



Specification of the SCOOP Software for Vro-ITS-S

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Reference to the version administration

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- **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

Acronyms & Terms

The following terms are defined in the glossary:

- API Application Programming Interface
- C-ITS Cooperative Intelligent Transport System "By cooperative systems, we mean (definition adopted by the EC, unit C.5 - ICT for "ICT for Transport and the Environment"): "Road operators, infrastructure, vehicles, their drivers and other road users will co-operate to deliver the most efficient, safe, secure and comfortable journeys"
- C-ITS-S C-ITS Station
- CAM Cooperative Awareness Message provide information about the presence, positions and basic status of vehicles and road side units to the surrounding area
- CAN bus Controller Area Network BUS: Cabling inside a vehicle transmitting electronic data.
- DATEX Data Exchange A data exchange protocol, structured in a set of technical annexes, containing also a database of road traffic related events, standardized by the CEN under the number 16157.
- DENM Decentralized Environmental Notification Message, transmitted by a vehicle when it detects an event (see DENM standard)
- GNSS: Global navigation satellite system, system used for positioning and road segment identification
- GPS :Global Positioning System : American GNSS
- HMI: Human-Machine Interface: a front-end user interface.
- ICPU : name for the basic part of a Vro-ITS-S
- PF French Interface Platform
- PKI Public Key Infrastructure
- R-ITS-S Roadside ITS Station: ITS station implemented in the road infrastructure
- TLOGS Records related to Technical data
- ULOGS Records related to User data
- Vro-ITS-S Road Operator Vehicle ITS station: It is, in SCOOP, an after-market Vru-ITS-S specialized for traffic operator.
- Vru-ITS-S : an embedded ITS Station in a road user vehicle
-

Some terms are used in this document in a specific way:

- The persons who will use the SCOOP software are road operator employees, driver or passenger, in or near the equipped car, with the Vro-ITS-S.
- A "person", a "human" or an "actor" have rights, which allows them to do certain actions on the SCOOP software. (See 2.3.6 for details on rights)
- A "user" is a person with rights allowing him to run the user mode (See 2.2.1 for details on user mode).
- An "operator" is a person with rights allowing him to run the operator mode (See 2.2.2 for details on operator mode).
- A "server administrator" is a person with rights allowing him to configure the SCOOP software from the server (See 2.3.6.1 for details on server administration).
- A "tablet administrator" is a person with rights allowing him to run the administrator mode on the tablet (See 2.3.6.2 for details on administrator mode).
- In a requirement, the person mentioned has always the appropriate rights.

- The “user use case” or “user DENM” correspond to a DENM sent by a Vu-ITS-S. (See 2.2.1 for the list)
- This term is used here in opposition with the term “operator DENM”, which correspond to the DENM only sent from the Vro-ITS-S in the operator mode. (See 2.2.2 for the list)
- An operator DENM can be linked to the vehicle (example “the vehicle is salting”), or can be exterior to the vehicle (example “an animal is on the road”)
- An external DENM is a DENM received by the considered ITS-S. In other terms, the sender of an external DENM is another ITS-S.
- The “route” is a set of continuous road that an operator has to follow during his activity, e.g. patrolling or salting. (in French: “circuit”)
- The “itinerary” is a set of continuous road, which is calculated when the user entered a destination, and which he wants be guided on. (in French: “itinéraire”)

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1 Introduction

1.1 Purpose of the document

The document specifies a part of the SCOOP Vro-ITS-S: the SCOOP software.

The other parts of the SCOOP Vro-ITS-S are described in:

- 2.4.2.2: specification of the Vro-ITS-S hardware, the basic ICPU software and the Vro-ITS-S server,
- 2.4.2.2 ter: Management of displays on the HMI of road operator Vro-ITS-S.

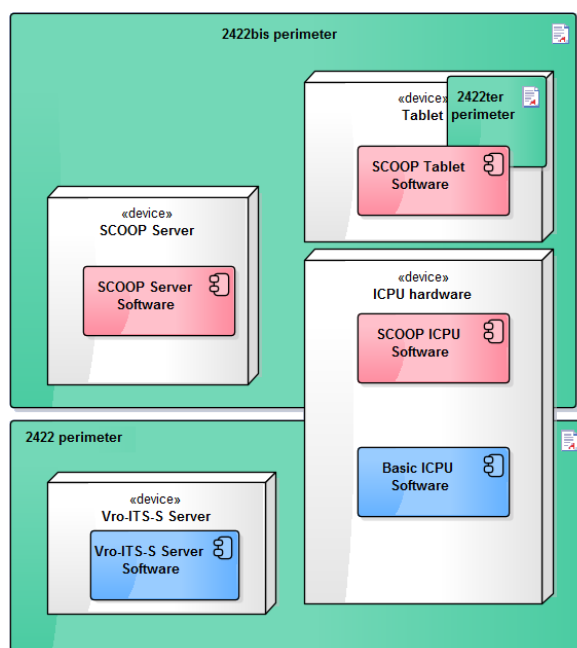


Figure 1 : Vro-ITS-S software documentation

In this document, only functional requirements are mentioned and some technical requirements specific to the SCOOP software.

The technical requirements for the Vro-ITS-S are set in the 2.4.2.2.

The ergonomic, or display requirements that the SCOOP software shall comply with, are set in the deliverable 2.4.2.2ter.

1.2 Vro-ITS-S in the SCOOP system

The general description of the SCOOP system is set in the Deliverable 2.4.1.

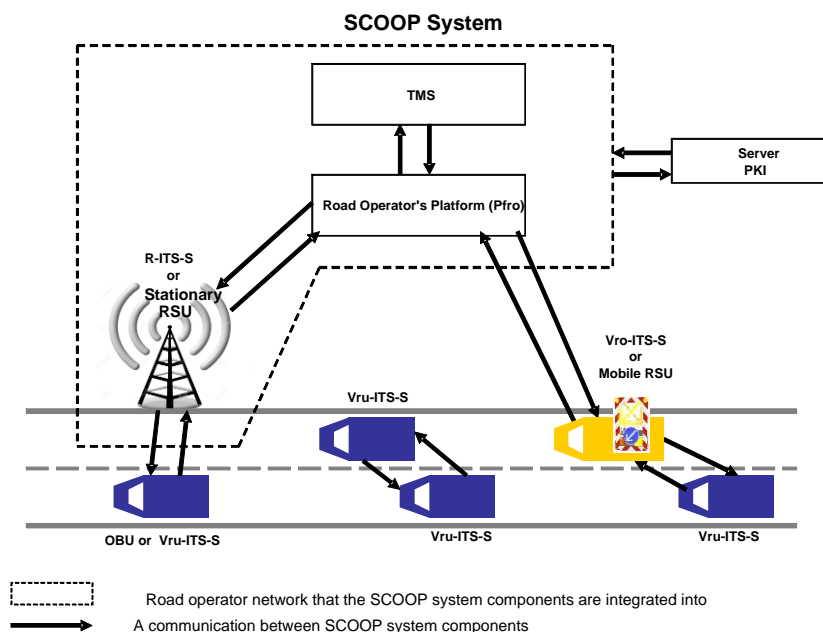


Figure 2 : Diagram of the SCOOP system with the PKI (extract from 2.4.1-Release 2)

The Vro-ITS-S are part of the Road Operator Network. They communicate directly with the SCOOP platform, and with the other C-ITS stations.

SCOOP software will handle the SCOOP wave 1 services based on DENM exchanges (A2, A3, B, D, and E).

The deliverables 2.2, 2.4.1 and 2.4.1.2 detail these use cases.

