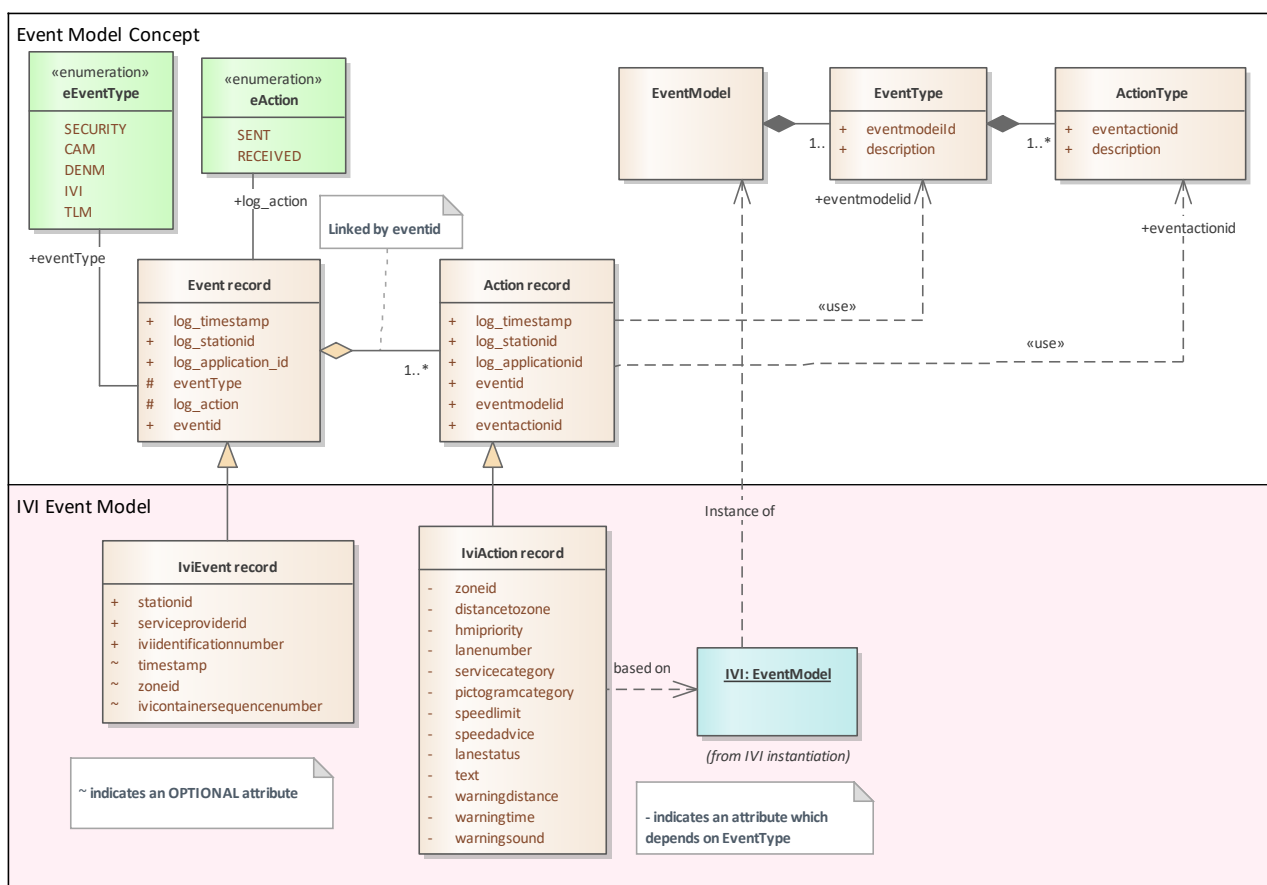


Figure 30 : Event Model Concept and IVI application records

Below an extract from [DA11], in order to illustrate IVI event model instantiation.

EventType		ActionType	
eventmodelid	description	eventactionid	description
1	Generating IVI	1	IVI trigger
		2	IVI update
		3	IVI termination cancellation
		4	IVI termination negation
2	Processing received IVI	1	IVI trigger
		2	IVI update
		3	IVI termination cancellation
		4	IVI termination negation
3	Relevance of received IVI	1	relevant = assumes all of the following criteria are checked as relevant
		2	not relevant: not in time validity duration
		3	not relevant: not in travel direction of detection and relevance zones
		4	not relevant = vehicle characteristics not applicable
		5	not relevant = none of the road sign codes can be processed (e.g. not implemented or recognised)
4	Matching of received IVI	1	not within awareness time or distance, or near any zones
		2	within awareness time traveling towards the event and in the direction of the zones, while not in any zone yet.
		3	in detection zone and in travel direction of the zone
		4	in relevance zone and in travel direction of the zone
5	Awareness of received IVI	1	trigger presentation request to HMI
		2	trigger update request to HMI (only specify the updated information)
		3	trigger revocation request to HMI
6	Presentation on HMI of received information	1	first visual presentation
		2	updated visual presentation
		3	revoke visual presentation
		4	first audible signal
		5	revoke audible signal

Table 4 : IVI EventModels (extracted from [DA11])

6.1.2.1 Communication log

A communication log file is made up of communication records.



Figure 31 : Communication log file

ID	2.4.2.2_Master-LOG-022(1)
Component(s)	VroES
Requirement	Each time an IVI message is received (including IVIM repetition) by the Vro-ITS-S through IF_Nfr or IF_G5 a communication record shall be logged.
Additional information	N/A

ID	2.4.2.2_Master-LOG-023(1)
Component(s)	VroES
Requirement	Each time an IVI message is sent (including IVIM repetition) by the Vro-ITS-S through IF_Nfr or IF_G5 a communication record shall be logged.
Additional information	N/A

ID	2.4.2.2_Master-LOG-024(1)
Component(s)	VroES
Requirement	<p>The communication record shall respect the structure described in [DA12].</p> <p>The Vro-ITS-S shall fill all bold attributes in the document [DA12] except the RxPK and TxPK attributes.</p> <p>log_communicationprofile attribute shall be set to "ITS-G5" when interface IF_G5 is used or "CELLULAR" when interface IF_NFr is used.</p> <p>If the communication interface is not known, the attribute value shall be set to "NULL".</p>
Additional information	N/A

6.1.2.2 Application logs

IviEvent records and IviAction records are collected in a separate log file, respectively ivievent log file and iviaction log file due to the choice of file format (see § 6.1.2.3).

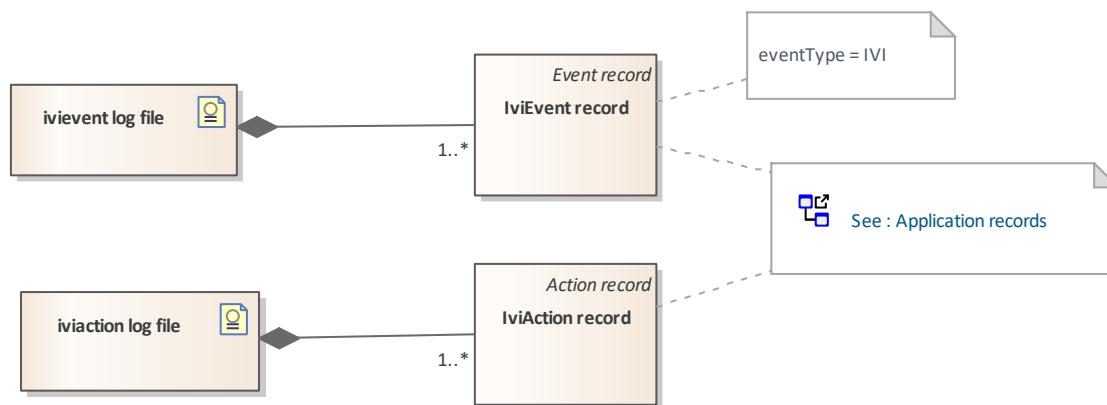


Figure 32 : Application log files

ID	2.4.2.2_Master-LOG-025(1)
Component(s)	VroES
Requirement	<p>Each time the Vro-ITS-S detects a new IVI event (SENT/RECEIVED) an IVI event record shall be logged.</p> <p>The Vro-ITS-S shall associate a unique identifier, eventid [0...4294967295] to each IVI event identified by the pair serviceProviderId / iviidentificationNumber.</p>
Additional information	There is only one event associated with all the states of an IVI message life cycle.

ID	2.4.2.2_Master-LOG-026(1)
Component(s)	VroES
Requirement	<p>The ivi event record shall respect the structure described in [DA11], sheet [ivievent].</p> <p>The Vro-ITS-S shall fill only bold attributes in this sheet.</p>
Additional information	<ul style="list-style-type: none"> According to [DA19], more than one zone applies to IVI event (detectionZone and relevanceZone), then attribute zoneid is not set. As IVI event is always linked to all IVIM containers and not a specific one, then attribute ivicontainersequencenumber is not set. According to [DA11], as no optional attribute is filled in, then the timestamp attribute also becomes optional. <p>Then, attributes timestamp, zoneid and ivicontainer may not be managed by the Vro-ITS-S.</p>

ID	2.4.2.2_Master-LOG-027(1)
Component(s)	VroES
Requirement	<p>Each time an IVIM is sent (triggered, updated or cancelled, without taking into account repetition) by the Vro-ITS-S an IVI action record of type “Generating IVI” with the corresponding action type:</p> <ul style="list-style-type: none"> • IVI trigger • IVI update • IVI termination cancellation <p>shall be logged.</p>
Additional information	IVI termination negation is not triggered by Vro-ITS-S.

ID	2.4.2.2_Master-LOG-028(1)
Component(s)	VroES
Requirement	<p>The IVI action record of type “Generating IVI” (whatever the value of action type) shall respect the structure described in [DA11], sheet [iviaction].</p> <p>The Vro-ITS-S shall fill only bold attributes for this record.</p>
Additional information	N/A

ID	2.4.2.2_Master-LOG-029(1)
Component(s)	VroES
Requirement	<p>Each time an IVIM is received (triggered, updated or cancelled, without taking into account repetition) by the Vro-ITS-S an IVI action record of type “Processing received IVI” with the corresponding action type:</p> <ul style="list-style-type: none"> • IVI trigger • IVI update • IVI termination cancellation <p>shall be logged.</p>
Additional information	IVI termination negation is not managed by Vro-ITS-S.

ID	2.4.2.2_Master-LOG-030(1)
Component(s)	VroES
Requirement	<p>The IVI action record of type “Processing received IVI” (whatever the value of action type) shall respect the structure described in [DA11], sheet [iviaction].</p> <p>The Vro-ITS-S shall fill only bold attributes for this record.</p>
Additional information	N/A

ID	2.4.2.2_Master-LOG-031(1)
Component(s)	VroES
Requirement	<p>Each time an IVIM received is dropped by the Vro-ITS-S because it doesn't correspond to its vehicle characteristics an IVI action record of type "Relevance of received IVI" with the corresponding action type:</p> <ul style="list-style-type: none"> <i>not relevant = vehicle characteristics not applicable</i> <p>shall be logged.</p>
Additional information	N/A

ID	2.4.2.2_Master-LOG-032(1)
Component(s)	VroES
Requirement	<p>The IVI action record of type "Relevance of received IVI" shall respect the structure described in [DA11], sheet [iviaction].</p> <p>The Vro-ITS-S shall fill only bold attributes for this record.</p>
Additional information	Only action type linked to vehicle characteristic is managed by Vro-ITS-S.

ID	2.4.2.2_Master-LOG-033(1)
Component(s)	VroES
Requirement	The IVI action record of type " Matching of received IVI " may not be managed by the Vro-ITS-S.
Additional information	<p>Taking this record into account can generate a lot of logs which are also implicitly linked to IVI action records "Awareness of received IVI" and "Presentation on HMI of received information".</p> <p>Indeed, a displayed message is necessarily relevant and well matched.</p>

ID	2.4.2.2_Master-LOG-034(1)
Component(s)	VroES
Requirement	<p>Each time the Vro-ITS-S triggers a display request to the HMI linked to an IVI event (first request, updates or revocation) an IVI action record of type “Awareness of received IVI” with the corresponding action type:</p> <ul style="list-style-type: none"> • <i>trigger presentation request to HMI,</i> • <i>trigger update request to HMI (only specify the updated information),</i> • <i>trigger revocation request to HMI</i> <p>shall be logged.</p>
Additional information	N/A

ID	2.4.2.2_Master-LOG-035(1)
Component(s)	VroES
Requirement	<p>The IVI action record of type “Awareness of received IVI” (whatever the value of action type) shall respect the structure described in [DA11], sheet [iviaction].</p> <p>The Vro-ITS-S shall fill bold attributes for this record and following attributes:</p> <ul style="list-style-type: none"> • lanenumber, • servicecategorycode • pictogramcategorycode • speedlimit • lanestatus • text • warningdistance • warningtime
Additional information	<p>Following attributes are not managed by Vro-ITS-S:</p> <ul style="list-style-type: none"> • hmipriority • speedadvice • warningsound

ID	2.4.2.2_Master-LOG-036(1)
Component(s)	VroES
Requirement	<p>Each time the Vro-ITS-S displays on HMI information linked to an IVI event (first display, updates or revocation) an IVI action record of type “Presentation on HMI of received information” with the corresponding action type:</p> <ul style="list-style-type: none"> • <i>first visual presentation</i> • <i>updated visual presentation</i> • <i>revoke visual presentation</i> <p>shall be logged.</p>
Additional information	<p>As no sound is associated to IVI event, the following action are not managed by Vro-ITS-S:</p> <ul style="list-style-type: none"> • first audible signal • revoke audible signal

ID	2.4.2.2_Master-LOG-037(1)
Component(s)	VroES
Requirement	<p>The IVI action record of type “Presentation on HMI of received information” (whatever the value of action type) shall respect the structure described in [DA11], sheet [iviaction].</p> <p>The Vro-ITS-S shall fill bold attributes for this record and following attributes:</p> <ul style="list-style-type: none"> • lanenumber, • servicecategorycode • pictogramcategorycode • speedlimit • lanestatus • text • warningdistance • warningtime
Additional information	<p>Following attributes are not managed by Vro-ITS-S:</p> <ul style="list-style-type: none"> • hmipriority • speedadvice • warningsound

6.1.2.3 File format and name

ID	2.4.2.2_Master-LOG-038(1)
Component(s)	VroES
Requirement	<p>The format of the communication, ivievent and iviaction log files shall be a CSV file format compliant with RFC 4180 (see https://tools.ietf.org/html/rfc4180).</p> <p>The separator is a comma (ASCII: 0x2C) and character set used is ASCII.</p> <p>The header line shall appear as the first line of the file with the name of each attribute separated by a comma.</p> <p>Each separate line in the file corresponds to a communication record, an ivievent record or an iviaction record according to the considered log file.</p>
Additional information	See example in Figure 33.

ID	2.4.2.2_Master-LOG-039(2)
Component(s)	VroES
Requirement	<p>The file name shall respect the following syntax [TimeStamp]_[Pseudo]_G_[Type].csv with :</p> <ul style="list-style-type: none"> ▪ TimeStamp – Time at which the file is created (see TimeStampIts defined in [DA26]) in format YYYYMMDDHHMMSSnnn (nnn representing milliseconds on 3 digits), ▪ Pseudo – stationID (4 bytes) expressed in hexadecimal in format FFFFFFFF. ▪ Type – indicates the type of log file. Shall be one of the following: <ul style="list-style-type: none"> ○ comm in case of communication file, ○ [EventModelType]event in case of event log, ○ [EventModelType]action in case of action log with EventModelType = {secu;cam;denm;ivi;tlm} <p><u>Example:</u> 20221215180010100_F9D8E432_G_comm.csv 20221215180010100_F9D8E432_G_ivievent.csv 20221215180010100_F9D8E432_G_iviaction.csv</p>
Additional information	In the [DA10], the file name is described but it does not work with csv file format. Therefore, the choice has been made to use a name closed to U-LOG/T-LOG filename.

ID	2.4.2.2_Master-LOG-040(1)
Component(s)	VroES
Requirement	<p>An attribute not managed by the system (optional by definition or by specification) may be completely absent from the file.</p> <p>A mandatory attribute whose value is not available shall be populated with the NULL value or left empty. See example in Figure 33</p>
Additional information	N/A

communication log file

```
log_timestamp,log_stationid,log_applicationid,log_action,log_communicationprofile,log_message_type,asn1data
1593674887922,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887959,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887939,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887939,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887939,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887939,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887959,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887959,930072041,I,RECEIVED,CELLULAR,ISO_IVI,01060000000000BAC9AC400A4793FAF7AE1E4FBE88793F668AE0.
1593674887961,930072041,I,RECEIVED,ITS-G5,ISO_IVI,01060000000000BAC9AC40104793FB1551E4FECF55478793F8439E020.
1593674887966,930072041,I,RECEIVED,ITS-G5,ISO_IVI,01060000000000BAC9AC40104793FB1551E4FECF55478793F8439E020.
1593674888547,930072041,I,RECEIVED,ITS-G5,ISO_IVI,01060000000000BAC9AC40104793FB24841E4FECF32110793F6936C4020.
1593674888582,930072041,I,RECEIVED,ITS-G5,ISO_IVI,01060000000000BAC9AC40104793FB24841E4FECF32110793F6936C4020.
```

RSSI, RSRP, RxPK, TxPk
attributes not managed
=> « columns » not
present

iviaction log file

[illegible]

NULL value or blank

Figure 33 : CSV log files example

6.1.2.4 Management and upload

ID	2.4.2.2_Master-LOG-041(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall create a log file (communication, ivievent and iviaction file) and transmit it to the dedicated server:</p> <ul style="list-style-type: none"> when the maximum authorized size for the file is reached, when the time interval since the last sending of a file is exceeded, before entering in off mode
Additional information	The record implying the exceedance of the log file size may be included in the current file or in the next one.