Note: The basic ICPU software directly handles the emission of CAM (A1 use case in the deliverable 2.2). However, it does not aggregate the collected CAM as an R-ITS-S would do (See chapter 2.2.4 for details about the mobile R-ITS-S function).

1.3 The SCOOP software in the Vro-ITS-S

The main objective of the SCOOP software is to manage mobile road operators uses cases specified in SCOOP, in the same way for all French road operators.

The deliverable 2.4.2.2 described the Vro-ITS-S:

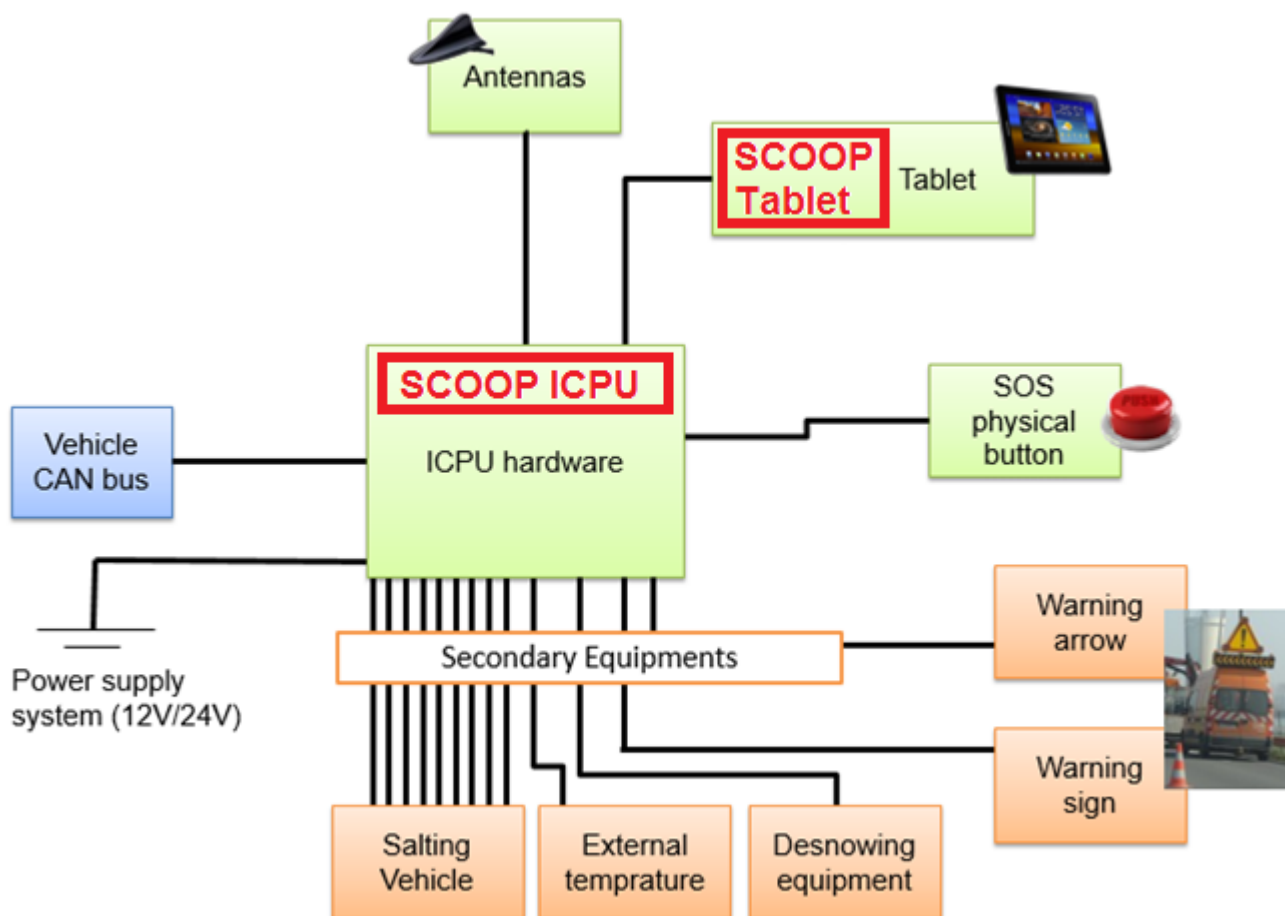


Figure 3 : Overview of the Vro-ITS-S embedded hardware architecture (extract from 2.4.2.2)

The figure 3 is an extract from the 2.4.2.2 Deliverable, on which the SCOOP software is added in red.

This specification is written by considering a complete embedded Vro-ITS-S with an “ICPU associated with a tablet and a sim card”. If some requirements of the SCOOP software need exceptions for different types of installation, the document will mention it.

2 SCOOP software

2.1 Technical architecture

Requirement n°1. The SCOOP software shall be composed of 3 components, each installed on a different hardware.

They are the following:

- The SCOOP tablet software:
 - is an android application installed on the tablet,
 - manages the interaction with the human actor.
- The SCOOP ICPU software:
 - is an application installed on the ICPU,
 - manages all the processes of creation and translation of DENM and DATEX II messages in collaboration with the basic ICPU software,
- The SCOOP server software:
 - is a software installed on the road operator information system,
 - manages the SCOOP software configuration files, administrates the SCOOP software, and manages the authentication of persons.

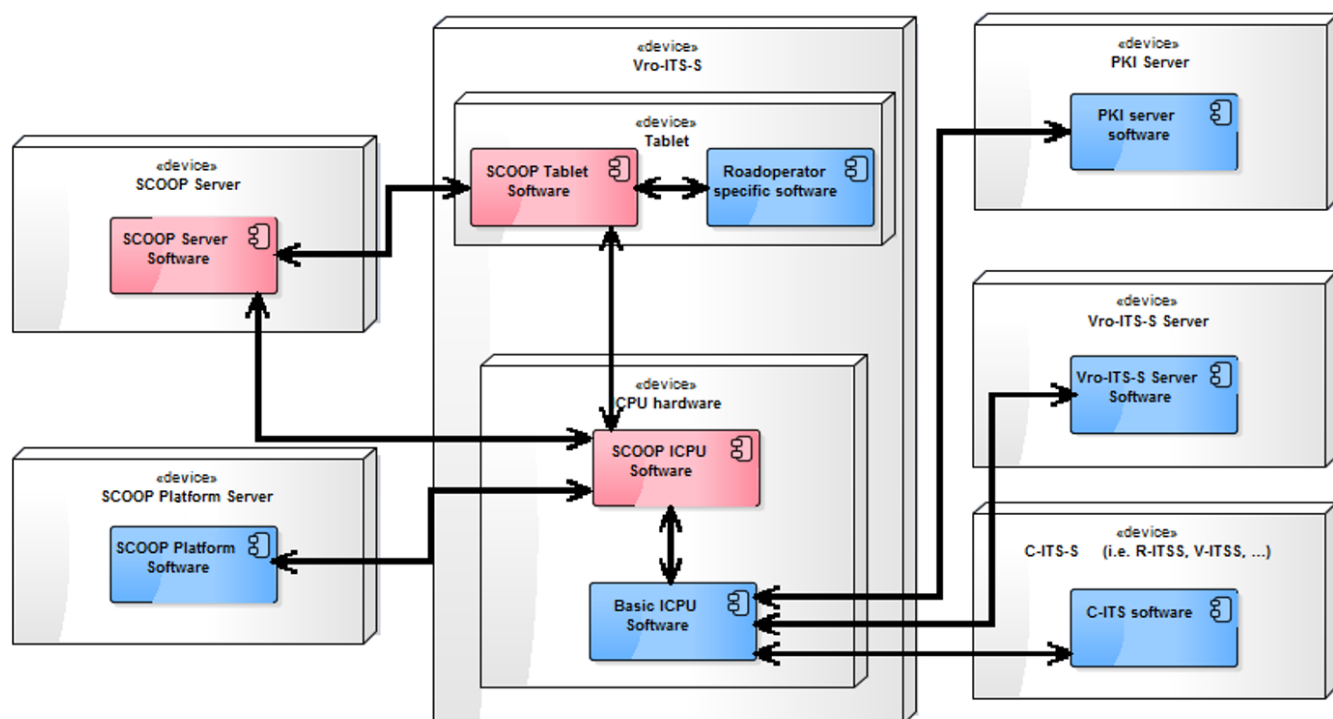


Figure 4 : Functional flows concerning the SCOOP software.

Captions:

- Red component = part of the SCOOP software
- Blue component= other software which interacts functionally with the SCOOP software
- Grey component = device or hardware component

Requirement n°2. The basic ICPU software shall handle all the technical communications of the SCOOP software.

Thereafter, in this document, the description of the exchanges are functional.

Note: Each component of the SCOOP software can be several pieces of software and can need specific settings of supporting software. Thereafter, in this document, the requirements are only functional, without presuming any implementation constraints.

The SCOOP software aims to be deployed in every road operator vehicles, beginning by those involved in the C-ITS projects, and the French national road operators.

This implies practical requirements such as:

Requirement n°3. The human interface of the SCOOP software shall be in French.

Requirement n°4. The applications involved in the SCOOP software shall be distributable to the road operators (for example, the legacy propriety shall not be a constraint)

2.2 Functional requirements

The main functionalities of the SCOOP software are:

- to declare manual events and create the corresponding DENM, for both the regular user events (i.e. obstacle on the road) and the road operator events (i.e. mobile roadworks),
- to create automatic DENMs for the road operator events (i.e. intervention on the road),
- to display the received events from both the SCOOP platform and the other C-ITS stations, as well as their own events,
- to help the person to navigate,
- to offer the mobile R-ITS-S function,
- to send an emergency call. (See 2.2.5)

These functions need supports functions to be operational. They are:

- to start up the Vro-ITS-S,
- to switch off the Vro-ITS-S,
- to manage the persons rights,
- to update the Vro-ITS-S,
- to monitor the Vro-ITS-S,
- to administrate the Vro-ITS-S,
- to manage the cartography.

Requirement n°5. The SCOOP software operates under three modes on the tablet. Two are functional: user mode and operator mode, and the last, the administrator mode, is a supporting mode.

Before the person chooses their mode, the basic ICPU software have to send CAM and can send automatic user DENM, and so basic ICPU software sets the CAM and DENM values regarding the setting exchanged at the starting up with the SCOOP software (e.g. vehicleRole, stationType, certificates)

If the installation is "without tablet", the Basic ICPU software shall use operator certificates for the CAM.

Requirement n°6. In the user mode, the Vro-ITS-S shall act as a Vru-ITS-S.

It means principally that in the user mode:

- the Vro-ITS-S sends, as an Vru-ITS-S, CAM and user DENM to other C-ITS stations,
- the Vro-ITS-S displays received events to the user,
- by default, there is no connection with the SCOOP platform.

Requirement n°7. In the operator mode, the Vro-ITS-S shall act as an extension of the road operator SCOOP System.

It means principally that in the operator mode:

- the Vro-ITS-S sends, with road operator specific certificates, CAM and user DENM to other C-ITS stations,
- the Vro-ITS-S sends, with road operator specific certificates, operator DENM,
- the Vro-ITS-S displays received events to the operator,
- the mobile R-ITS-S function is activated, and so the Vro-ITS-S acts as an R-ITS-S (receives DATEX messages from the SCOOP platform, translates them in DENM and sends them to other C-ITS stations, and vice-versa).

Requirement n°8. In the administrator mode on the tablet, the tablet administrator shall be able to configure the tablet settings and to consult the connections or modules status. (See **Erreur ! Source du renvoi introuvable.** for details)

2.2.1 Run user mode

Description:

In this mode, the user is a driver, or a passenger, and so the Vro-ITS-S acts as a Vru-ITS-S.

Some of the operator mode functionalities can be set available for the user mode. See the detail of each operator mode in chapter 2.2.2.

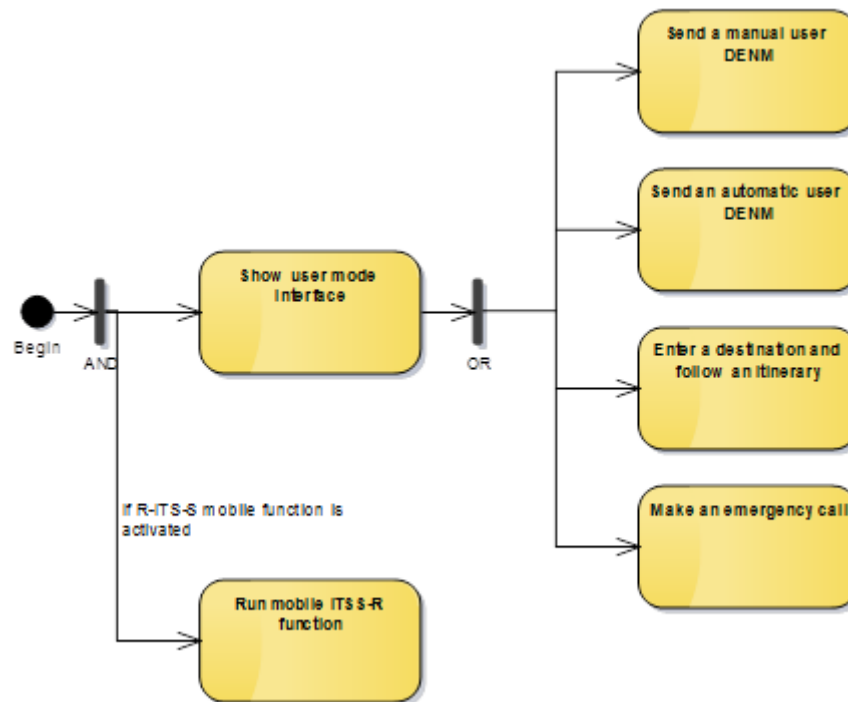


Figure 5 : Actions a user can do in the user mode

Requirement n°9. In the user mode, the Vro-ITS-S shall only send:

- the manual user DENM,
- and the automatic user DENM detected by the CAN bus connection.

The use cases are set in the 2.4.1. The list is:

- D1: warning- temporary slippery road,
- D2a: animal on the road,
- D2b: people on the road,
- D3: obstacle on the road,
- D4a: stationary vehicle,
- D4b: vehicle breakdown,
- D5: ego vehicle in accident, (automatic detection)
- D5: accident, (manual declaration)
- D6: reduced visibility,
- D8: unmanaged blockage of a road,
- D10: warning - emergency brake,
- D11: warning - end of queue,
- E6: exceptional weather conditions.

Requirement n°10. In the user mode, the sent DENM shall be associated with a user certificate.

The deliverable 2.4.4.8 Technical specifications of the IT security system lists the DENM SSPs for Vro-ITS-S in user mode.

Requirement n°11. In the user mode, the user can enter a destination and follow an itinerary.

See Chapter 2.2.3.

Requirement n°12. In the user mode, the user can send an emergency message.

See chapter 2.2.5.

2.2.1.1 Declare manual user DENM

Description:

The user can declare manual user DENM, by clicking on the tablet, for example: “I see an animal on the road”, or “I see an accident”.