ID	2.4.2.2_Master-LOG-042(1)
Component(s)	VroES; Scoop Server
Requirement	<p>For each type of record (communication, ivievent and iviaction), a parameter (<i>p_GEN_Tlog[type]On</i>) shall be configurable in order to authorize or not its creation.</p> <p>The scope of these parameters shall be global (not configurable by vehicle).</p>
Additional information	For example, parameter <i>p_GEN_Tlog_ivieventOn</i> authorize or not the log by the Vro-ITS-S of the IVI event record.

ID	2.4.2.2_Master-LOG-043(1)
Component(s)	VroES; Scoop Server
Requirement	<p>The parameters associated to the creation of a log file shall be configurable for each type of log file (communication, ivievent or iviaction).</p> <p>The scope of these parameters (<i>p_GEN_Tlog[type]MaxSize</i>, <i>p_GEN_Tlog[type]IntervallSend</i>) shall be global (not configurable by vehicle).</p>
Additional information	The trigger thresholds can be different for the different types of logs.

ID	2.4.2.2_Master-LOG-044(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall store communication, ivievent or iviaction files which fail to be uploaded for retransmission. When the storage space dedicated to log files is not sufficient to save the new file, the oldest files shall be erased to free space.
Additional information	It's important to limit the loss of T-LOG.

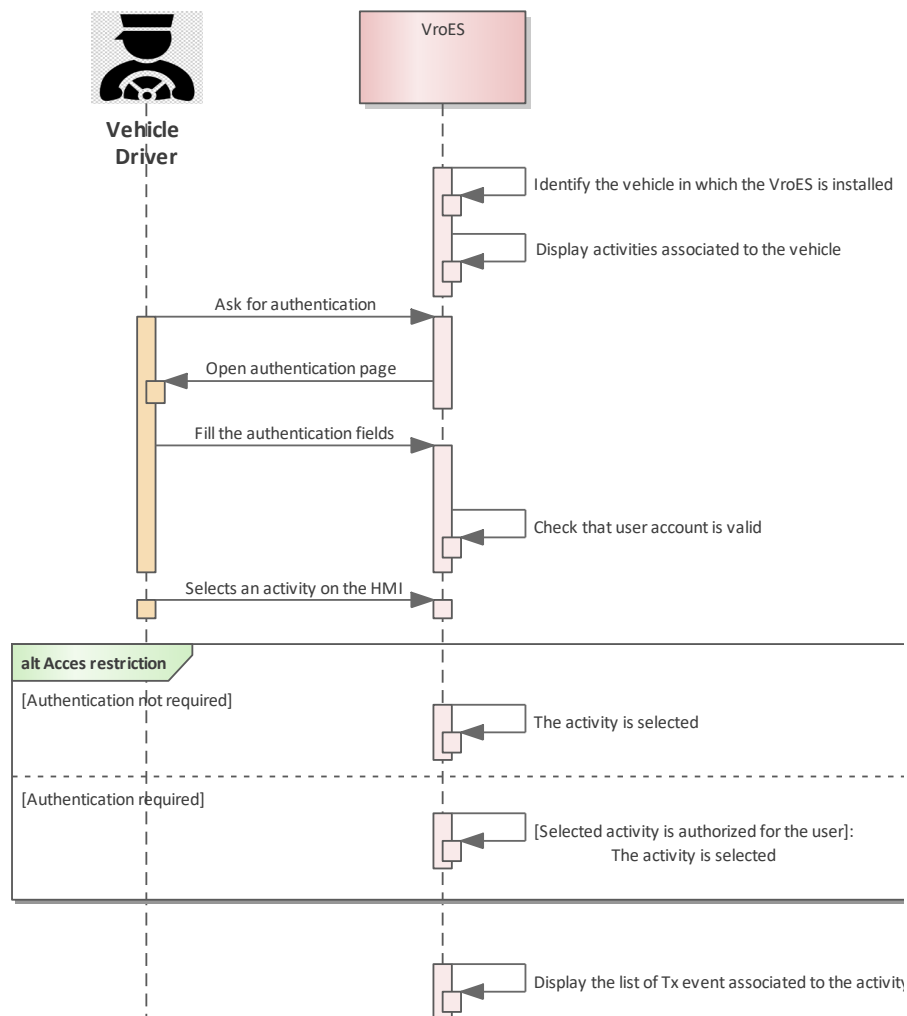
ID	2.4.2.2_Master-LOG-045(1)
Component(s)	VroES; Scoop Server
Requirement	When the SCOOP Server is used as a log server, then the Vro-ITS-S shall respect the interface IF_ScSV.
Additional information	N/A

ID	2.4.2.2_Master-LOG-046(1)
Component(s)	VroES
Requirement	The dedicated server shall allow a third party to have access to the communication, ivievent and iviaction files.
Additional information	This will allow the evaluation of the Scoop projects via the study of logs.

6.2 Manage authentication

6.2.1 Nominal case

Authenticate before activity selection



Authenticate after activity selection

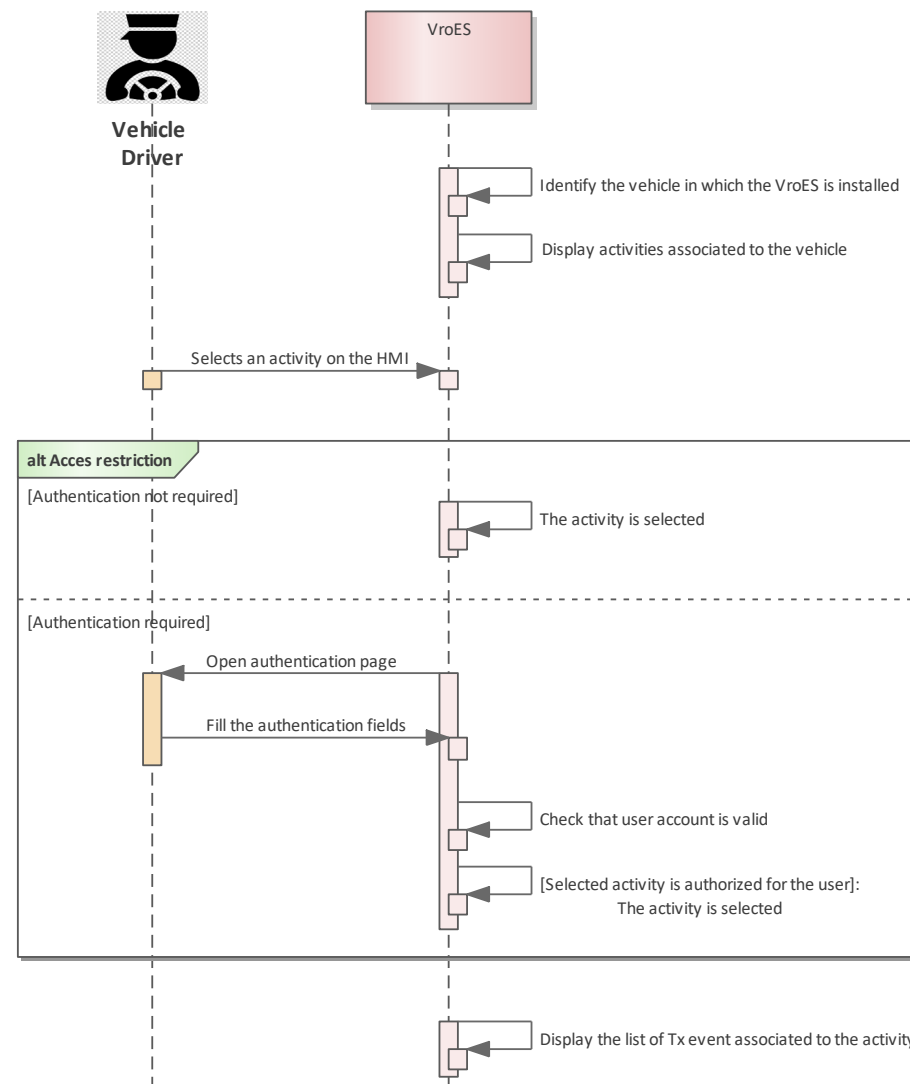


Figure 35: Manage authentication, before and after activity selection – sequence diagram

ID	2.4.2.2_Master-AUTH-001(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	<p>The VroES shall identify the vehicle in which it is installed thanks to the following logic:</p> <ul style="list-style-type: none"> - Vehicle and ICPU are linked per configuration (see Figure 42), - The ICPU offers a Wi-Fi connection identifiable by its configurable SSID (<i>p_ICPU_WiFiSSID</i>), - When the tablet is installed, it is connected to the ICPU WiFi. <p>Per rebound, the tablet knows on which vehicle it is installed.</p> <p>The association Vehicle ⇔ ICPU ⇔ is configurable and illustrated in Figure 43.</p>
Additional information	N/A

ID	2.4.2.2_Master-AUTH-002(1)
Component(s)	VroES; Scoop Server
Requirement	<p>The Vro-ITS-S shall display on the home page of the HMI all the activities associated to the vehicle (activity with or without required authentication).</p> <p>The association Activity ⇔ Vehicle is configurable and illustrated in Figure 42</p>
Additional information	Thus, an activity not compatible with the vehicle will never be selected.

ID	2.4.2.2_Master-AUTH-003(1)
Component(s)	VroES; Scoop Server
Requirement	<p>When the driver selects an activity which does not require an authentication (i.e. <i>p_GEN_Authentication</i> = False), the Vro-ITS-S shall display the list of Tx events associated to the activity.</p>
Additional information	N/A

ID	2.4.2.2_Master-AUTH-004(1)
Component(s)	VroES; Scoop Server
Requirement	<p>When the driver selects an activity which requires an authentication (i.e. <i>p_GEN_Authentication</i> = True), and the driver is not already logged, the Vro-ITS-S shall request its authentication:</p> <ul style="list-style-type: none"> - Username (<i>p_GEN_UserName</i>), - Password (<i>p_GEN_Password</i>).
Additional information	N/A

ID	2.4.2.2_Master-AUTH-005(1)
Component(s)	VroES; Scoop Server
Requirement	<p>When the driver is authenticated and its associated profile gives access to the selected activity, the Vro-ITS-S shall display the list of Tx events associated to the activity.</p> <p>The association driver ⇔ profile ⇔ activity is configurable and illustrated in Figure 42</p>
Additional information	N/A

ID	2.4.2.2_Master-AUTH-006(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall allow the driver to switch from an activity to another if its rights allow it.
Additional information	N/A

ID	2.4.2.2_Master-AUTH-007(1)
Component(s)	Vro-ITS-S
Requirement	<p>A driver shall be unlogged only if the driver:</p> <ul style="list-style-type: none"> • logs out by himself, • turns off the vehicle engine, • shuts down the application.
Additional information	N/A

6.2.2 Alternative case

ID	2.4.2.2_Master-AUTH-008(1)
Component(s)	VroES
Requirement	If the VroES is not able to identify the vehicle in which it is installed, no activity shall be accessible.
Additional information	N/A

ID	2.4.2.2_Master-AUTH-009(1)
Component(s)	VroES; Scoop Server
Requirement	<p>If the vehicle is not associated to activities, the Vro-ITS shall display on the home page of the HMI all the activities associated to the vehicle type</p> <p>The association activity ⇔ vehicleType ⇔ vehicle is configurable and illustrated in Figure 42</p>
Additional information	N/A

ID	2.4.2.2_Master-AUTH-010(1)
Component(s)	VroES
Requirement	<p>If a driver fails to authenticate himself (e.g. wrong password), the Vro-ITS-S shall ask for authentication again.</p>
Additional information	No maximum number of attempts is needed.

ID	2.4.2.2_Master-AUTH-011(1)
Component(s)	VroES
Requirement	<p>If a driver selects an activity before authentication, and its associated profile does not give access to the selected activity, the Vro-ITS-S shall alert the driver and return back to the home page.</p>
Additional information	N/A

ID	2.4.2.2_Master-AUTH-012(1)
Component(s)	VroES
Requirement	<p>At the SCOOP application opening before any activity selection, the default activity is the user one.</p>
Additional information	

ID	2.4.2.2_Master-AUTH-013(1)
Component(s)	VroES; Scoop Server
Requirement	<p>If the Vro-ITS-S is mounted without tablet (i.e $p_VEH_InstallationSetup = 0$), only one activity is active.</p> <p>This activity shall be configurable via $p_VEH_DefaultActivityNoTablet..$</p>
Additional information	This is mandatory for the ICPU to know the Tx events automatically triggerable.

ID	2.4.2.2_Master-AUTH-014(1)
Component(s)	VroES; Scoop Server
Requirement	<p>A tablet administrator (see § Definitions) shall be able to identify himself the same way a driver does.</p> <p>A driver is a tablet administrator if its profile has <i>p_GEN_tabletAdminActivation</i> is set to [True].</p>
Additional information	N/A

ID	2.4.2.2_Master-AUTH-015(1)
Component(s)	VroES
Requirement	<p>From the Vro-ITS-S HMI, a tablet administrator shall be able to:</p> <ul style="list-style-type: none"> • Modify the SSID of the ICPU the tablet is connected to. • Modify the URL of the Scoop Server the tablet is connected to. • Force the reload of the cartography.
Additional information	N/A

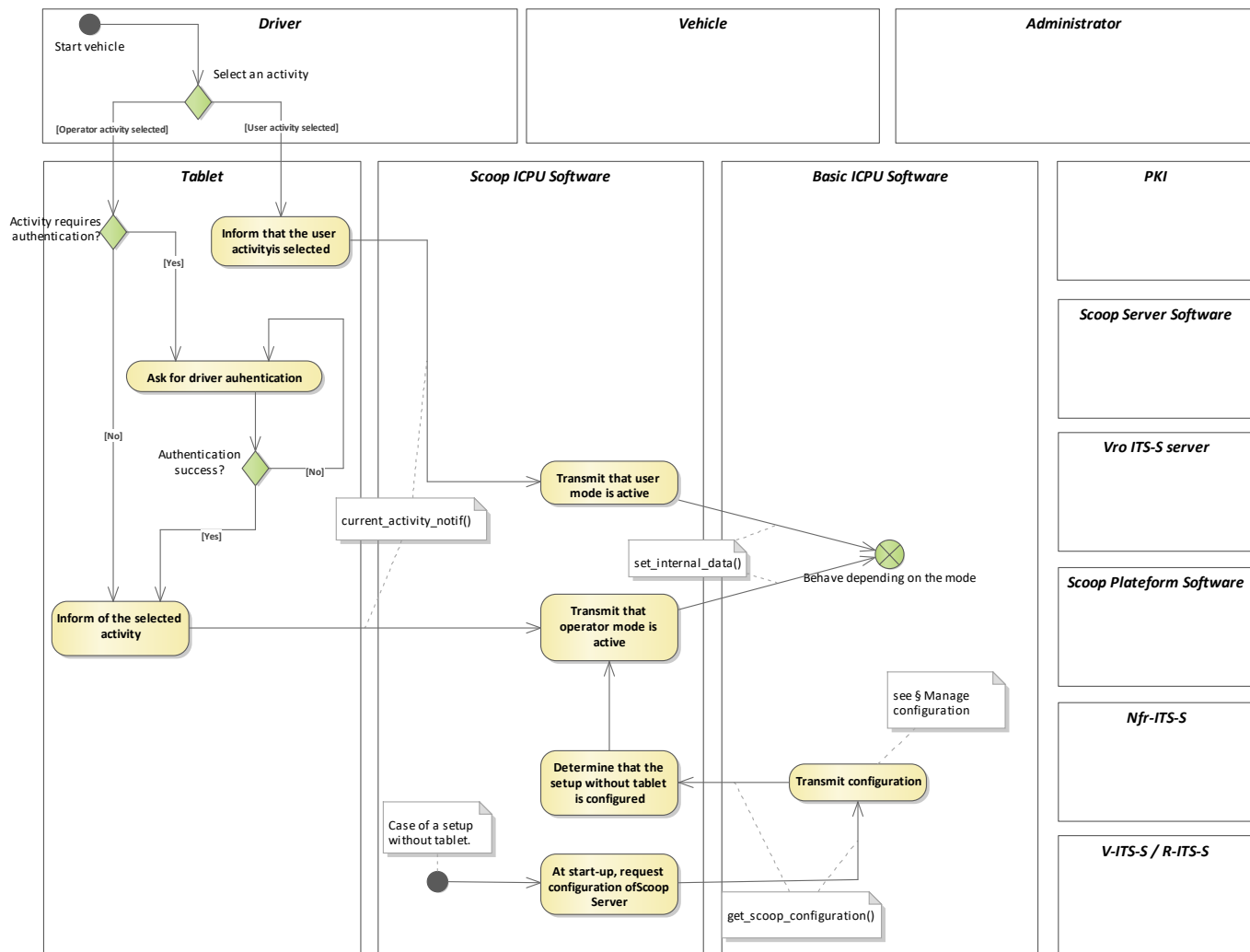


Figure 36 : Authentication for driver – activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context. (list of parameters mentioned is not exhaustive compared to the definition of the method)

Methode	Specificities and parameters
[current_activity_notif]	N/A
[set_internal_data]	stationType: 5, 7 or 8 if current mode is user. For operator activities or setup without tablet, 10.
[get_scoop_configuration]	Type_configuration_uevg: 1 if Vro-ITS-S without tablet. Activite_metier: value of the activity that determines p_GEN_DefaultActivityNoTablet.