The manual user DENM correspond to the five SCOOP use cases.

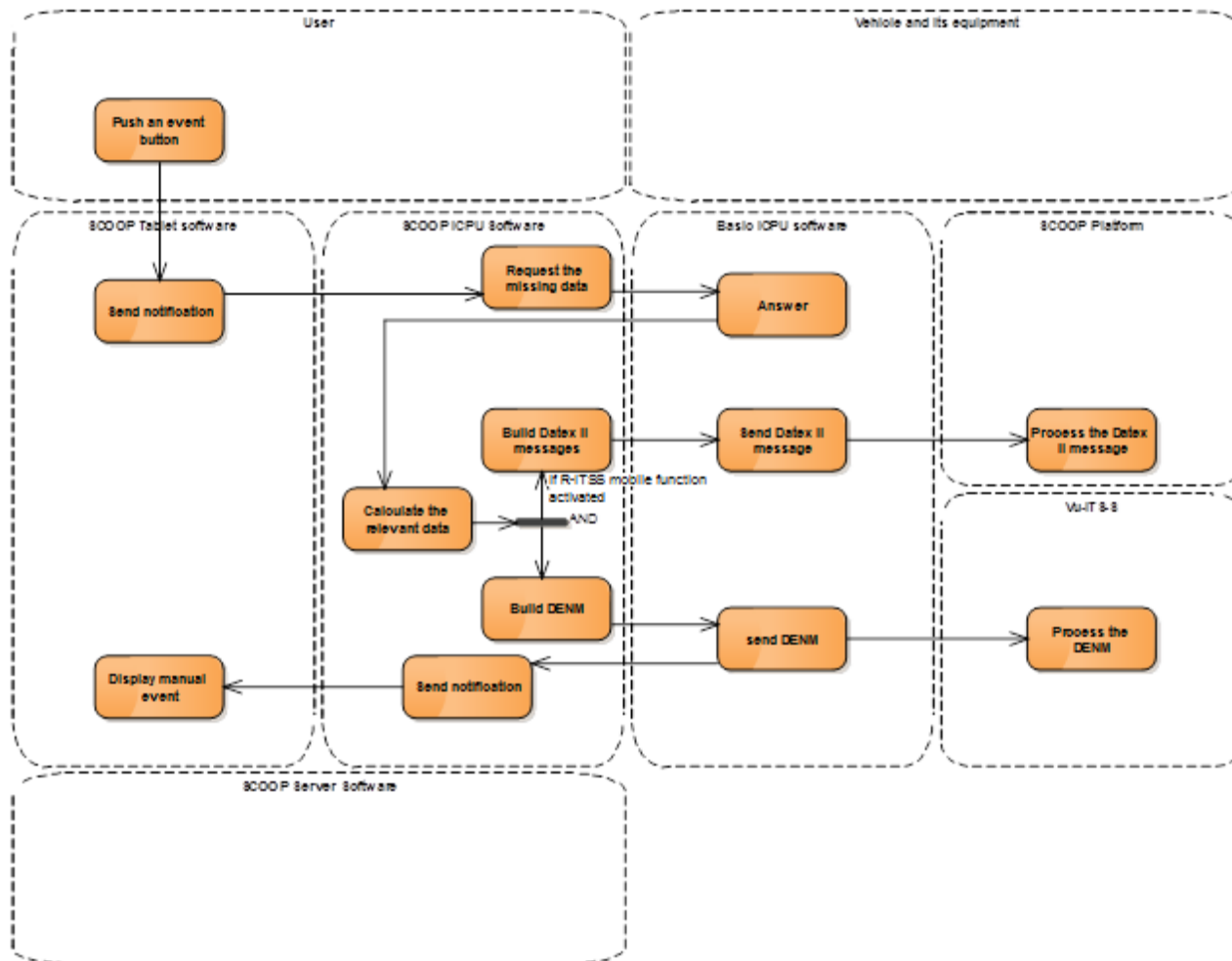


Figure 6 : Internal SCOOP software process for manual user DENM

Requirement n°13. The SCOOP software shall allow a user to declare the manual user DENM.

The use cases are set in the 2.4.1. The list is:

- D2a: animal on the road,
- D2b: people on the road,
- D3: obstacle on the road,
- D5: accident, (manual declaration)
- D8: unmanaged blockage of a road.

Requirement n°14. The SCOOP software shall allow a user to cancel manually his own manual user DENM, in order the basic ICPU software can send the cancellation to other C-ITS stations.

Requirement n°15. The list of the manual user DENM is fixed, but a server administrator can modify the values of the data element of the manual user DENM.

The default value of the manual user DENM are fixed in the 2.4.1.2.

Requirement n°16. The SCOOP software shall display to the user the events he declares.

- Note: the display of their own events is only an acknowledgment of sending and not a display such as the external events display.

2.2.1.2 Create, send and display automatic user DENM

Description:

The Vro-ITS-S can detect automatically some event concerning their own car, inform the user and send the corresponding DENM, for example, “My car is stationary”, “I had an accident”...

The automatic user use cases are set in the 2.4.1. The list is:

- D1: warning- temporary slippery road,
- D4a:stationary vehicle,
- D4b: vehicle breakdown,
- D5: ego vehicle in accident, (automatic detection)
- D6: reduced visibility,
- D10: warning - emergency brake,
- D11: warning - end of queue,
- E6: exceptional weather conditions.