6.3 Manage cartography

In this chapter, the term “cartography elements” is used to include:

- Background map (used for esthetical reason),
- Vectorial map (used for relevance calculation),
- Postal addresses (used for itinerary calculation).

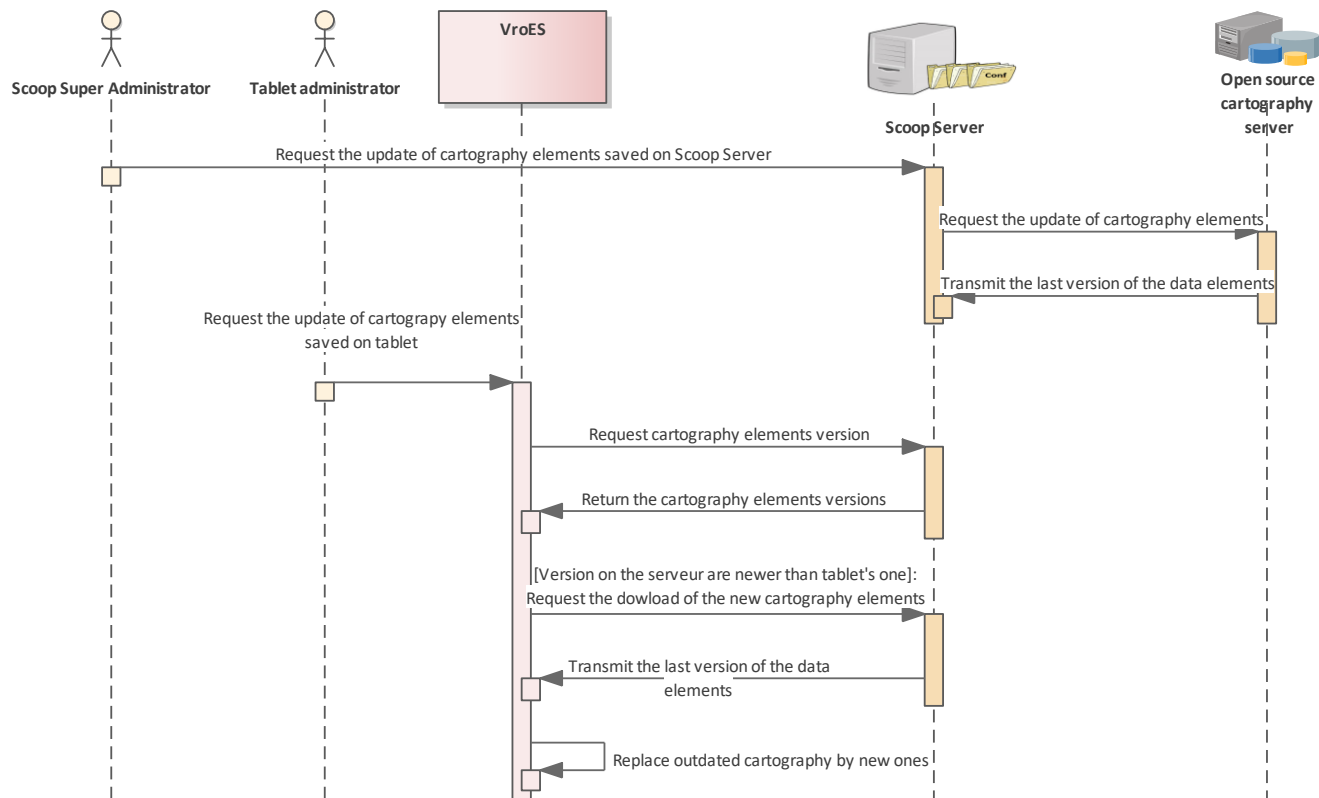


Figure 37 : Manage cartography – sequence diagram

ID	2.4.2.2 Master-CART-001(2)
Component(s)	Scoop Server
Requirement	A Scoop super administrator shall be able to configure on the scoop server the URL of the open-source cartography server to contact when a download is requested. This URL is independent for each cartography element.
Additional information	N/A

ID	2.4.2.2_Master-CART-002(1)
Component(s)	VroES, SCOOP Server
Requirement	A Scoop super administrator shall be able to request the update of each cartography elements saved on the Scoop server.
Additional information	The request is realised one element at a time.

ID	2.4.2.2_Master-CART-003(1)
Component(s)	VroES; Scoop Server
Requirement	After a Scoop super administrator request, the Scoop server shall download from an open-source cartography server the latest version of the cartography element.
Additional information	N/A

ID	2.4.2.2_Master-CART-004(1)
Component(s)	VroES; Scoop Server
Requirement	The tablet administrator shall be able to request the VroES to download the latest version of the cartography elements saved on the Scoop server. If the latest version of an element is already saved on the VroES, no download shall be launched.
Additional information	N/A

ID	2.4.2.2_Master-CART-005(1)
Component(s)	VroES
Requirement	After the download of an element, the Vro-ITS-S shall erase the previously saved version and keep in memory the saved one.
Additional information	N/A

6.4 Update software

6.4.1 Nominal case

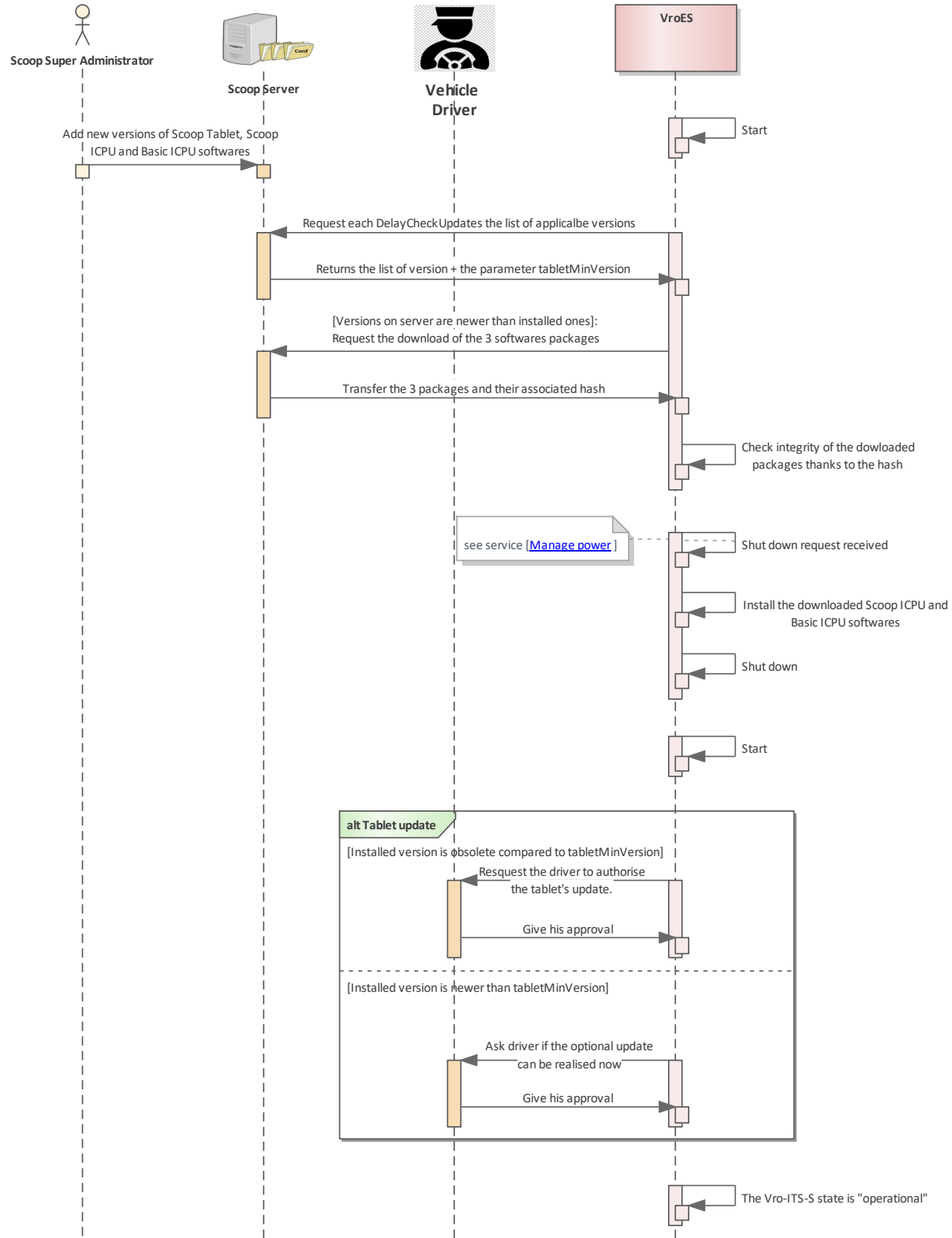


Figure 38: Update software - sequence diagram

ID	2.4.2.2_Master-UPDT-001(1)
Component(s)	VroES; Scoop Server
Requirement	<p>An administrator shall be able to upload on the Scoop Server a new version of:</p> <ul style="list-style-type: none"> • Scoop Tablet Software, • Scoop ICPU Software, • Basic ICPU Software. <p>Those new versions are global to all Vro-ITS-S.</p>
Additional information	Those updates are independent packages but the compatibility between the three softwares is a key principle. Thus, it is advised to always update the three at the same time. Compatibility is registered in the release notes.

ID	2.4.2.2_Master-UPDT-002(1)
Component(s)	VroES; Scoop Server
Requirement	The Scoop Server shall allow an administrator to update the VroES with a previous version of the softwares.
Additional information	This allows back pedalling in case of a software malfunction.

ID	2.4.2.2_Master-UPDT-003(3)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The Vro-ITS-S shall check each <i>p_ICPU_DelayCheckUpdates</i> if the version of the 3 softwares available on the Scoop server are different than the installed ones.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-004(1)
Component(s)	VroES; Scoop Server
Requirement	If the version of the softwares on the Scoop server are different than the installed ones, the Vro-ITS-S shall download the associated packages and their hash.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-005(1)
Component(s)	VroES
Requirement	During the download, the process shall be hidden to the user.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-006(1)
Component(s)	VroES
Requirement	After downloading the packages, the Vro-ITS-S shall check their integrity by confronting them to their hash.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-007(1)
Component(s)	VroES
Requirement	At the shutdown request and before effective shutdown, the Vro-ITS-S shall install the downloaded version of the Scoop ICPU and Basic ICPU software.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-008(1)
Component(s)	VroES; Scoop Server
Requirement	At the start of the VroES, if the installed version of the Scoop tablet software is older than <i>p_GEN_tabletMinVersion</i> , the Vro-ITS-S shall request the driver's authorisation to launch the update of the software.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-009(1)
Component(s)	VroES; Scoop Server
Requirement	At the start of the VroES, if the installed version of the Scoop tablet software is newer than <i>p_Gen_tabletMinVersion</i> , the Vro-ITS-S shall offer to the driver the possibility to update the software.
Additional information	This update is optional.

ID	2.4.2.2_Master-UPDT-010(1)
Component(s)	VroES
Requirement	The update of a software shall not erase the configuration previously saved if the update does not explicitly require it.
Additional information	This prevents from unwanted changes due to the update of a software.

ID	2.4.2.2_Master-UPDT-011(1)
Component(s)	VroES
Requirement	After the update of the 3 software, the Vro-ITS-S state shall be "operational"
Additional information	This allows to see on the VroES that the update was successful.

6.4.2 Alternative case

ID	2.4.2.2_Master-UPDT-012(1)
Component(s)	VroES; Vro-ITS-S Server
Requirement	For more conveniency, the Vro-ITS-S server may substitute the Scoop Server for the update of Scoop ICPU and Basic ICPU software.
Additional information	The choice to make the software version global or specific for each Vro-ITS-S is a choice let to the ICPU manufacturer.

ID	2.4.2.2_Master-UPDT-013(1)
Component(s)	VroES; Scoop Server
Requirement	If the Vro-ITS-S fails to download a software or its integrity (via hash) is not consistent, it shall try anew to download after <i>p_GEN_DelayCheckUpdates</i> seconds.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-014(1)
Component(s)	VroES
Requirement	At the shutdown request, if the Vro-ITS-S does not have the 3 software successfully downloaded and with the integrity checked, the Vro-ITS-S shall delete the downloaded packages without installing any of them.
Additional information	This ensures the compatibility at the installation: the Vro will never install 1 out of 3 softwares leading to malfunctions.

ID	2.4.2.2_Master-UPDT-015(1)
Component(s)	VroES
Requirement	If the Vro-ITS-S fails to install the software or the installation leads to a malfunction, the Vro-ITS-S shall reload the previous version of the software.
Additional information	A Scoop super administrator will be able to check the installed version as mentioned in 6.7.

ID	2.4.2.2_Master-UPDT-016(1)
Component(s)	VroES; Scoop Server
Requirement	When a mandatory update of the tablet is proposed from the VroES to the driver, a negative response from the driver shall imply the extinction of the Scoop tablet software.
Additional information	This case occurs when the installed application is obsolete (older than <i>p_Gen_tabletMinVersion</i>)

ID	2.4.2.2_Master-UPDT-017(1)
Component(s)	VroES; Scoop Server
Requirement	When an optional update of the tablet is proposed from the VroES to the driver, a negative response from the driver shall imply the nominal opening of the Scoop tablet software.
Additional information	This case occurs when the installed application is not obsolete (newer than <i>p_Gen_tabletMinVersion</i>)

ID	2.4.2.2_Master-UPDT-018(1)
Component(s)	VroES
Requirement	When an update of the tablet is rejected by the driver (whether optional or mandatory), it shall be proposed again at the next start of the Scoop tablet software.
Additional information	N/A

ID	2.4.2.2_Master-UPDT-019(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The administrator shall be able to deactivate the remote update of the VroES. This is realised when <i>p_ICPU_remoteUpdate</i> is set to false.
Additional information	This prevent from conflicts if a manual update is realised.

ID	2.4.2.2_Master-UPDT-020(1)
Component(s)	VroES
Requirement	The Scoop server administrator shall be able to manually upload on the VroES the new versions of the 3 software via a wired connection
Additional information	N/A

6.5 Inform of the Vro-ITS-S status

6.5.1 Metrics and statuses

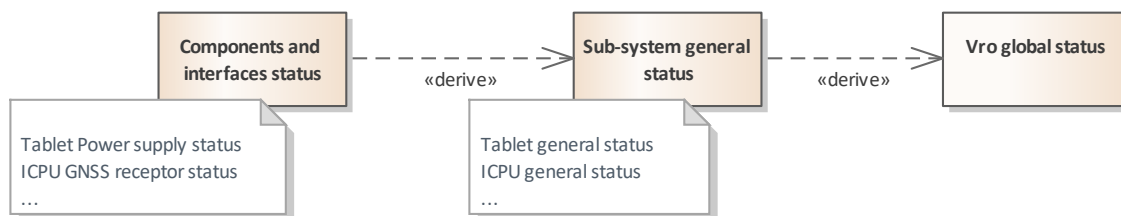


Figure 39: Vro-ITS-S statuses construction – class diagram

ID	2.4.2.2_Master-SUPP-001(1)
Component(s)	VroES
Requirement	Each Vro-ITS-S's sub-system shall monitor its <u>components and interfaces</u> following Table 5.
Additional information	The detail of the status calculation will be defined in the development process.

ID	2.4.2.2_Master-SUPP-002(1)
Component(s)	VroES
Requirement	When a component or interface is characterised as a "Status", it shall be set to one of the following values: <ul style="list-style-type: none"> • Unavailable • Operational • Degraded • Fail mode
Additional information	When a data is characterised as an "information", it is not used for other status calculation, but can be display and/or sent. Thus, the constraint on the type of those data is less strict.

Sub-system	Component and interface	Usage
Tablette	Power supply status	Status
	% of charge Table	Information
	GNSS receptor status	Status
	Connexion to webservices (ie remote servers)	Status
	% of memory usage	Information
ICPU	Cellular component (2G/3G/4G) status	Status
	ITS-G5 component status	Status

GNSS receptor status	Status
WiFi component status	Status
% CPU usage	Information
% RAM usage	Information
% non-volatile memory usage	Information
Interface with CAN bus status	Information
Equipment status– Snow plough	Information
Equipment status – FLR	Information
Equipment status – FLU	Information
Equipment status – Work in progress sign.	Information
Equipment status – Salting	Information
Equipment status – Orange flashing light	Information
Equipment status – Bleu flashing light	Information
Status equipment – SOS bouton	Information
"Ignition" (position of the ignition key)	Information
"ACC" (position of the ignition key)	Information
Power supply status	Status
Scoop ICPU Software status	Status
Basic ICPU Software status	Status
Status connexion to servers – PFro	Status
Status connexion to servers – Scoop Server	Status
Status connexion to servers – Vro-ITS-S Server	Status
Status connexion to servers – Nfr-ITS-S	Status
Status connexion to servers – Other servers	Status
Number of DATEX messages to resend	Information
Number of DATEX messages deleted	Information
Number de TLOGs to resend	Information
Number de ULOGs to resend	Information

Table 5 : Components and interface statuses

ID	2.4.2.2_Master-SUPP-003(1)
Component(s)	VroES
Requirement	From the components and interfaces statuses, the Vro-ITS-S sub-systems shall calculate <u>sub-system general statuses</u> as defined in Table 6.
Additional information	N/A

ID	2.4.2.2_Master-SUPP-004(1)
Component(s)	VroES
Requirement	<p>When a sub-system general status is characterised as a “Status”, it shall be set to one of the following values:</p> <ul style="list-style-type: none"> Operational = none of the components/interfaces are neither with a failure, nor a degraded status. Degraded = at least one component/interface has a degraded status, but none has a failure status. Failure = at least one component/interface has a failure status.
Additional information	<p>When a data is characterised as an “information”, it is not used for other status calculation, but can be display and/or sent. Thus, the constraint on the type of those data is less strict.</p>

Sub-system	General status	Usage
Tablet	General status	Status
	Usage duration with operational general status	Information
	Usage duration with degraded general status	Information
	Usage duration with failure general status	Information
ICPU	General status	Status
	Usage duration with operational general status	Information
	Usage duration with degraded general status	Information
	Usage duration with failure general status	Information

Table 6 : Sub-systems general statuses

ID	2.4.2.2_Master-SUPP-005(1)
Component(s)	VroES
Requirement	<p>From the sub-systems statuses, the Vro-ITS-S shall calculate the <u>Vro global status</u> as follow:</p> <ul style="list-style-type: none"> Operational = none of the sub-systems are neither with a failure, nor a degraded status. Degraded = at least one sub-system has a degraded status, but none has a failure status. Failure = at least one sub-system has a failure status.
Additional information	N/A

ID	2.4.2.2_Master-SUPP-006(1)
Component(s)	VroES
Requirement	<p>The driver shall be able to check via a dedicated page on tablet's HMI's:</p> <ul style="list-style-type: none"> • The components and interface status, • The sub-systems general status.
Additional information	The Vro global status is not displayed because the simplified status of the service ITS is deemed enough

ID	2.4.2.2_Master-SUPP-007(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall always display on the tablet's HMI a simplified status of the service ITS:</p> <ul style="list-style-type: none"> • Operational: status operational for G5, Wi-Fi, Nfr and GNSS • Degraded: status operational for component GNSS, and at least a degraded or failure for one of the three interfaces: G5, Wi-Fi or Nfr. • Failure: no GNSS position for more than 1 minute.
Additional information	N/A

ID	2.4.2.2_Master-SUPP-008(1)
Component(s)	VroES; Vro-ITS-S server
Requirement	<p>The Vro-ITS-S should transmit to the Vro-ITS-S server:</p> <ul style="list-style-type: none"> • The components and interfaces status, • The sub-systems general status, • The system global status.
Additional information	N/A

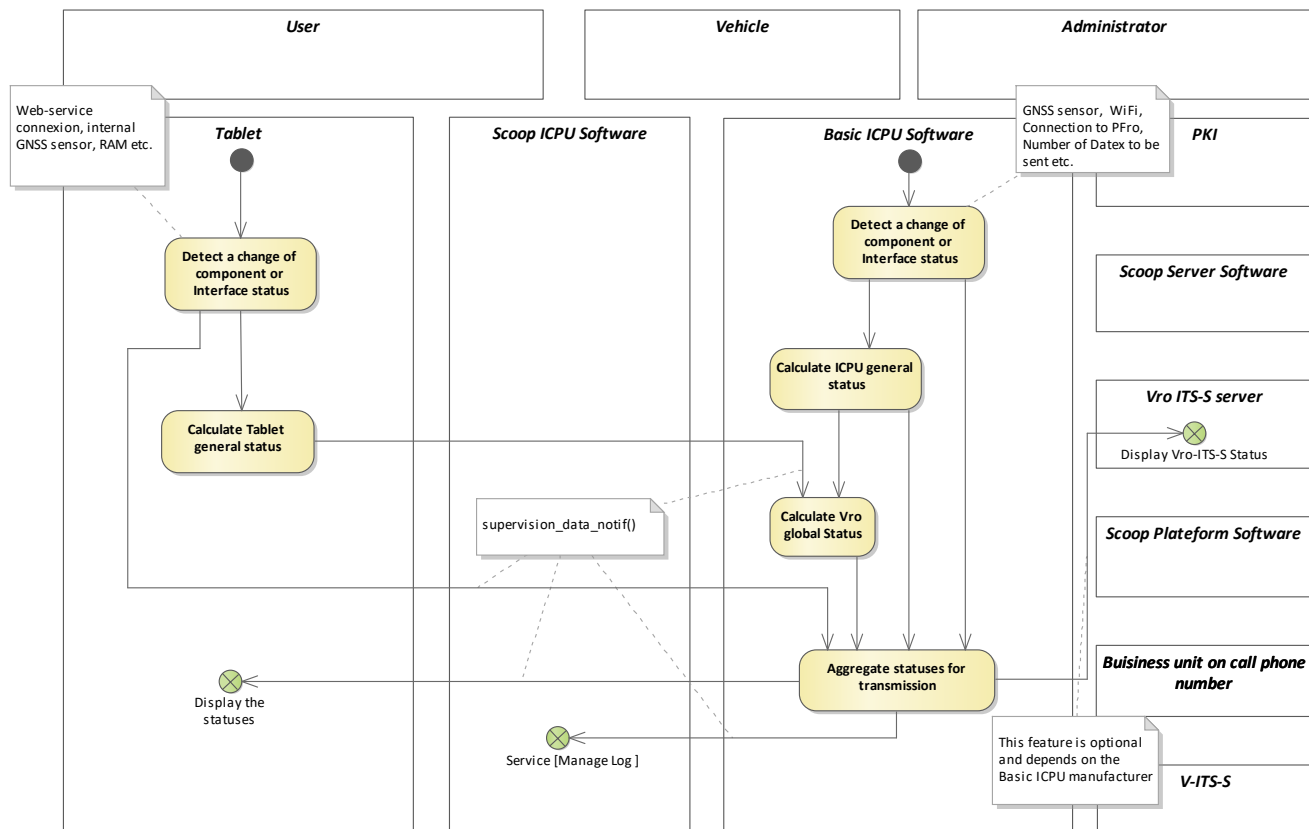


Figure 40 : Supervision of the Vro-ITS-S – activity diagram

NB: A change of state also impacts Figure 27 for the T-logs creation.

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context (list of parameters mentioned is not exhaustive compared to the definition of the method)

Methode	Specificities and parameters
[supervision_data_notif]	N/A

6.5.2 Software identification

ID	2.4.2.2_Master-SUPP-009(1)
Component(s)	VroES; Vro-ITS-S server
Requirement	<p>The Vro-ITS-S shall allow the driver to check installed version of the different application installed:</p> <ul style="list-style-type: none"> - Basic ICPU software - Scoop ICPU software - Scoop tablet software - Other modules connected to the communication bus (see 7.2.3)
Additional information	N/A

ID	2.4.2.2_Master-SUPP-010(1)
Component(s)	VroES; Vro-ITS-S server
Requirement	<p>The Vro-ITS-S shall transmit to the Scoop server the current version of the different softwares installed in the Vro-ITS-S.</p>
Additional information	See requirement mentioning their display.

6.6 Manage security

As a reminder, the change of mode does not impact the security processes as described in § 5.2.3.

ID	2.4.2.2_Master-SECU-013(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The URL or IP address and port of the connection to several servers related to security shall be configurable by an administrator of the Vro-ITS-S server for all Vro-ITS-S or independently for each Vro-ITS-S.
Additional information	The URL or IP address (parameters <i>p_ICPU_PkiEaUrl</i> , <i>p_ICPU_PkiAaUrl</i> , <i>p_ICPU_PkiDcUrl</i> , <i>p_ICPU_PkiEctlUrl</i>) and corresponding ports (parameters <i>p_ICPU_PkiEaPort</i> , <i>p_ICPU_PkiAaPort</i> , <i>p_ICPU_PkiDcPort</i> , <i>p_ICPU_PkiEctlPort</i>) of the security servers are ICPU parameters.

ID	2.4.2.2_Master-SECU-001(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	When security is activated (i.e. <i>p_ICPU_SecuITS</i> is set to [True]), the user mode shall imply the usage of a user authorisation ticket.
Additional information	<p>This covers the services:</p> <ul style="list-style-type: none"> - Inform other systems of triggered events - Relay information from PFro - Inform the position/speed/heading of the Vro

ID	2.4.2.2_Master-SECU-002(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	When security is activated (i.e. <i>p_ICPU_SecuITS</i> is set to [True]), the operator mode shall imply the usage of an operator authorisation ticket.
Additional information	<p>This covers the services:</p> <ul style="list-style-type: none"> - Inform other systems of triggered events - Relay information from PFro - Inform the position/speed/heading of the Vro

ID	2.4.2.2_Master-SECU-003(1)
Component(s)	VroES
Requirement	<p>When security is activated in Vro-ITS-S, the content body of the created C-ITS messages shall be a GeoNetworking Secured Packet as described in [DA17].</p> <p>Otherwise, the content body of the message shall be a GeoNetworking Non Secured Packet.</p>
Additional information	N/A

ID	2.4.2.2_Master-SECU-004(2)
Component(s)	VroES
Requirement	<p>When security is activated in Vro-ITS-S, the Vro-ITS-S shall treat the payload of each message received as a GeoNetworking Secured Packet (see [DA17]).</p> <p>Otherwise, the Vro-ITS-S shall consider the payload as a GeoNetworking Non Secured Packet.</p>
Additional information	N/A

ID	2.4.2.2_Master-SECU-005(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall comply with [DA4]. In particular the following requirements and paragraphs:</p> <ul style="list-style-type: none"> - 2448M-CPKI-001 - 2448M-CPKI-002 - 2448M-CMGM-001 - 2448M-CMGM-003 - Entire §3 - Parameters of Annex 3
Additional information	N/A

ID	2.4.2.2_Master-SECU-014(1)
Component(s)	VroES
Requirement	<p>In operator mode, when the [Mobile R-ITS-S function] is activated, the Vro-ITS-S shall use the SSPs values that allow to emit the following events :</p> <ul style="list-style-type: none"> - Events for which the R-ITS-S is authorized to emit - Events for which the Vro-ITS-S is authorized to emit.
Additional information	See [DA19] for the SSP related to each kind of stations and events.

ID	2.4.2.2_Master-SECU-006(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The VroES shall be able to download an "enrolment certificate" (EC) from the PKI server when 90% of the validity of the EC is passed. The validity of the EC is set via the parameter $p_ICPU_validityEC$.
Additional information	<p>EC usage and downloading is defined in [DA4]</p> <p>This certificate is necessary so that the Vro-ITS-S can then download authorisation ticket (AT) from the PKI server.</p> <p>The old EC is deleted when download succeeded.</p>

ID	2.4.2.2_Master-SECU-007(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The VroES shall be able to download a user AT from the PKI server when the number of user ATs stocked in memory is under $p_ICPU_NbPoolUser \times p_ICPU_NbCertifATPerPoolUser$.
Additional information	<p>AT usage and downloading is defined in [DA4].</p> <p>Per default:</p> <p>$p_ICPU_NbPoolUser \times p_ICPU_NbCertifATPerPoolUser = 13 \times 10 = 130$ ATs which represents 3 months</p>

ID	2.4.2.2_Master-SECU-008(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The VroES shall be able to download an operator AT from the PKI server when the number of user AT stocked in memory is under $p_ICPU_NbPoolOperator \times p_ICPU_NbCertifATPerPoolOperator$.
Additional information	<p>AT usage and downloading is defined in [DA4]</p> <p>Per default:</p> <p>$p_ICPU_NbPoolOperator \times p_ICPU_NbCertifATPerPoolOperator = 13 \times 10 = 130$ ATs which represents 3 months</p>

ID	2.4.2.2_Master-SECU-009(1)
Component(s)	VroES
Requirement	When security is active and at least a pool of AT is available for both user and operator mode, the downloading of other pools of ATs for future use shall not block the nominal usage of the VroES (in particular emission and reception of secured messages)
Additional information	N/A

ID	2.4.2.2_Master-SECU-010(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The VroES shall be able to download Certificate Trust List (CTL) from the PKI server when 90% of the validity duration of the CTL is passed. The validity of the CTL is set via the parameter <i>p_ICPU_validityCTL</i> .
Additional information	<p>The CTL was previously named TSL.</p> <p>CTL is used by VroES to:</p> <ul style="list-style-type: none"> • update the certificates and contact details of the PKI SCOOP entities. • be informed of new PKI to support (separate from PKI SCOOP) <p>The old CTL is deleted when download succeeded.</p>

ID	2.4.2.2_Master-SECU-011(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The VroES shall be able to download European Certificate Trust List (ECTL) from the PKI server when 90% of the validity duration of the ECTL is passed. The validity of the ECTL is set via the parameter <i>p_ICPU_validityECTL</i> .
Additional information	<p>ECTL usage and downloading is defined in [DA4]</p> <p>The old ECTL is deleted when download succeeded.</p>

ID	2.4.2.2_Master-SECU-012(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The VroES shall be able to download a Certificate Revocation List (CRL) from the PKI server when 90% of the validity duration of the CRL is passed. The validity of the CRL is set via the parameter <i>p_ICPU_validityCRL</i> .
Additional information	<p>This CRL will be used to:</p> <ul style="list-style-type: none"> • check the validity of the AT of CAM / DENM messages received • check the validity of AT stored in memory <p>The old CRL is deleted when download succeeded.</p>

Note: RS_MSP_091(1) is not applied as it is the role of [DA4] to determine the applicability of the security requirements link to the C-Roads Platform specifications.

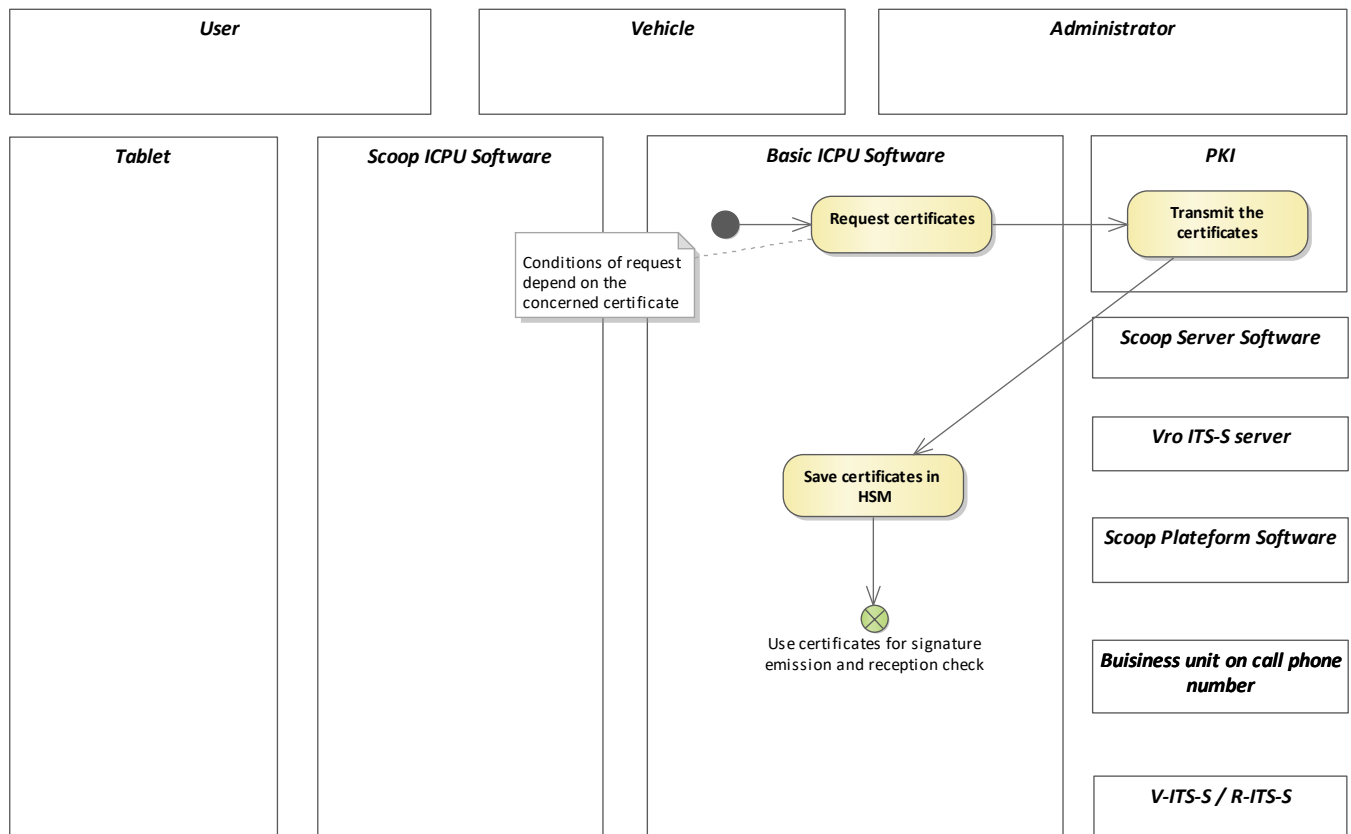


Figure 41 : Manage certificates – activity diagram

6.7 Manage configuration

6.7.1 Administrative usage of the Scoop Server

ID	2.4.2.2 Master-CNFG-001(1)
Component(s)	SCOOP server
Requirement	<p>The Scoop super administrator profile shall allow to create, read, update and delete all the tables and parameters on the Scoop Software.</p> <p>The list of users with the Scoop super administrator profile is configurable.</p>
Additional information	<p>This list is independent from the driver's one. Nothing forbids a Scoop super admin to also be a Vro-ITS-S user.</p> <p>The different profiles are defined in 3.3.4.</p>