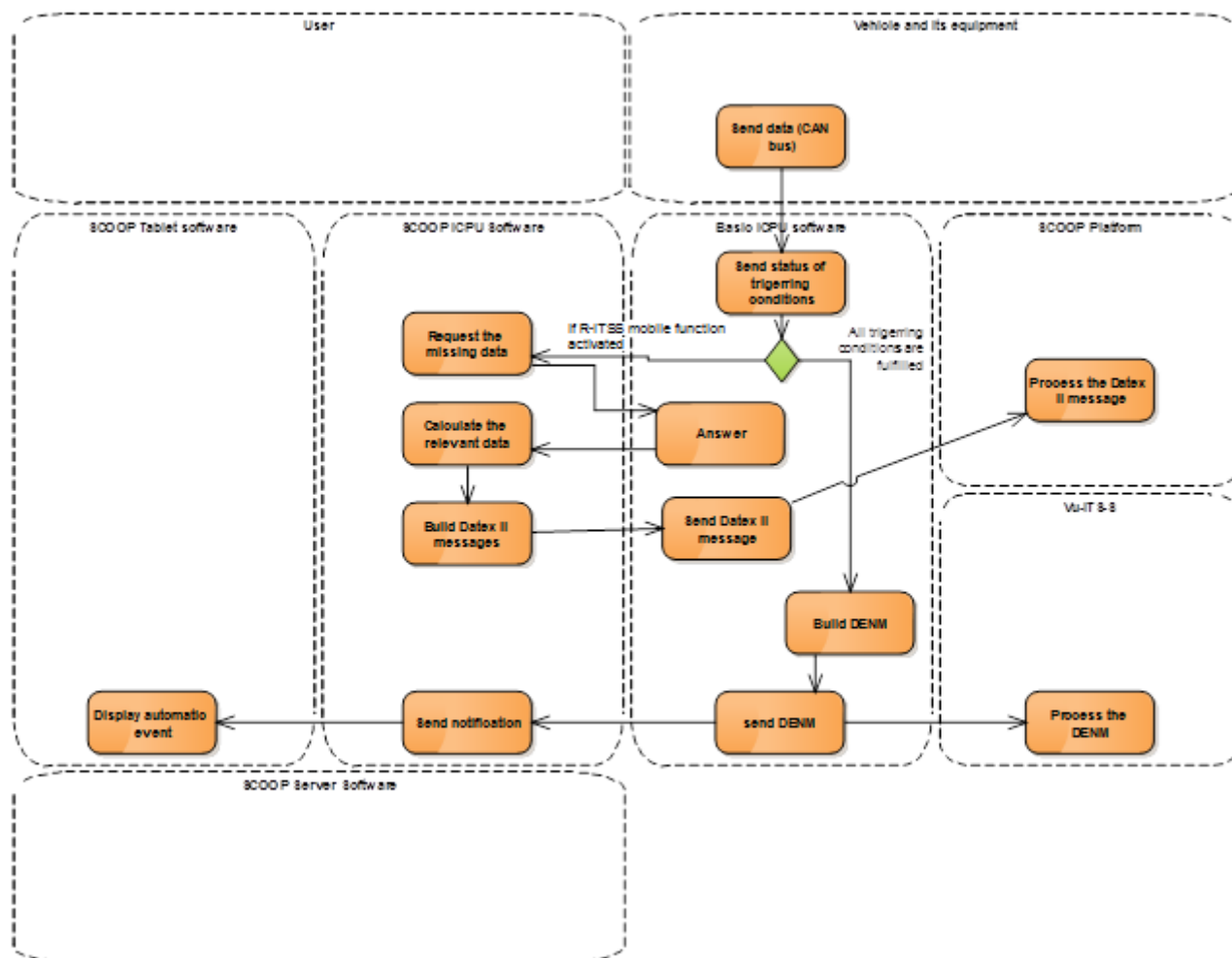


Figure 7 : Internal SCOOP software process for automatic user DENM

Requirement n°17. The SCOOP software shall inform the user when an automatic user DENM is sent by the Basic ICPU software.

Requirement n°18. The SCOOP software shall not allow manual cancel of automatic user DENM.

Requirement n°19. If the mobile R-ITS-S function is active, the SCOOP software shall send the data to the platform when the Vro-ITS-S sends an automatic user DENM.

Requirement n°20. The list of the automatic user DENM is fixed.

Requirement n°21. A server administrator can modify the values of the data element of the automatic user DENM.

The default values of the DENM data elements are fixed in the 2.4.1.2.

2.2.1.3 Display an external DENM

Description:

The Vro-ITS-S receives DENM messages from other C-ITS Stations, such events or DENM

are called “external”.

Requirement n°22. If it is relevant, the SCOOP software shall display events to the user.
The way to display a DENM is set in the deliverable 2.4.2.2ter.

2.2.2 Run operator mode

Description:

In this mode, the operator is a road operator employee with a specific activity to carry. His vehicle might be manoeuvring in a different way than the other regular vehicles. For example, he can stop or go backwards on the highway. The purpose of the operator mode is to alert other drivers of those specificities.

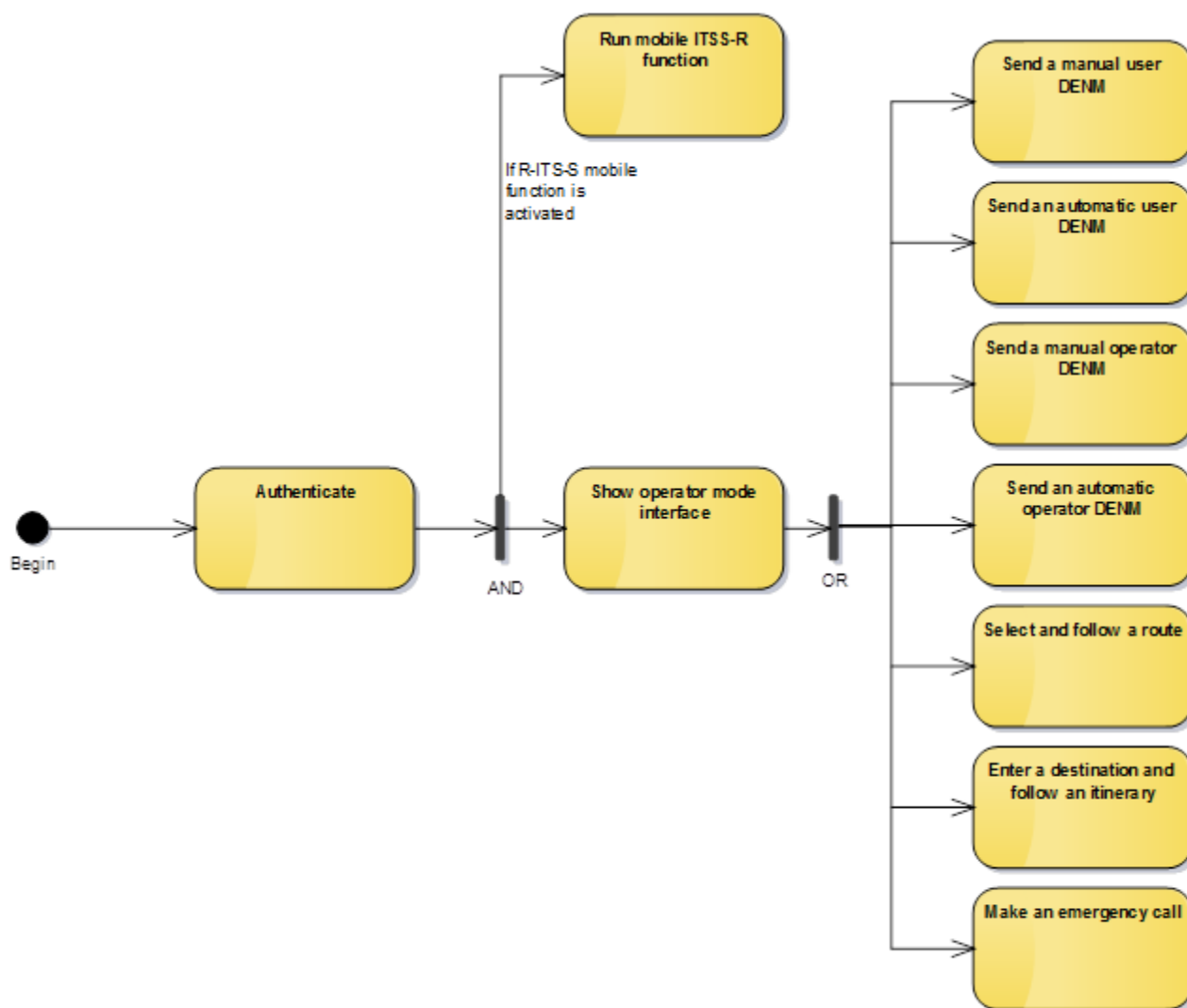


Figure 8 : Actions an operator can do in the operator mode

In each activity, the operator can be in a different context, called sub activity, and which corresponds to a SCOOP use case, described in the deliverable 2.4.1.