ID	2.4.2.2 Master-CNFG-002(1)
Component(s)	SCOOP server
Requirement	<p>A Scoop business unit administrator shall be able to create, update and modify only the following tables linked to its local business unit:</p> <ul style="list-style-type: none"> • Vehicles • Tablet • ICPU • Driver <p>The list of users with the Scoop business unit administrator profile is configurable.</p>
Additional information	<p>This list is independent from the driver's one. Nothing forbids a Scoop business unit admin to also be a Vro user.</p> <p>The different profiles are defined in 3.3.4.</p>

ID	2.4.2.2 Master-CNFG-003(1)
Component(s)	SCOOP server; Vro-ITS-S Server
Requirement	<p>A Scoop super administrator shall be able to check the versions of the 3 software installed on each Vro-ITS-S.</p> <p>This should also be doable via the Vro-ITS-S server.</p>
Additional information	N/A

6.7.2 Applicable configuration

ID	2.4.2.2_Master-CNFG-004(1)
Component(s)	SCOOP server
Requirement	For the well-functioning of the Vro-ITS-S (i.e. to fulfil the other requirements), the Scoop Server shall handle the parameters / configuration following at least the content of Figure 42.
Additional information	N/A

ID	2.4.2.2_Master-CNFG-005(1)
Component(s)	SCOOP server; Vro-ITS-S
Requirement	The Scoop server shall offer webservice to the Vro-ITS-S to give access to the configuration. This is described in IF_ScSV .
Additional information	N/A

ID	2.4.2.2_Master-CNFG-015(1)
Component(s)	SCOOP server; Vro-ITS-S Server; Vro-ITS-S server
Requirement	If some parameters identified as _ICPU_ (see § 1.6) are configured on the Vro-ITS-S Server instead of the Scoop Server: the Vro-ITS-S server shall offer an access to the Vro-ITS-S to allow the download of the configuration. The Vro-ITS-S shall download those parameters following IF_VroSV
Additional information	N/A

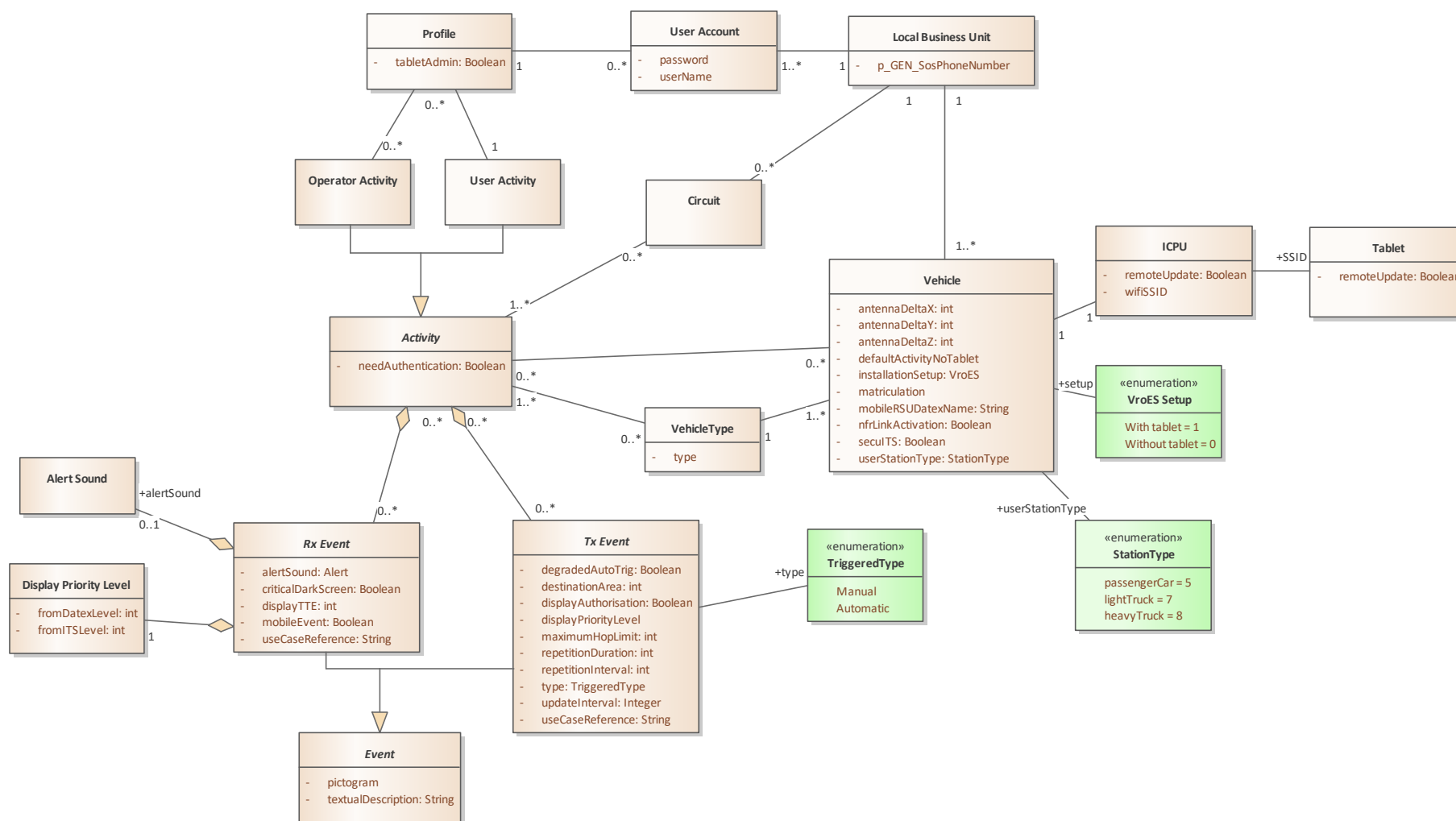


Figure 42: Minimum configuration offered by the Scoop Server – class diagram

The figure below illustrates in more details what is required in 2.4.2.2_Master-AUTH-001(1), i.e., how a tablet recognises the vehicle in which it is installed.

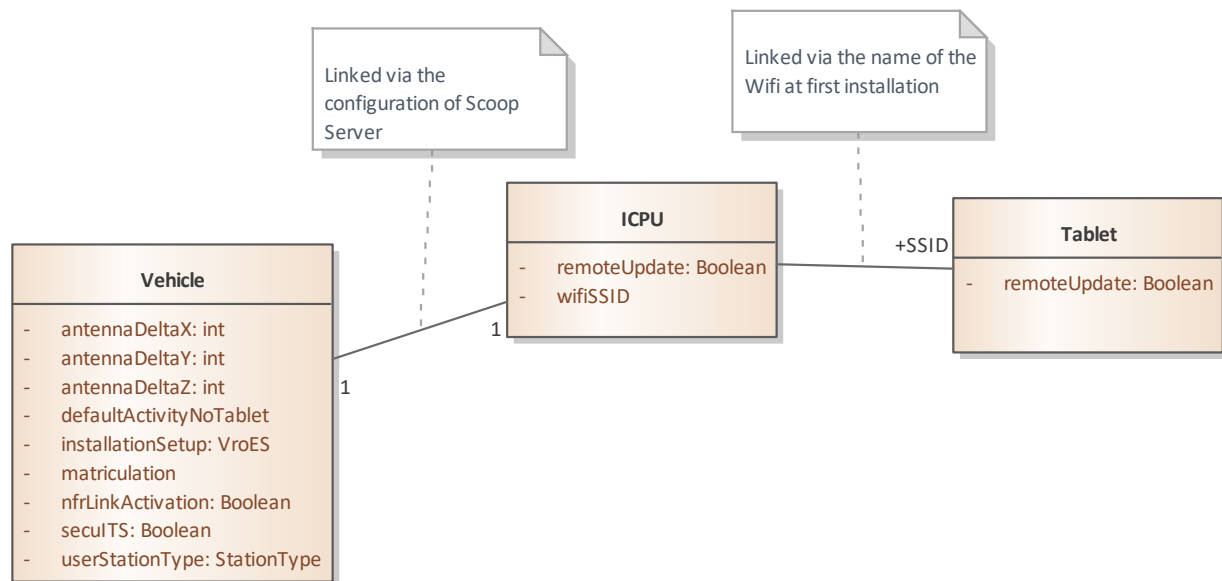


Figure 43: Zoom on the link tablet ⇔ ICPU ⇔ Vehicle – class diagram

6.7.3 Activity/events

Because the association Activities ⇔ Events is fully configurable, the following requirements always use the term “per default”. This implies that a release of the Scoop Software shall comply with those requirements, but an administrator may modify it.

ID	2.4.2.2_Master-CNFG-006(1)
Component(s)	SCOOP server
Requirement	Per default, the list of event triggerable in the activity “Usager” shall be the one listed in Table 7.
Additional information	Those events are described in [DA1]

ID	Event name
A2-D1	Temporary slippery road
A2-D10	Warning - emergency brake
A2-D11	Warning end of queue
A2-D4a	Stationary vehicle
A2-D4b	Vehicle in breakdown
A2-D5	Vehicle in an accident
A2-D6	Reduced visibility
A2-E6	Exceptional weather conditions
A3-D2a	Animal on the road
A3-D2b	People on the road
A3-D3	Obstacle on the road
A3-D5	Vehicle in an accident
A3-D8	Unsecured blockage of a road

Table 7: User activity default events

ID	2.4.2.2_Master-CNFG-007(1)
Component(s)	SCOOP server
Requirement	Per default, the user activity displays all events defined in [DA1] and [DA2].
Additional information	N/A

ID	2.4.2.2_Master-CNFG-008(1)
Component(s)	SCOOP server
Requirement	<p>Per default , the list of events that can be triggered in the operator activities shall include the events triggerable automatically in the user activity.</p> <p>Automatic events are described in:</p> <ul style="list-style-type: none"> ▪ [DA1] if the event is supported by a DENM ▪ [DA2] if the event is supported by an IVIM
Additional information	N/A

ID	2.4.2.2_Master-CNFG-009(1)
Component(s)	SCOOP server
Requirement	Per default, the operator activities shall allow the trigger of events following Table 8.
Additional information	The list of events specific to operator activities is listed in Table 9

Operator activity	Associated events ID
Travaux Mobile	B1c – B2b
Travaux fixes	B1c
Intervention	B2a – B2b

Patrouille	B2b – B2c
Maintenance hivernale	B3a – B3b – B3c

Table 8: Operator activities default events

ID	Event name
B1c	Mobile planned roadwork
B2a	Road operator vehicle approaching
B2b	Road operator vehicle in intervention
B2c	Road operator vehicle in patrol
B3a	Salting in process
B3b	Snow removal in process
B3c	Winter maintenance - alert vehicle moving

Table 9: Operator activities default events

6.7.4 Configuration download

As mentioned in § 1.6, the parameters may come either from Scoop Server and/or Vro-ITS-S server.

ID	2.4.2.2_Master-CNFG-010(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	At each start-up and after <i>p_ICPU_DelayConfDownload</i> , the VroES shall download the configuration mandatory for the national applications well-functioning from the Scoop server.
Additional information	/!\ download does not mean apply!

ID	2.4.2.2_Master-CNFG-011(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	At each start-up and after <i>p_ICPU_DelayConfDownload</i> , the VroES shall download: <ul style="list-style-type: none"> The global configuration (SCOOP) from the SCOOP server. The vehicle and UTIC configuration either from the Scoop Server or from the Vro-ITS-S server.
Additional information	/!\ “download” does not mean “apply” !

ID	2.4.2.2_Master-CNFG-012(1)
Component(s)	VroES
Requirement	At each start-up, the VroES applies the configuration just downloaded. All configurations downloaded afterwards shall not be applied until next start-up.
Additional information	N/A

ID	2.4.2.2_Master-CNFG-013(1)
Component(s)	VroES
Requirement	If the VroES starts when it does not have cellular connection to scoop server and/or Vro-ITS-S server, it shall apply the last known configuration.
Additional information	N/A

ID	2.4.2.2_Master-CNFG-014(1)
Component(s)	VroES
Requirement	<p>A SCOOP Tablet administrator shall be able to modify locally (via the Tablet of a Vro-ITS-S):</p> <ul style="list-style-type: none"> • The URL of the Scoop Server • The ICPU connected to this tablet.
Additional information	<p>When the Tablet has no valid SCOOP configuration (e.g. at the integration in the vehicle) this administration screen will be opened by default, to force installer to enter the server and UTIC connection parameters.</p> <p>Once this information has been entered, the SCOOP Tablet application can then download all of its configuration data.</p>

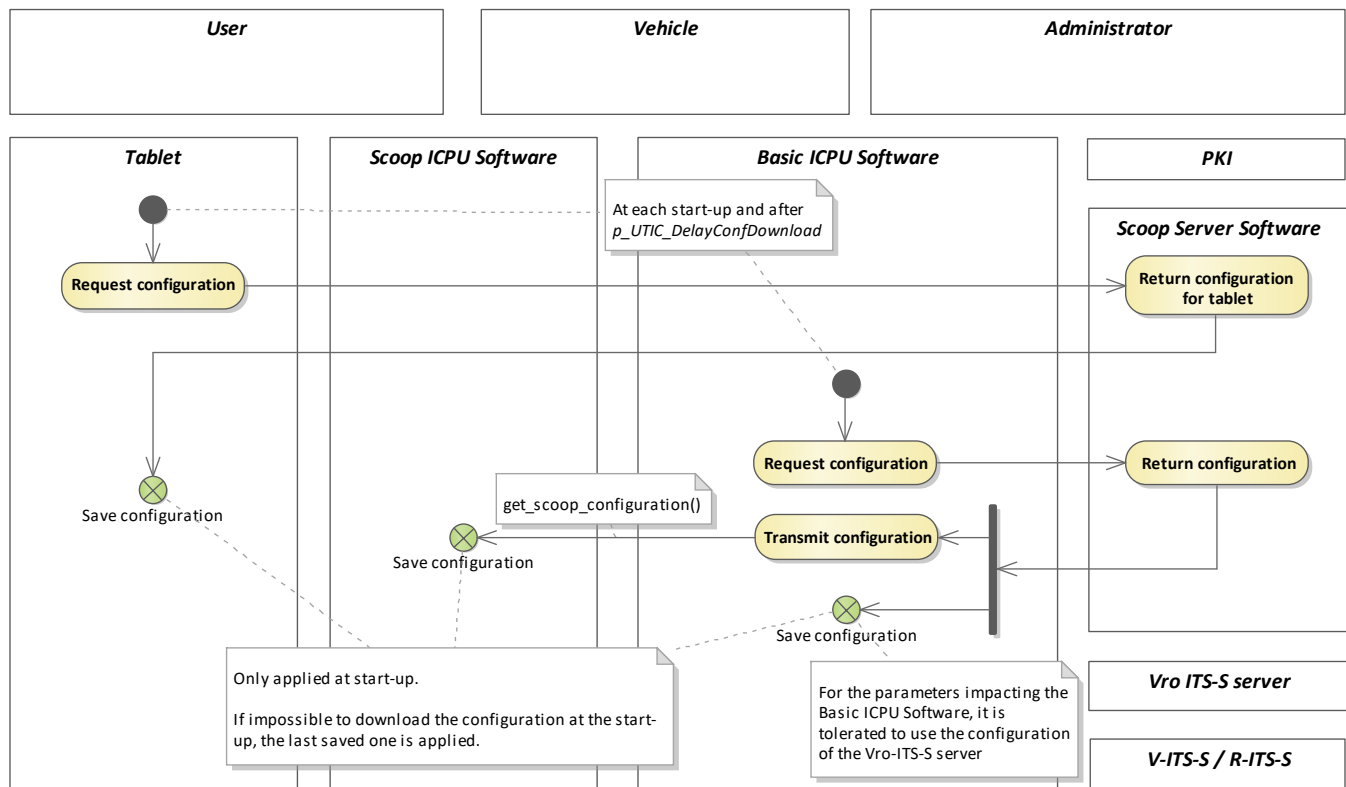


Figure 44 : Configuration download process – activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context. (list of parameters mentioned is not exhaustive compared to the definition of the method).