Five default activities have been retained:

- Mobile roadworks
 - In the sub activity “Mobile roadworks”, the operator is driving slowly, or manoeuvring along or on the road, because he is cleaning the road, fixing restraint systems, mowing or spreading phytosanitary treatments,
 - corresponding to SCOOP Use case “B1 warning scheduled roadwork – mobile”, which DENM EventType is “3/3”.
 - In the sub activity “marking”, the operator is driving slowly, or manoeuvring, along or on the road, because he is marking up future roadworks, or marking off ended roadworks,
 - corresponding to SCOOP Use case “B1 warning scheduled roadwork – stationary”, which DENM EventType is “15/0”.
 - In the sub activity “traffic jam”, the operator is driving slowly, or stopping at the end of a traffic jam, because he is alerting drivers of the end of queue.
 - corresponding to SCOOP Use Case “A2-D11 warning end of queue”, which DENM EventType is “27/0”.
- Fixed roadworks
 - In the sub activity “Marking”, the operator is driving slowly, or manoeuvring, along or on the road, because he is marking up future roadworks, or marking off ended roadworks,
 - corresponding to SCOOP Use case “B1 warning scheduled roadwork – stationary”, which DENM EventType is “15/0”.
 - In the sub activity “traffic jam”, the operator is driving slowly, or stopping at the end of a traffic jam, because he is alerting drivers of the end of queue.
 - corresponding to SCOOP Use Case “A2-D11 warning end of queue”, which DENM EventType is “27/0”.
- Intervention
 - In the sub activity called “Intervention vehicle approaching”, the operator drives to reach rapidly an accident zone for example,
 - corresponding to SCOOP Use case “B2 warning road operator intervention - operator vehicle out on service call”, which DENM EventType is “95/0”.
 - In the sub activity called “vehicle in intervention”, he is protecting a zone, and for example the damaged vehicle, while waiting for the tow truck or the police,
 - corresponding to SCOOP Use case “B2 warning road operator intervention - operator vehicle stopped in a protected mode”, which DENM EventType is “15/0”.
 - In the sub activity “traffic jam”, the operator is driving slowly, or stopping at the end of a traffic jam, because he is alerting drivers of the end of queue.
 - corresponding to SCOOP Use Case “A2-D11 warning end of queue”, which DENM EventType is “27/0”.
- Patrol
 - In the sub activity called “Patrolling vehicle”, he is driving slowly along the road to see problems on the road,
 - corresponding to SCOOP Use case “B2 warning road operator intervention - the operator vehicle on patrol”, which DENM EventType is “26/4”.
 - In the sub activity called “Vehicle in intervention”, the driver stops his vehicle and go to fix a problem he has seen,

- corresponding to SCOOP Use case “B2 warning road operator intervention - operator vehicle stopped in a protected mode”, which DENM EventType is “15/0”.
- In the sub activity “traffic jam”, the operator is driving slowly, or stopping at the end of a traffic jam, because he is alerting drivers of the end of queue.
 - corresponding to SCOOP Use Case “A2-D11 warning end of queue”, which DENM EventType is “27/0”.
- Wintry viability: in this activity, the Vro-ITS-S is in a snowplough, in a salting vehicle, or in a truck with a large salting trailer.
 - In the sub activity called “Slow Moving Vehicle ”, the vehicle is just running, but might be larger (with the blade for example)
 - Corresponding to SCOOP Use case “B3 - Warning winter maintenance - winter road maintenance vehicle on road”, which DENM EventType is “3/6”.
 - In the sub activity called “Snow clearance in progress”, the vehicle pushes slowly the snow out of the road.
 - Corresponding to SCOOP Use case “B3 - Warning winter maintenance - winter road maintenance vehicle clearing snow”, which DENM EventType is “26/6”.
 - In the sub activity called “Salting in progress”, the vehicle is moving slowly and is spreading salt on the road.
 - Corresponding to SCOOP Use case “B3 - Warning winter maintenance - winter road maintenance vehicle is salting”, which DENM EventType is “26/8”.

These activities and sub activities are the default ones, and others can be added.

The settings of these activities and sub activities can be changed.

Requirement n°23. The SCOOP software shall support these activities and these sub activities.

Requirement n°24. A server administrator shall be able to add new activities and sub activities.

Requirement n°25. An activity is accessible only to operators with authorized rights.

Requirement n°26. In an activity, a sub-activity is accessible only to operators with authorized rights.

Requirement n°27. In the operator mode, the Vro-ITS-S shall be able to send:

- the manual user DENM,
- the automatic user DENM,
- the manual operator DENM
- and the automatic operator DENM.

Requirement n°28. In the operator mode, the sent DENM shall be associated with an operator certificate.

The deliverable 2.4.4.8 Technical specifications of the IT security system lists the DENM SSPs for Vro-ITS-S in operator mode.

Note: in the operator mode, the sent CAM shall be associated with an operator certificate too.

The triggering conditions of cancelling are set in the deliverable 2.4.1.

Requirement n°29. In the operator mode, the operator can send an emergency message.
See chapter 2.2.5.

2.2.2.1 Act as an Vru-ITS-S, under a road operator label

Requirement n°30. In the operator mode, the SCOOP software shall manage the external DENM the same way as in the user mode.

Requirement n°31. In the operator mode in all activities, the SCOOP software shall manage the manual and automatic user DENM as in the user mode, except for:

- stationType value of the DENM
- informationQuality value of the DENM,
- and the security certificate added to the DENM.

Note: in the operator mode, the basic ICPU software will also adapt the CAM "vehicleRole" according to the 2.4.1 and the certificate according to the 2.4.4.8.

2.2.2.2 Manage an operator DENM

Requirement n°32. Each sub-activity shall offer the possibility to send one and only one operator DENM.

Requirement n°33. The operator DENM and their links with sub activities are configurable.

Requirement n°34. In the operator mode, when the operator changes from one activity to another, the SCOOP software shall cancel all the operator DENM linked to the first activity.

Requirement n°35. Each operator DENM can be triggered manually or automatically.

Requirement n°36. If the Vro-ITS-S can automatically trigger a DENM, then the operator cannot send manually the same DENM.

Requirement n°37. If the Vro-ITS-S cannot automatically trigger a DENM, then the operator can send manually the same DENM.

For example, this case happens if the secondary equipment is not detected by the Vro-ITS-S.

2.2.2.2.1 DECLARE A MANUAL OPERATOR DENM

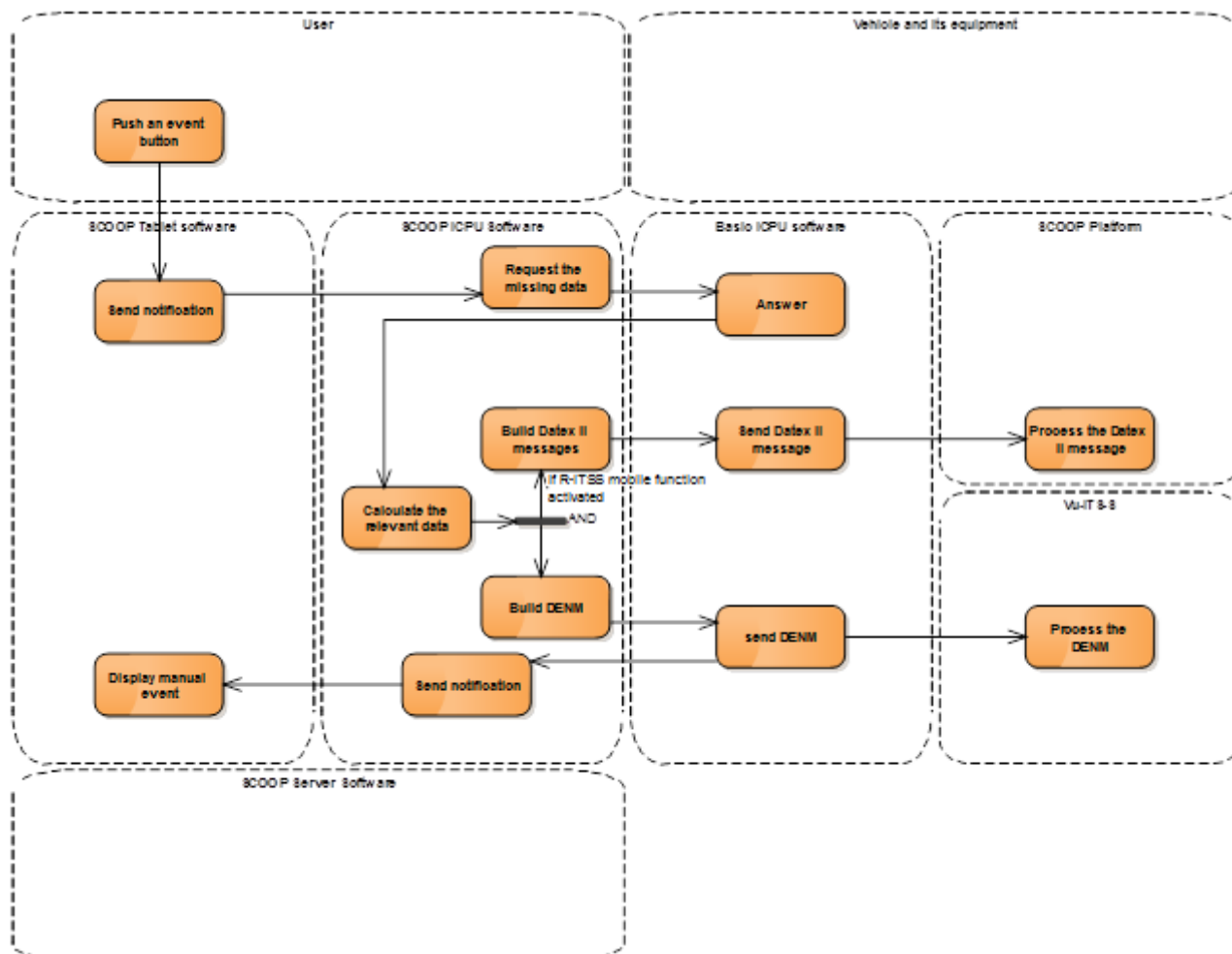


Figure 9 : Internal SCOOP software process for manual operator DENM

Requirement n°38. The SCOOP software shall allow an operator to declare the manual operator DENM, in order the basic ICPU software can send it to other C-ITS stations.

Requirement n°39. The SCOOP software shall display to the operator the DENM he declares.

Requirement n°40. The SCOOP software shall allow an operator to cancel the manual operator DENM.

Requirement n°41. If the mobile R-ITS-S function is active, the SCOOP software shall send the data to the SCOOP platform when the Vro-ITS-S is sending a manual operator DENM.

The default list of the manual operator DENM is set in the 2.4.1.2. The list is:

- | | | | |
|--------------------|---|--|------|
| • Mobile roadworks | Mobile roadworks | B1 warning scheduled roadwork – mobile | 3/3 |
| • Mobile roadworks | Marking | B1 warning scheduled roadwork – stationary | 15/0 |
| • Mobile roadworks | Traffic jam | A2-D11 warning end of queue | 27/0 |
| • Fixed roadworks | Marking | B1 warning scheduled roadwork – stationary | 15/0 |
| • Fixed roadworks | Traffic jam | A2-D11 warning end of queue | 27/0 |
| • Intervention | Intervention vehicle approaching | B2 warning road operator | |
| • Intervention | intervention - operator vehicle out on service call | 95/0 | |
| • Intervention | vehicle in intervention | B2 warning road operator intervention - operator | |
| | vehicle stopped in a protected mode | 15/0 | |

• Intervention	Traffic jam	A2-D11 warning end of queue 27/0
• Patrol vehicle on patrol	Patrolling vehicle 26/4	B2 warning road operator intervention - the operator
• Patrol vehicle stopped in a protected mode	Vehicle in intervention 15/0	B2 warning road operator intervention - operator
• Patrol	Traffic jam	A2-D11 warning end of queue 27/0
• Wintry viability: maintenance vehicle on road	Slow Moving Vehicle 3/6	B3 - Warning winter maintenance - winter road
• Wintry viability	Snow clearance in progress	B3 - Warning winter maintenance - winter
road maintenance vehicle clearing snow	26/6	
• Wintry viability: maintenance vehicle is salting	Salting in progress 26/8	B3 - Warning winter maintenance - winter road

Requirement n°42. A server administrator can add new manual operator DENM.

Requirement n°43. A server administrator can modify the values of the data element of any manual operator DENM.

The default value of the manual operator DENM in the default list are fixed in the 2.4.1.2.

Note: other sources can improve data for manual operator event. For example, some road operators have an already installed application on the tablet processing data that the SCOOP software can use to enhance a DENM. (See chapter **Erreur ! Source du renvoi introuvable.** for the interface).

2.2.2.2.2 MANAGE AN AUTOMATIC OPERATOR DENM

Description:

If secondary equipments are installed on the vehicle, and connected to the Vro-ITS-S, the Vro-ITS-S can detect their status or their electronic signal. According to the road operator rules and the Vro-ITS-S setting, the Vro-ITS-S can send an appropriate DENM.

Some secondary equipments, which can be connected to a VRO-ITS-S, are:

- Light arrows
- Emergency arrows
- Salt spreader
- Dynamic warning triangle
- Flashing lights
- Rotating beacon
- Snowplough

Other equipments could be considered in the future.