Methode	Specificities and parameters
[get_scoop_configuration]	N/A

6.8 Manage power

The Vro-ITS-S uses the energy supplied by the vehicle and must therefore endeavour to consume as little as possible when the vehicle is switched off (engine off).

ID	2.4.2.2_Master-PWR-001(1)
Component(s)	VroES
Requirement	When the driver starts the vehicle, the VroES shall switch on.
Additional information	The electrical linkage to the vehicle is defined in [DA23]

ID	2.4.2.2_Master-PWR-002(1)
Component(s)	VroES
Requirement	<p>When the Vro-ITS-S is on:</p> <ul style="list-style-type: none"> - All functionalities shall be operational (i.e. all functionalities presented in chapter 5) - All sub-systems shall be switch on (i.e. WiFi, GPS, ITS-G5, cellular, IO)
Additional information	N/A

ID	2.4.2.2_Master-PWR-003(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	After the vehicle stops and the driver turns off the power, the Vro-ITS-S shall switch off after a delay. The delay follows the value of <i>p_ICPU_SwitchOffDelay</i> to allow the clean extinction of the Scoop ICPU Software.
Additional information	N/A

ID	2.4.2.2_Master-PWR-004(2)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall offer the possibility to the driver to switch off the Vro-ITS-S manually through the HMI of the Tablet after a confirmation.</p> <p>If it is not possible to switch off the Vro-IT-S in the case of a Vro-ITS-S without a tablet, the responsible party needs to ensure that privacy of the driver is respected.</p>
Additional information	This allows to comply with RS_MSP_017(1).

ID	2.4.2.2_Master-PWR-005(1)
Component(s)	VroES
Requirement	<p>Before each switch off, the Vro-ITS-S shall realise all the following processes:</p> <ul style="list-style-type: none"> • Install the downloaded update files, if necessary (see Update software) • Close the on-going Tlog files and transmit them (see Manage log) • Emits the Datex waiting for transmission (see Inform PFro) • Stop the Vro-ITS-S software devices, put the tablet device to sleep and switch off the Vro-ITS-S hardware.
Additional information	N/A

ID	2.4.2.2_Master-PWR-006(1)
Component(s)	VroES
Requirement	<p>When the Vro-ITS-S is off:</p> <ul style="list-style-type: none"> - All functionalities shall be not-operational (i.e. all functionalities presented in chapter 5) - All sub-systems shall be switch off (i.e. WiFi, GPS, ITS-G5, cellular, IO)
Additional information	N/A

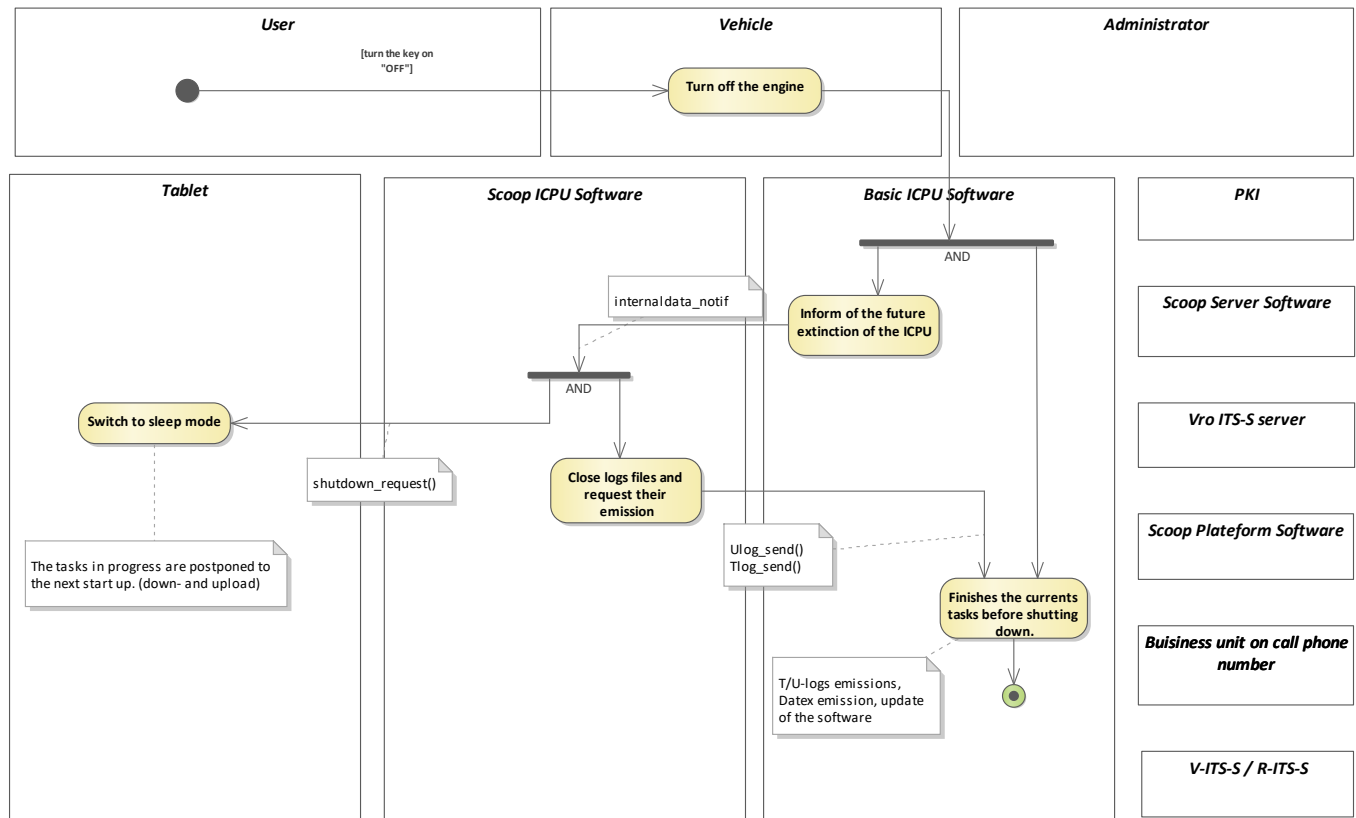


Figure 45 : Switch of from engine – activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context (list of parameters mentioned is not exhaustive compared to the definition of the method).

Method	Specificities and parameters
[internal_data_notif]	<code>ignitionKeyTerminal15</code> set to False.
[shutdown_request]	N/A
[tlog_send]	N/A
[ulog_send]	N/A

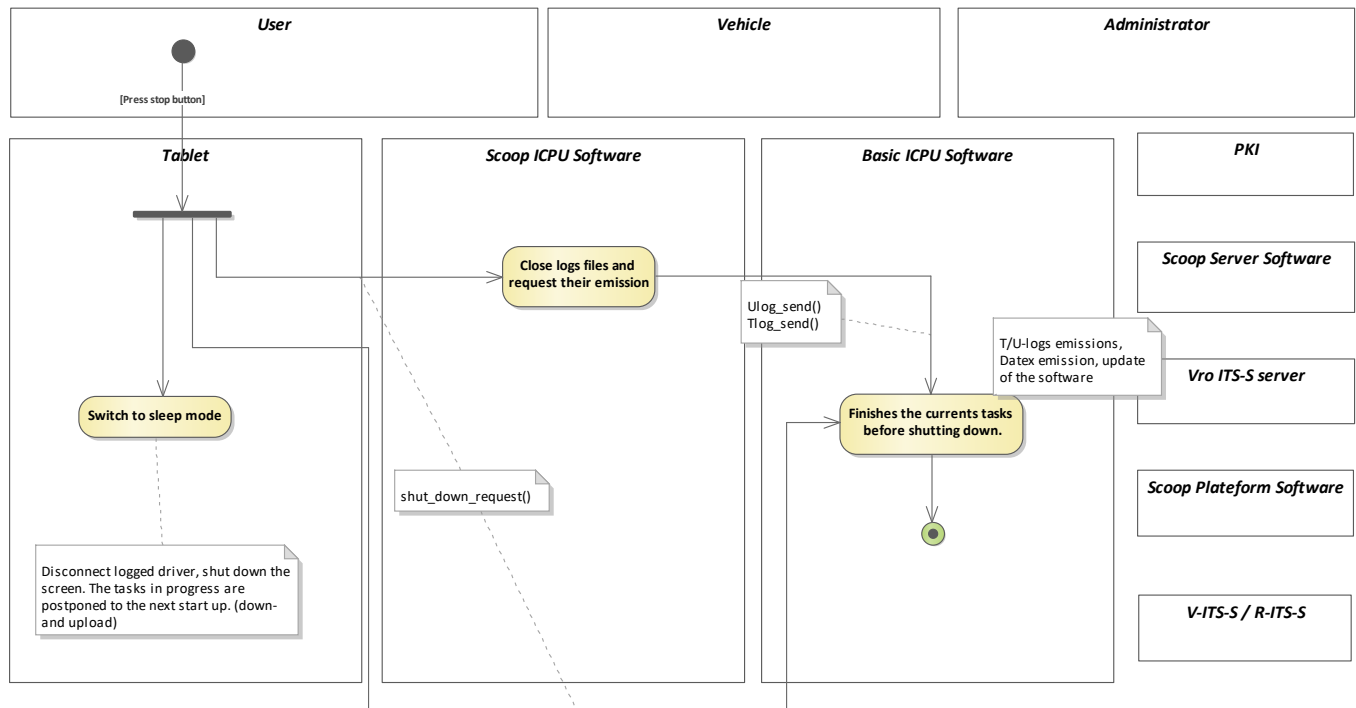


Figure 46 : Switch off from tablet – activity diagram

The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context (list of parameters mentioned is not exhaustive compared to the definition of the method).

Method	Specificities and parameters
[shutdown_request]	N/A
[tlog_send]	N/A
[ulog_send]	N/A

7 Interfaces with Vro-ITS-S Global System

This chapter contains the external and internal interfaces of the Vro-Global-System.

7.1 External interfaces

The external interfaces are based on ITS-G5 and cellular link.

ID	2.4.2.2_Master-INTF-021(1)
Component(s)	VroES
Requirement	Ideally the sending of a given message through ITS-G5 and cellular link shall be simultaneous. Nonetheless if these messages were to be serially sent in a queuing process, it shall be first sent through ITS-G5, and through the cellular link afterwards.
Additional information	N/A

7.1.1 IF_G5

IF_G5 is the air interface on the ITS-G5 channel which is based on existing European standards and profiles.

ID	2.4.2.2_Master-INTF-001(1)
Component(s)	VroES
Requirement	To implement the IF_G5 interface, the Vro-ITS-S shall comply with the requirements listed in Table 10 extracted from [DA22]
Additional information	N/A

MSP requirements	Requirement's topic
RS_MSP_018(1)	Transmission delay
RS_MSP_019(1)	Transmission delay
RS_MSP_021(1)	DENM only if CAM
RS_MSP_022(1)	Transmission power
RS_MSP_023(1)	Transmission power
RS_MSP_025(1)	Transmission power
RS_MSP_027(1)	Channel definition
RS_MSP_026(1)	Channel definition
RS_MSP_028(1)	Channel definition
RS_MSP_111(1)	Transmission efficiency
RS_MSP_114(1)	Broadcast
RS_MSP_038(1)	DCC
RS_MSP_040(1)	Geonet
RS_MSP_041(1)	Geonet

MSP requirements	Requirement's topic
RS_MSP_042(1)	Geonet
RS_MSP_043(1)	Geonet
RS_MSP_044(1)	Geonet
RS_MSP_045(1)	Geonet
RS_MSP_046(1)	Geonet
RS_MSP_047(1)	Geonet
RS_MSP_048(1)	Geonet
RS_MSP_049(1)	Geonet
RS_MSP_050(1)	Geonet
RS_MSP_051(1)	Geonet
RS_MSP_052(1)	Geonet
RS_MSP_053(1)	Geonet
RS_MSP_054(1)	Geonet
RS_MSP_056(1)	Geonet
RS_MSP_057(1)	Geonet
RS_MSP_059(1)	Geonet
RS_MSP_060(1)	Geonet
RS_MSP_113(1)	Geonet
RS_MSP_061(1)	Geonet
RS_MSP_062(1)	Geonet
RS_MSP_063(1)	Geonet
RS_MSP_077(1)	Geonet
RS_MSP_088(1)	Geonet
RS_MSP_089(1)	Geonet
RS_MSP_090(1)	Transmission delay
RS_MSP_091(1)	security
RS_MSP_092(1)	security
RS_MSP_093(1)	security
RS_MSP_094(1)	security
RS_MSP_096(1)	security
RS_MSP_110(1)	security

Table 10: MSP requirements applicable for IF_G5

ID	2.4.2.2_Master-INTF-002(1)
Component(s)	VroES
Requirement	In addition to Table 10 the Vro-ITS-S shall comply with the requirements listed in Table 11 extracted from [DA22].
Additional information	Those requirements include an optional part. This requirement set it as "mandatory" in French implementation. e.g. 5.3 of TS 102 687 is applicable, pltsWithPrivacy is set to True etc.

MSP requirements	Requirement's topic
RS_MSP_036(1)	DCC
RS_MSP_037(1)	DCC

MSP requirements	Requirement's topic
RS_MSP_112(1)*	Geonet
RS_MSP_097(1)	security
RS_MSP_098(1)	security

Table 11: MSP optional requirements applicable for IF_G5

*: MSP has two requirements identified with ID MSP_112.

ID	2.4.2.2_Master-INTF-003(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall follow the dissemination rules defined in: <ul style="list-style-type: none"> - [DA1] if the message is a DENM, - [DA2] if the message is an IVIM.
Additional information	This includes repetitionDuration, repetitionInterval, traffic class etc.

ID	2.4.2.2_Master-INTF-004(1)
Component(s)	VroES
Requirement	If the repetitionDuration of an event is higher than 10 minutes, it shall be re-signed each 9 minutes.
Additional information	This is realised to prevent the message to be rejected due to security time filter implemented by other stations (see RS_MSP_092(1))

ID	2.4.2.2_Master-INTF-005(1)
Component(s)	VroES
Requirement	If the Vro-ITS-S receives a message on the G5 channel which needs to be forwarded (in the Geonet sense of the word), then the Vro-ITS-S shall forward it over G5.
Additional information	N/A

ID	2.4.2.2_Master-INTF-006(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall use the TC ID of the received messages to determine the access category.
Additional information	This contradicts RS_MSP_058(1)

7.1.2IF_PFro

This interface is based on a cellular connection

The main principals of this interface are described in [DA24].
The webservices implemented on the PFro are described in [DA25].

ID	2.4.2.2_Master-INTF-007(1)
Component(s)	VroES
Requirement	<p>If the Mobile R-ITS-S function is activated:</p> <p>In order to maintain the connection to the PFro, the Vro-ITS-S shall transmit each minute a Datex KeepAlive to be acknowledged by the PFro.</p> <p>KeepAlive message are defined in [DA5] § 2.2.3</p>
Additional information	<p>This is entirely handled by the Basic ICPU software. An implementation is described in 0303-08_I_BPE_SPE_DC_FP02_Informer des événements requirement FP02_REQ_26:(1).</p> <p>This is realised via the PUSH method on the webservice of the PFro.</p>

ID	2.4.2.2_Master-INTF-008(1)
Component(s)	VroES
Requirement	<p>If the PFro does not acknowledge two consecutive keepalive messages, the Vro-ITS shall determine the connexion as lost.</p>
Additional information	<p>This is used to calculate the status mentioned in Table 5 and for Snapshot purpose.</p>

ID	2.4.2.2_Master-INTF-009(1)
Component(s)	VroES
Requirement	<p>The Vro-ITS-S shall acknowledge keepalive message received from the PFro.</p>
Additional information	<p>This is entirely handled by the Basic ICPU software. An implementation is described in 0303-08_I_BPE_SPE_DC_FP02_Informer des événements requirement FP02_REQ_25:(1).</p>

ID	2.4.2.2_Master-INTF-010(1)
Component(s)	VroES
Requirement	<p>Any Datex messages shall be encapsulated in SOAP as defined in [DA24].</p>
Additional information	N/A

7.1.3IF_Nfr

This interface is based on a cellular connection.

ID	2.4.2.2_Master-INTF-019(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The connection between the Nfr-ITS-S and Vro-ITS-S shall be made through a single URL or @IP and port for all Vro-ITS-S.
Additional information	The URL or @IP (<i>p_Icpu_Nfr_address</i>) and port (<i>p_Icpu_Nfr_port</i>) of the Nfr-ITS-S are ICPU parameters as defined in Annex B.

ID	2.4.2.2_Master-INTF-011(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	This interface between Vro-ITS-S and Nfr-ITS-S shall be functional if the parameter <i>p_ICPU_NfrLinkActivation</i> is set.
Additional information	N/A

ID	2.4.2.2_Master-INTF-012(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	<p>The Vro-ITS-S shall send a CAM to Nfr-ITS-S when one of these conditions is fulfilled:</p> <ul style="list-style-type: none"> The distance between the current position of the Vro-ITS-S and the position included in the CAM previously transmitted to Nfr exceeds <i>p_ICPU_NfrGenCamDistance</i> meter, The time elapsed since the last CAM sent to Nfr is equal to or greater than <i>p_ICPU_NfrGenCamDelay</i> seconds. <p>The <i>p_ICPU_NfrGenCamDistance</i> and <i>p_ICPU_NfrGenCamDelay</i> values shall be configured in the SCOOP Server for all Vro-ITS-S.</p>
Additional information	<p>The Vro-ITS does not have to create a CAM just to transmit it to Nfr. Waiting for a generation for G5 transmission is tolerated.</p> <p>The default value of <i>p_ICPU_NfrGenCamDistance</i> is 250 m.</p> <p>The default value of <i>p_ICPU_NfrGenCamDelay</i> is 120 s.</p>

ID	2.4.2.2_Master-INTF-018(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The current state of the connection to the Nfr-ITS-S shall be supervised at all times when the connection is supposedly active. This connection is deemed to be qualified as defective if <i>p_ICPU_NfrSupervizMessFail</i> successively fail to be sent.
Additional information	The number of C-ITS messages that have failed to be sent <i>p_Icpu_NfrSupervizMessFail</i> shall be configurable, its value is comprised between 1 and 10 (default value is 1, knowing that TCP has internal mechanisms with multiple retries).

ID	2.4.2.2_Master-INTF-013(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	<p>If the Vro-ITS-S receives a message from Nfr which needs to be forwarded (in the Geonet sense of the word) and the parameter <i>p_ICPU_NfrGeoFwdAuthorization</i> is set, then the Vro-ITS-S shall forward it over G5.</p> <p>The parameter <i>p_ICPU_NfrGeoFwdAuthorization</i> value shall be configured in the SCOOP Server for all Vro-ITS-S.</p>
Additional information	The treatments are identical to those performed when receiving the same packet on the G5 interface (hop management).

ID	2.4.2.2_Master-INTF-014(1)
Component(s)	VroES
Requirement	A message received from the Nfr-ITS-S shall not be translated in C-ITS Datex and forwarded to the PFro even if the Mobile-R-ITS-S-function is activated.
Additional information	This avoids loops of events in the French ITS architecture.

ID	2.4.2.2_Master-INTF-015(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	<p>Each time the Vro-ITS-S sends a DENM on ITS-G5 (new, update, cancel), it shall send this DENM to the Nfr-ITS-S.</p> <p>Repetition of a given DENM shall be sent every $p_ICPU_NfrRepDENM$ minutes only when no other message regarding this DENM (new, update, cancel) has been sent in the meantime.</p>
Additional information	<p>/!\ This requirement only concerns DENM triggered by the Vro-ITS-S itself and not the ones forwarded or those relayed (DENM issued from a PFro DATEX or other V-ITS-S).</p> <p>The default value for $p_ICPU_NfrRepDENM$ is 9min, it shall be comprised between 1 and 9 minutes</p>

ID	2.4.2.2_Master-INTF-020(1)
Component(s)	ICPU
Requirement	<p>Two thresholds respectively on the uploaded and downloaded data to and from the Nfr-ITS-S shall be made configurable. The uploaded and downloaded data shall be estimated at daily, weekly or monthly intervals.</p> <p>The crossing of either one of those thresholds, namely $p_ICPU_NfrThresUploaded$ and $p_ICPU_NfrThresDownloaded$, will disable the connection to the Nfr-ITS-S.</p>
Additional information	<p>According to current cellular data subscriptions, these thresholds shall be defined on a daily/weekly/monthly base given a starting date.</p> <p>$p_Icpu_NfrThresUploaded$ and $p_Icpu_NfrThresDownloaded$ are ICPu parameters and are measured in Mo.</p>

7.1.4IF_SOS

This interface is described in [DA23]. It is based on a cellular connection.

7.1.5 IF_PKI

This interface is described in [DA4]. It is based on a cellular connection.

7.2 Internal interfaces

7.2.1 Interfaces VroES <--> Servers

7.2.1.1 IF_ScSV - Interface VroES <--> Scoop Server

This interface is based on a cellular connection.

ID	2.4.2.2_Master-INTF-016(1)
Component(s)	VroES; Scoop Server
Requirement	The Vro-ITS-S shall use the webservices offered by the Scoop Server to realise the different services implemented requiring a file / data from Scoop Server.
Additional information	This interface is handled by the basic ICPU software.

In addition, the tablet is interfaced directly with the Scoop Server. However, this interface is out of the scope of this document and is defined by the National Software supplier (i.e. National contract in § 4.3.1.)

7.2.1.2 IF_VroSV - Interface Basic ICPU <--> Vro-ITS-S Server

This interface is based on a cellular connection.

ID	2.4.2.2_Master-INTF-017(1)
Component(s)	VroES; Scoop Server; Vro-ITS-S Server
Requirement	The Vro-ITS-S server address shall be configurable and comply with the parameter <i>p_ICPU_supervision_address</i>
Additional information	N/A

This interface is out of the scope of this document and is defined by the Basic ICPU Software supplier (i.e. local contract in § 4.3.1.)

7.2.2 Interfaces VroES <--> Vehicle

7.2.2.1 IF_3 - Interface road operator equipment <--> VroES

This interface is based on a wired connection. It is described in [DA23]

7.2.2.2 IF_4 - Interface Vehicle CAN <--> VroES

This interface is based on a wired connection. It is described in [DA23]

7.2.2.3IF_5 - Interface SOS push button ↔ VroES

This interface is based on a wired connection. It is described in [DA23]

7.2.3 Interfaces inside the VroES

This interface is based on a Communication Bus specified in [DA20]. The main principal of the communication bus is to allow the communication between different modules of the Vro-ITS-S:

- Basic ICPU,
- Scoop Tablet,
- Scoop ICPU,
- data acquisition modules
- future other modules.

Three types of communications are used:

- Bus management communication (registration of a module, list of connected modules, debug etc.)
- Notification emission (communication 1 to n)
- Request emission (communication n to 1)

Figure 47 shows how to register on the bus, and an example of a request and a notification is given.

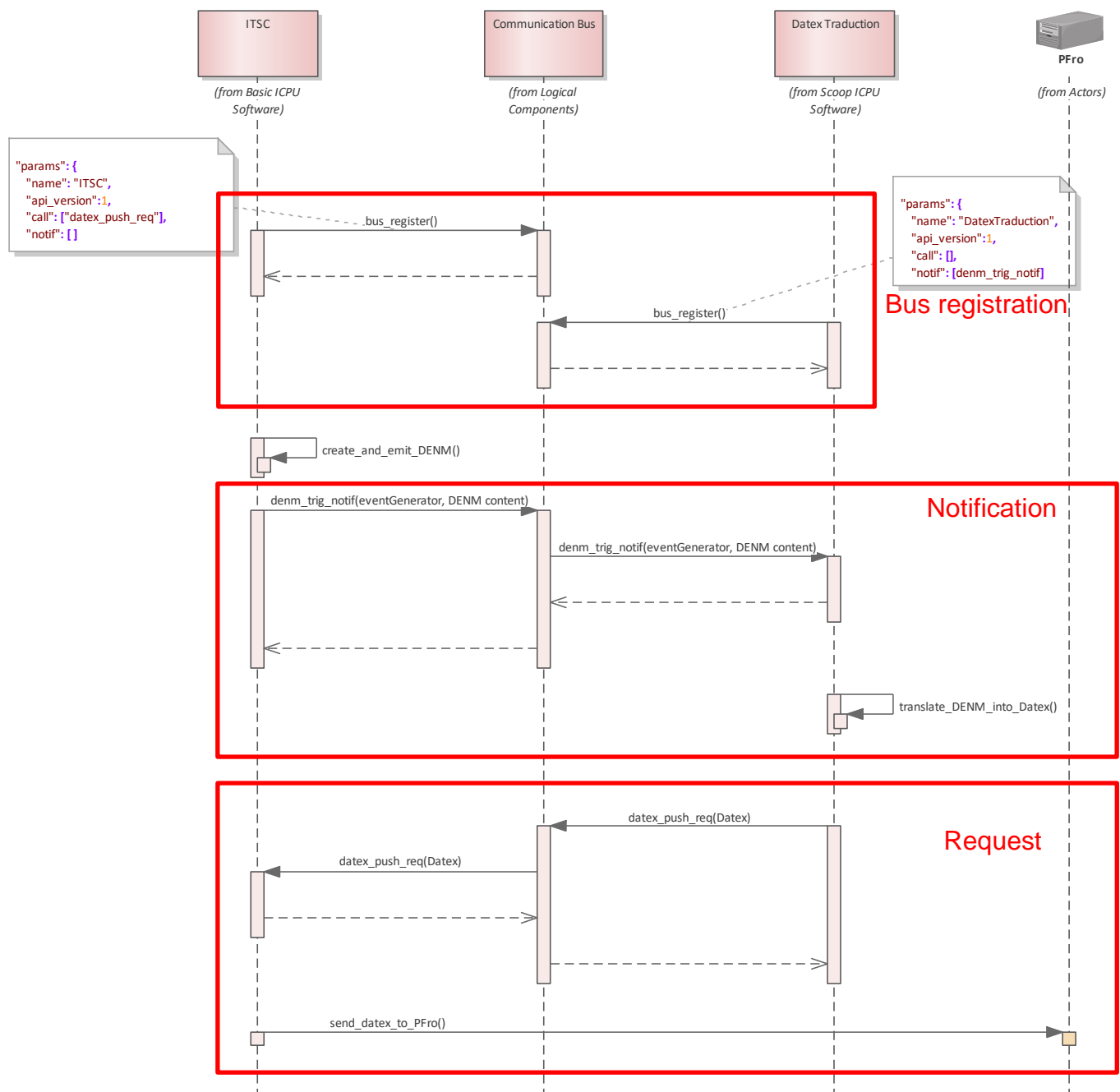


Figure 47: Registration, call and notification with the BUS

The module “ITSC” allows to emit a DATEX to the PFro. It registers on the bus by indicating that it implements the associated method *datex_push_req*.

The module “Datex Traduction” allows to translate a DENM into Datex. It registers on the bus by indicating that it implements the associated method: *denm_trig_notif*.

- 1- When “ITSC” emits a DENM (e.g. following the manual triggering), it **notifies**.
- 2- “Datex Traduction” **is informed** and the DENM is translated into DATEX.
- 3- Once the translation is done, “Datex Traduction” **requests** that the Datex is emitted.
- 4- “ITSC” realises the task that **is required** and emits the Datex to the PFro.

The list of methods relating to the BUS management communication is the following one:

bus_register
bus_list
bus_register_notif

Those methods are described in details in the annex of [DA20]

7.2.3.1IF_1 - Interface Scoop ICPU <=> Basic ICPU

Basic ICPU and Scoop ICPU Software reside on the same hardware: ICPU.

The present document mentions methods implemented between Scoop ICPU Software and Basic ICPU Software.

Those methods listed below, might be completed by the ones used in [DA1] and [DA2]:

denm_trig
denm_trig_notif
denm_rx_notif
cam_rx_notif
cam_tx_notif
ivi_rx_notif
ivi_trig_notif
ubr_mobile_enable
datex_push_req
datex_pull_notif
datex_snapshot_req
emergency_call_request
text_to_speech
get_tlog_network_access
get_tlog_radio
tlog_send
ulog_send
supervision_data_notif
internal_data_notif
set_internal_data
get_scoop_configuration
secu_notif
secuincident_notif
faulty_message_notif
objects_pki_notif
adjust_clock_notif

Those methods are described in details in the annex of [DA20]

7.2.3.2IF_2 - Interface Scoop ICPU <=> Scoop Tablet

This interface is based on a Wi-Fi connection.

The present document mentions methods implemented between Scoop ICPU Software and Scoop Tablet Software.

Those methods listed below, might be completed by the ones used in [DA1] and [DA2]:

emergency_call_tablet_request
event_display_notif
ivi_display_notif
supervision_data_notif

Those methods are described in details in the annex of [DA20]

7.2.3.3 IF_7 - Interface Basic ICPU <--> Scoop Tablet

This interface is based on a Wi-Fi connection.

The present document mentions methods implemented between Basic ICPU Software and Scoop Tablet Software.

Those methods listed below, might be completed by the ones used in [DA1] and [DA2]:

denm_list
ivi_list
emergency_call_cancellation
emergency_call_status_notif
shutdown_request
internal_data_notif
supervision_data_notif
adjust_clock_notif

Those methods are described in details in the annex of [DA20]

Note: [DA20] defines methods between “Module UPER” and the Scoop Tablet software. In this document, the Module UPER is considered as a part of the Scoop Tablet Software. Thus, the methods between both modules are considered as internal to the Scoop Tablet software. It concerns:

denm_rx_json_notif
denm_tx_json_notif
denm_list_json
ivi_rx_json_notif
ivi_tx_json_notif
ivi_list_json

7.2.3.4 IF_6 - Interface Road Operator Specific Software <--> Scoop Tablet.

This interface is realized inside the tablet. It is described in [DA21].

8 Interoperability requirements

8.1 Position and Timing compatibility

ID	2.4.2.2_Master-COMP-001(1)
Component(s)	VroES
Requirement	For interoperability concerns on position and timing, the Vro-ITS-S shall comply with the requirements listed in Table 12 extracted from [DA22]
Additional information	N/A

MSP requirements	Requirement's topic
RS_MSP_001(1)	Clock
RS_MSP_002(1)	Clock
RS_MSP_007(1)	VehicleState
RS_MSP_008(1)	Confidence
RS_MSP_009(1)	Coordinate system
RS_MSP_010(1)	Heading
RS_MSP_012(1)	VehicleState
RS_MSP_013(1)	Vehicle Dimension
RS_MSP_112(1)*	Confidence 95%
RS_MSP_014(1)	Coordinate system

Table 12: MSP applicable requirements for POTI interoperability

*: MSP has two requirements identified with ID MSP_112.

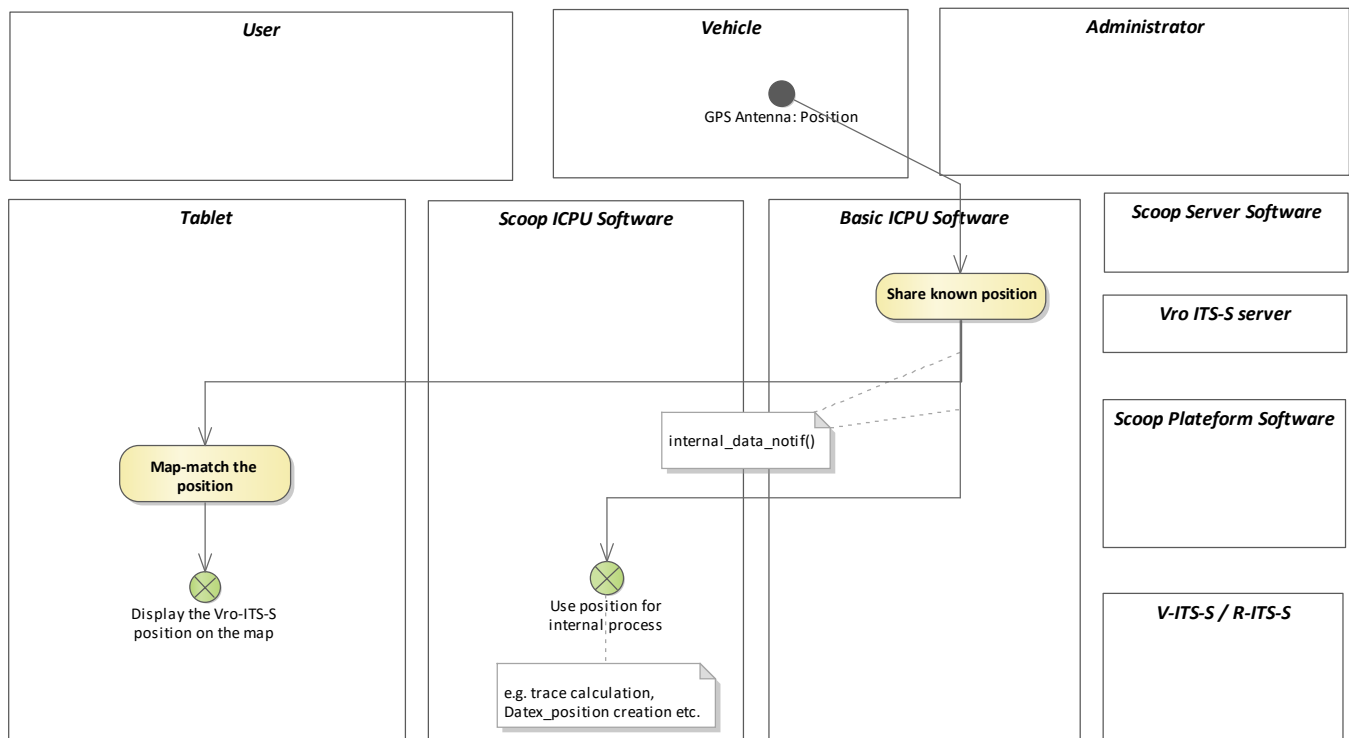
ID	2.4.2.2_Master-COMP-002(1)
Component(s)	VroES
Requirement	In order to have a consistent usage of the clock between the different software and comply with RS_MSP_001(1), the Vro-ITS shall synchronise the different clocks used in its different software.
Additional information	This is realised via the BUS method <code>adjust_clock_notif</code> . (see [DA21])

ID	2.4.2.2_Master-COMP-003(1)
Component(s)	VroES; Scoop Server
Requirement	<p>In order to provide a position corresponding to the bounding box of the vehicle (i.e. partially comply RS_MSP_009(1)), the Vro-ITS-S shall consider the position of the antenna and treat the GNSS data to adjust the location.</p> <p>To do so, each vehicle is associated to the following parameters: p_VEH_AntennaDeltaX, p_VEH_AntennaDeltaZ, p_VEH_AntennaDeltaZ</p>
Additional information	This uses RS_MSP_014(1) as a referential.

ID	2.4.2.2_Master-COMP-004(1)
Component(s)	VroES
Requirement	The Vro-ITS-S should take into account the optional requirements extracted from [DA22] are listed in Table 13.
Additional information	N/A

MSP requirements	Requirement's topic
RS_MSP_003(1)	Clock maintenance
RS_MSP_004(1)	Heading latching
RS_MSP_005(1)	Start-up heading
RS_MSP_006(1)	Clock maintenance
RS_MSP_011(1)	VehicleState
RS_MSP_064(1)	Distance calculation

Table 13: MSP optional requirements for POTI



The different interface methods which names are written in notes in the diagrams are described in § 7.2.3. The table below specifies certain behaviours of those methods in the activity diagram context (list of parameters mentioned is not exhaustive compared to the definition of the method)

Methode	Specificities and parameters
[internal_data_notif]	<code>posVector</code> : filled with the position information.

8.2 MSP not considered requirements

ID	2.4.2.2_Master-COMP-005(1)
Component(s)	VroES
Requirement	The Vro-ITS-S shall not consider the requirements listed in Table 14
Additional information	N/A

MSP requirements	Requirement's topic
RS_MSP_015(1)	Public traffic participation
RS_MSP_016(1)	Protected zones
RS_MSP_034(1)	Protected zones
RS_MSP_035(1)	Protected zones
RS_MSP_055(1)	Hop number
RS_MSP_058(1)	Background forward
RS_MSP_095(1)	Security
RS_MSP_099(1)	AT change
RS_MSP_100(1)	AT change
RS_MSP_101(1)	AT change
RS_MSP_102(1)	AT change
RS_MSP_103(1)	AT change
RS_MSP_104(1)	AT change
RS_MSP_105(1)	AT change
RS_MSP_106(1)	AT change
RS_MSP_107(1)	AT change
RS_MSP_108(1)	AT change
RS_MSP_109(1)	Secured link ICPU - vehicle

Table 14: MSP not applicable requirements

9 Annexes

Annex A.

The table below lists the changes in requirements compared to the previous main version of the current bundle. (Vro_System_v0.20 and associated documents). Only added, modified, and deleted requirements are listed.

A number preceded by the symbol # indicates a reference to a ticket (retroaction).

Requirement	Status	Comments
2.4.2.2_Master-MRSU-002(3)	Modified	Deactivation of the mobile R-ITS-S function in user mode and conservation of the parameter for debug purposes (#1677, #1023)
2.4.2.2_Master-MITI-002(1)	Created	Information on the existence of an ASECAP database to detect protected zones and avoid interference (#1147).
2.4.2.2_Master-PWR-004(2)	Modified	Guarantee privacy of the driver in the case of a Vro-ITS-S without a tablet (#1336).
2.4.2.2_Ivim-VMS-002(3)	Modified	Note on ValidTo deleted since the behavior has been updated in 2.4.1.2_M_v4.110: - The field is optional and NOT mandatory. - The field shall be always present except when it is a cancellation
2.4.2.2_Ivim-VMS-003(2)	Modified	Modification of the identification of IVI services since the use of TcPart for eVMS management (#1644).
2.4.2.2_Ivim-VMS-005(2)	Modified	Management of eVMS alternate pages following the use of TcPart in IVIM (#1658).
2.4.2.2_Ivim-VMS-007(3)	Modified	Addition of the iviType present in the TcPart for priority management (#1653).
2.4.2.2_Ivim-VMS-008(3)	Modified	Add additional information to explain how to display the 4 VMS lines since all the lines are now transmitted in a single instance of the Text composing the TcPart.text field (#1658).
2.4.2.2_Ivim-VMS-009(3)	Modified	Suppression of additional information, since TextCont content is now unlimited (#1570).
2.4.2.2_Ivim-VMS-010(1)	Created	Language prioritization since instance of Text are used to defined different language (#1658).
2.4.2.2_Ivim-MRI-001(3)	Modified	Additional information removed. A note is added in figure 18 explaining that there is no DATEX to IVI message translation (#1587).
2.4.2.2_Ivim-MRI-002(2)	Modified	The subtext of a pictogram is directly defined by the extraText contained in GicPart. No need to add // to identify it since the lines are accessible in the TextContainer (#1570).
2.4.2.2_Ivim-SRI-003(2)	Modified	Modification of the identification of IVI services since the use of TcPart for eVMS management (#1644).

Requirement	Status	Comments
2.4.2.2_Ivim-TSL-001(3)	Modified	Additional information removed. A note is added in figure 24 explaining that there is no DATEX to IVI message translation (#1587).
2.4.2.2_Ivim-GNRL-003(3)	Modified	Note on ValidTo deleted since the behavior has been updated in 2.4.1.2_M_v4.110: - The field is optional and NOT mandatory. - The field shall be always present except when it is a cancellation
2.4.2.2_Ivim-GNRL-011(2)	Modified	The subtext of a pictogram is directly defined by the extraText contained in GicPart. No need to add // to identify it since the lines are accessible in the TextContainer (#1570).
2.4.2.2_Ivim-GNRL-012(2)	Modified	The subtext of a pictogram is directly defined by the extraText contained in GicPart. No need to add // to identify it since the lines are accessible in the TextContainer (#1570).
2.4.2.2_Denm-PCTL-011(2)	Modified	Added the default definition of sounds for all DENMs (punctual, linear and mobile events) and clarification on their configuration (#1590)
2.4.2.2_Denm-LINE-011(2)	Modified	Added the default definition of sounds for all DENMs (punctual, linear and mobile events) and clarification on their configuration (#1590)
2.4.2.2_Denm-MOBL-014(2)	Modified	Added the default definition of sounds for all DENMs (punctual, linear and mobile events) and clarification on their configuration (#1590)
2.4.2.2_ter-VMS-008(1)	Created	Addition of a requirement for VMS alternate display capability
2.4.2.2_Ivim-GNRL-018(2)	Modified	Check of vehicleCharacteristics in both GicParts and TcParts instead of only in GicParts (#1653).
2.4.2.2_Ivim-GNRL-020(2)	Modified	TcPart added to additional information for vehicleCharacteristics checks (#1653).
2.4.2.2_Master-SECU-013(1)	Created	Migration of requirements from 2.4.2.2_hardware to 2.4.2.2_Master. Configuring the connection with the PKI.
2.4.2.2_Master-INTF-018(1)	Created	Migration of requirements from 2.4.2.2_hardware to 2.4.2.2_Master. Supervision of the connection with the Nfr.
2.4.2.2_Master-INTF-019(1)	Created	Migration of requirements from 2.4.2.2_hardware to 2.4.2.2_Master. Configuring the connection with the Nfr.
2.4.2.2_Master-INTF-020(1)	Created	Migration of requirements from 2.4.2.2_hardware to 2.4.2.2_Master. Configuration of network consumption authorized with Nfr (upload/download).
2.4.2.2_Master-SECU-014(1)	Created	SSP for Vro with mobile R-ITS-S function enabled.

Annex B.

The parameters used for the well-functioning of the Vro-ITS-S system are listed in the table below.

Location	Name	Default value	Scope	Unit	Description
Master	<i>p_GEN_displayAuthorisation</i>	-	Per event	Boolean	Authorisation for an event to be displayed at the emission.
Master	<i>p_GEN_criticalDarkScreen</i>	-	Per event	Boolean	True if the event is eligible to critical display (dark screen + sound)
Master	<i>p_GEN_criticalDisplayDuration</i>	10	Set once	Seconds	Duration of the critical display (dark screen + sound)
Master	<i>p_GEN_TxDisplayLevel</i>	-	Per event	Int	Display priority level when the event is triggered by the Vro-ITS-S
Master	<i>p_GEN_RxDisplayLevelFromDatex</i>	-	Per event	Int	Display priority level when the event is received from a DATEX
Master	<i>p_GEN_RxDisplayLevelFromITS</i>	-	Per event	Int	Display priority level when the event is received from an ITS message (G5 or Nfr)
Master, DENM	<i>p_GEN_UpdateInterval</i>	-	Per event	Seconds	Duration between two updates of a Tx event automatically updated. Value can be null if no automatic update.
Master, DENM	<i>p_GEN_DegradedAutoTrig</i>	False	Per event	Boolean	If true, degraded mode where an automatic event can be manually triggered.
Master	<i>p_GEN_UBRMobileActiveUser</i>	False	Set once	Boolean	Activates the Mobile ITS-S function for user mode.
Master	<i>p_GEN_DelayUpdateDatex</i>	8	Set once	Seconds	Minimum delay between two updates of the same event translated into Datex.

Location	Name	Default value	Scope	Unit	Description
Master	<i>p_VEH_matriculation</i>	-	Per vehicle	Char	Matriculation of the vehicle.
Master	<i>p_VEH_userStationType</i>	passengerCar(5)	Per vehicle	Int	Type of vehicle in which the ITS-S is installed.
Master	<i>p_GEN_Tlog[recordType]On</i>	True	Set once	Boolean	Authorize the creation of a Tlog. This parameter is duplicated for each Tlog recordType (in brackets [])
Master	<i>p_GEN_TlogMaxSize</i>	TBD	Set once	TBD	Maximum size of a T-Log file
Master	<i>p_GEN_TlogIntervallSend</i>	TBD	Set once	TBD	TBD
Master	<i>p_GEN_Ulog[recordType]On</i>	True	Set once	Boolean	Authorize the creation of a Ulog. This parameter is duplicated for each Ulog recordType (in brackets []).
Master	<i>p_GEN_UlogMaxSize</i>	TBD	Set once	TBD	Maximum size of a U-Log file
Master	<i>p_GEN_UlogIntervallSend</i>	TBD	Set once	TBD	TBD
Master	<i>p_GEN_Tlog_[type]On</i>	True	Set once	Boolean	Authorize the creation of Tlogs based on IVI messages. This parameter is duplicated for each type of record for IVI messages (in brackets [])
Master	<i>p_GEN_Tlog[type]MaxSize</i>	TBD	Set once	TBD	Maximum size of a Log file for new types
Master	<i>p_GEN_Tlog[type]IntervallSend</i>	TBD	Set once	TBD	TBD
Master	<i>p_ICPU_WiFiSSID</i>	True	Per ICPU	Char	Name of the Wifi connection offered by the ICPU.
Master	<i>p_GEN_Authentication</i>	True	Per activity	Boolean	Define if an activity requires the driver's authentication to access the activity.
Master	<i>p_GEN_UserName</i>	-	Per user	Char	Identifiant d'un utilisateur
Master	<i>p_GEN_Password</i>	-	Per user	Char	Mot de passe d'identification sur la tablette
Master	<i>p_VEH_installationMode</i>	TBD	Per vehicle	Int	Determine if the Vro-ITS-S is installed with or without tablet.

Location	Name	Default value	Scope	Unit	Description
Master	<i>p_VEH_DefaultActivityNoTablet</i>	-	Per vehicle	Int	Activity used per default if the Vro-ITS-S is set "without Tablet"
Master	<i>p_GEN_tabletAdminActivation</i>	False	Per driver	Boolean	Determines if a user has the rights to administrate the VroES.
Master	<i>p_ICPU_DelayCheckUpdates</i>	5	Set once	Minutes	Delay between two checks of the Vro-ITS-S to see if a new version of the softwares are available on the Scoop server
Master	<i>p_GEN_tabletMinVersion</i>	-	Set once	Char	Version of the tablet that determines if the installed version on the VroES is obsolete.
Master	<i>p_ICPU_remoteUpdate</i>	True	Per vehicle	Boolean	Determines if a VroES is allowed to remotely check for new updates or not.
Master	<i>p_ICPU_SecuITS</i>	True	Per vehicle	Boolean	Activation of the security on the ITS message level.
Master	<i>p_ICPU_NbPoolUser</i>	13	Set once	Int	Number of pool of certificate saved for the user mode
Master	<i>p_ICPU_NbCertifPseudoPerPoolUser</i>	10	Set once	Int	Number of user AT per pool
Master	<i>p_ICPU_NbPoolOperator</i>	13	Set once	Int	Number of pool of certificate saved for the operator mode
Master	<i>p_ICPU_NbCertifPseudoPerPoolOperator</i>	10	Set once	Int	Number of operator AT per pool
Master	<i>p_ICPU_validityEC</i>	156	Set once	Week	number of weeks the EC is valid.
Master	<i>p_ICPU_validityCTL</i>	1	Set once	Week	number of weeks the CTL is valid.
Master	<i>p_ICPU_validityECTL</i>	12	Set once	Week	number of weeks the ECTL is valid.
Master	<i>p_ICPU_validityCRL</i>	1	Set once	Week	number of weeks the CRL is valid.
Master	<i>p_ICPU_PkiEaUrl</i>	-	Set once	Char	Url or @IP of PKI EA
Master	<i>p_ICPU_PkiAaUrl</i>	-	Set once	Char	Url or @IP of PKI AA

Location	Name	Default value	Scope	Unit	Description
Master	<i>p_ICPU_PkiDcUrl</i>	-	Set once	Char	Url or @IP of PKI DC
Master	<i>p_ICPU_PkiEctlUrl</i>	-	Set once	Char	Url or @IP of PKI ECTL
Master	<i>p_ICPU_PkiEaPort</i>	-	Set once	Int	Port number of PKI EA
Master	<i>p_ICPU_PkiAaPort</i>	-	Set once	Int	Port number of PKI AA
Master	<i>p_ICPU_PkiDcPort</i>	-	Set once	Int	Port number of PKI DC
Master	<i>p_ICPU_PkiEctlPort</i>	-	Set once	Int	Port number of PKI ECTL
Master	<i>p_GEN_DatexPosFreq</i>	60	Set once	Seconds	Delay between two transmission to the PFro of the position of the Vro-ITS-S
Master	<i>p_ICPU_NfrLinkActivation</i>	True	Per vehicle	Boolean	Activation or not of the link between Vro and Nfr.
Master	<i>p_ICPU_NfrGenCamDistance</i>	250	Set once	Meter	Maximum distance between two CAM emitted to Nfr
Master	<i>p_ICPU_NfrGenCamDelay</i>	120	Set once	Seconds	Maximum delay between two CAM emitted to Nfr
Master	<i>p_ICPU_NfrGeoFwdAuthorization</i>	True	Set once	Boolean	Activates the broadcast on G5 messages received from Nfr
Master	<i>p_ICPU_NfrRepDENM</i>	9	Set once	Minutes	Delay between two repetitions send to the Nfr.
Master	<i>p_ICPU_Nfr_address</i>	-	Set once	Char	Url or @IP of Nfr-ITS-S
Master	<i>p_ICPU_Nfr_port</i>	-	Set once	Int	Port number of Nfr-ITS-S
Master	<i>p_ICPU_NfrSupervizMessFail</i>	1	Set once	Int	The number of C-ITS messages that have failed to be sent to the Nfr-ITS-S.
Master	<i>P_ICPU_NfrThresUploaded</i>	1024	Set once	Mo	Threshold on uploaded data to Nfr-ITS-S before deactivating the link to the Nfr-ITS-S.

Location	Name	Default value	Scope	Unit	Description
Master	<i>P_ICPU_NfrThresDownloaded</i>	1024	Set once	Mo	Threshold on downloaded data from Nfr-ITS-S before deactivating the link to the Nfr-ITS-S.
Master	<i>p_ICPU_supervision_address</i>	-	Set once	Char	Vro-ITS-S server address
Master	<i>p_ICPU_supervision_port</i>	-	Set once	Int	Port number of Vro-ITS-S server
Master	<i>p_ICPU_SwitchOffDelay</i>	30	Set once	Seconds	Delay between the shutdown request and the actual extinction of the ICPU
DENM	<i>p_GEN_RxMobileEvent</i>	-	Per event	Boolean	Define if a received event is associated to the mobile event service
DENM, IVI	<i>p_GEN_displayTTE</i>	10	Per event	Seconds	Time to event under which the event is displayed.
DENM, IVI	<i>p_GEN_MinDisplayingDuration</i>	3	Set once	Seconds	Minimum duration of the display of an event to avoid flash alerts.
IVI	<i>p_GEN_maxLanesToDisplay</i>	8	Set once	Int	Maximum number of displayed lanes for MRI service.