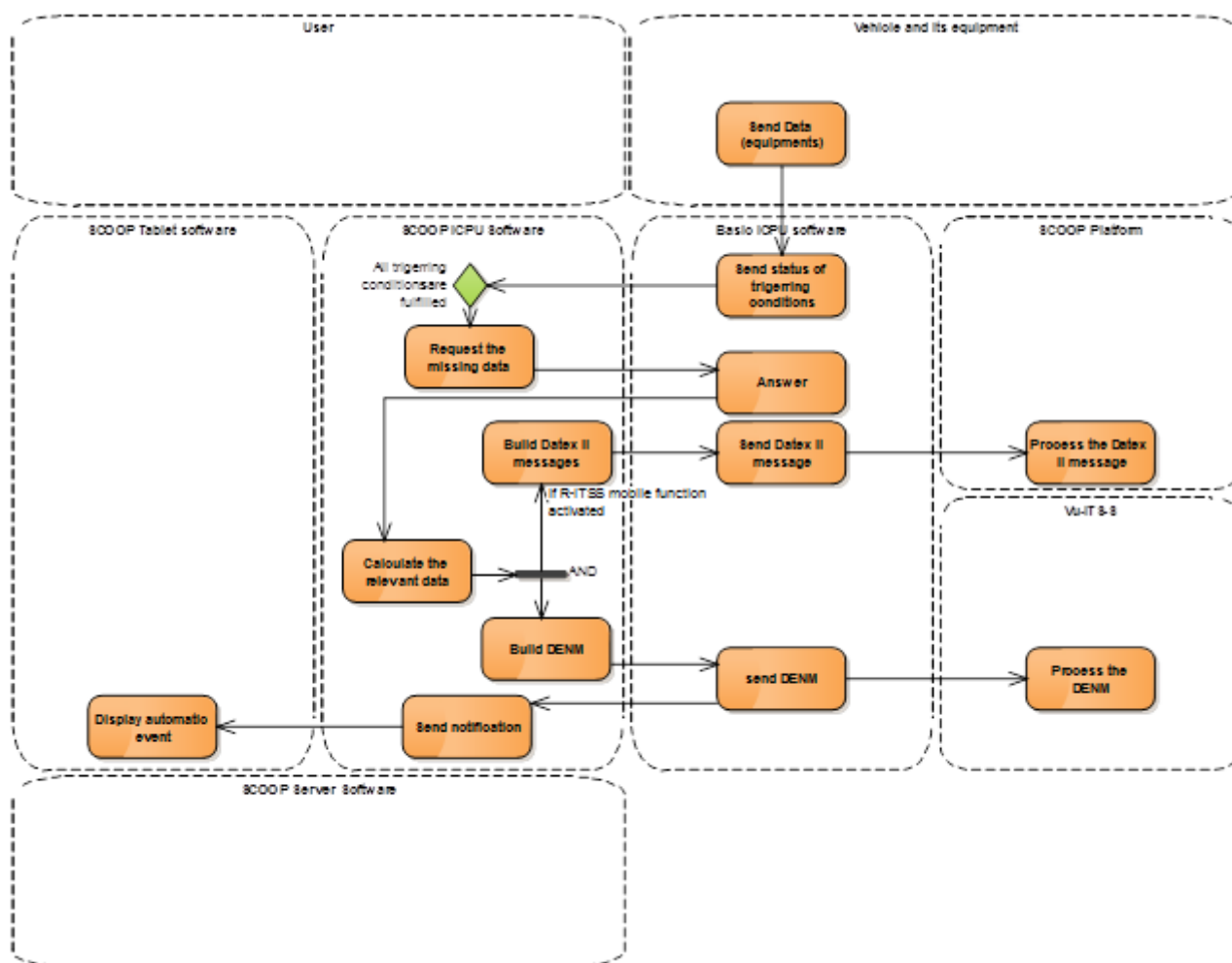


Figure 10 : Internal SCOOP software process for automatic operator DENM

Requirement n°44. A server administrator can modify the triggering conditions for an automatic operator DENM.

Requirement n°45. If the setting “automatic triggering” is disabled for a DENM, then the SCOOP software shall not send the corresponding automatic operator DENM.

Requirement n°46. As long as all the triggering conditions are fulfilled for a DENM, the SCOOP software shall send the corresponding DENM to other stations, and shall automatically display the corresponding DENM.

2.2.3 Help the operator to navigate

Description:

The SCOOP software helps to navigate, in three ways:

- by giving him information about the road, his position and the event around him,
- by showing him the route that his chief ordered him to follow during his activity, and guiding him on this route,

- by calculating and displaying him an itinerary to a destination that he previously requested, and guiding him on this itinerary.

Requirement n°47. The SCOOP software shall offer the possibility to consult the map, and to see the position of the vehicle.

Requirement n°48. A server administrator shall be able to create modify delete routes.

The available routes for an operator depends on the activity set in the Vro-ITS-S, and on the business unit of the operator.

Requirement n°49. If requested by the operator, the SCOOP software shall display a route that the operator will follow.

This route is an uninterrupted path from a start point to an end point. The start point and the end point can be the same.

Note: a specific application could send to the SCOOP software some routes or point of routes.

Requirement n°50. If requested by the human actor, the SCOOP software shall calculate the fastest itinerary to reach a destination set by the human actor, and display it.

2.2.4 Run the mobile R-ITS-S function

Description: The “mobile R-ITS-S” function consists for the Vro-ITS-S in offering some of the functionalities of a real R-ITS-S.

The deliverable 2.4.2.1 details:

- The Vro-ITS-S receives DATEX II messages from the SCOOP platform, translates these messages into a DENM format, and sends them to the other C-ITS stations,
 - See chapter “5.2.1 DENM from the platform” in the 2.4.2.1.

Note: The SCOOP software shall consider this message as an external DENM, for example, it shall be displayed on the HMI.

- The Vro-ITS-S receives DENM messages from the C-ITS stations, translates these messages into a DATEX II format, and sends them to the SCOOP Platform,
 - See chapter “5.1.2 Process DENM received from the ITS stations” in the 2.4.2.1.
- The Vro-ITS-S translates their own DENM messages into a DATEX II format, and sends them to the SCOOP Platform,
 - See chapter “5.1.2 Process DENM received from the C-ITS stations” in the 2.4.2.1.
- The Vro-ITS-S receives snapshot from the SCOOP platform.
- The Vro-ITS-S responds a snapshot to a snapshot request from the SCOOP platform.

Requirement n°51. The mobile R-ITS-S function shall start following a human authentication which rights allow him to activate the mobile R-ITS-S.

Requirement n°52. In the user mode, the mobile R-ITS-S function shall be deactivated by default but can be activated.

In consequence of the requirements, if the mobile R-ITS-S function is activated in the user mode, then the function shall be launched as soon as the SCOOP software starts.

Requirement n°53. In the operator mode, the mobile R-ITS-S function shall be activated by default.

Requirement n°54. In the administrator mode, the mobile R-ITS-S function shall be deactivated and cannot be activated.

Requirement n°55. When the mobile R-ITS-S function starts, the SCOOP software shall send their position to the platform and, after, request a snapshot to the platform.

In this function, and for technical purpose, the Vro-ITS-S sends their position to the platform regularly.

Requirement n°56. If the mobile R-ITS-S function is activated, then the SCOOP software sends the position of the vehicle to the SCOOP platform, every period set in the “period” parameter.

The message used for the position is a DATEX II Message called “TE04” which correspond to the position of the vehicle.

The rules for DATEX II translation are in the deliverable 2.4.1.4. The specific rules for Vro-ITS-S are set here.

Requirement n°57. The SCOOP software shall allow an administrator to change the DATEX II messages attributes, remotely or locally.

| The 2.4.1.4 sets the following convention:

- PROJECT = SCOOP for the SCOOP project (Maybe CROADS or INTERCOR in the future.)
- ENTITY = Name in capitals of the organisation for the motorway companies, DExxx for the counties (=French “Départements”) where xxx is their INSEE number, DIRxxx, for DIRs, ...
- SOURCE = UBR12345 (or UBR_12345 or 12345UBR...) for an R-ITS-S, PF for a platform, SAGT or TGBretagne or name of the TCC ...

Requirement n°58. In all sent DATEX II messages, the NationalIdentifier shall comply with SCOOP_ENTITE_SOURCE

- For example: SCOOP_DIRIF_UEVGEC301

Requirement n°59. In the SOS message, the “measurementSiteTableReference” shall comply with SCOOP_ENTITE_UEVG

- For example: SCOOP_DIRIF_UEVG

Requirement n°60. In the SOS message, “measurementSiteReference” shall comply with SOURCE.

- For example: UEVGEC301

Requirement n°61. For the position message, “sourceIdentification” shall comply with SCOOP_ENTITE_SOURCE.

Requirement n°62. In the position message, a server administrator can change the sending period of the message.

| By default, the period is set to 30 seconds.

Requirement n°63. If the mobile R-ITS-S function is active, the SCOOP software shall send the data in a DATEX II v2.3 format to the SCOOP platform when Vro-ITS-S is sending a manual or automatic user or operator DENM.

This translation shall be done according to the Deliverable 2.4.1.4.

Some extracts mentioning some vigilance points are mentioned below:

- The “Linear” elements inside the “GroupOfLocation” in the DATEX message sent by the platform will contain enough coordinates points for the R-ITS-S to send complete “trace” and “eventHistory” attributes in the DENM;
- The units used are different (e.g. tenth of a micro-degree for DENM, decimal degree for DATEX II);
- Whereas the different geographic locations, which are part of a trace or an event history, are defined in DENM by difference with the previous location (“deltas”), DATEX II defines point locations by geodetic coordinates (latitude and longitude) separately.

2.2.5 Send an emergency call

Description:

When the actor encountered a problem, for example in case of feeling of faintness, he can push a SOS button, which sends alerting messages to an already registered number and to the SCOOP Platform.

This button can be a physical one, and considered by the Vro-ITS-S as a secondary equipment, or a logical one, as a button on the tablet.

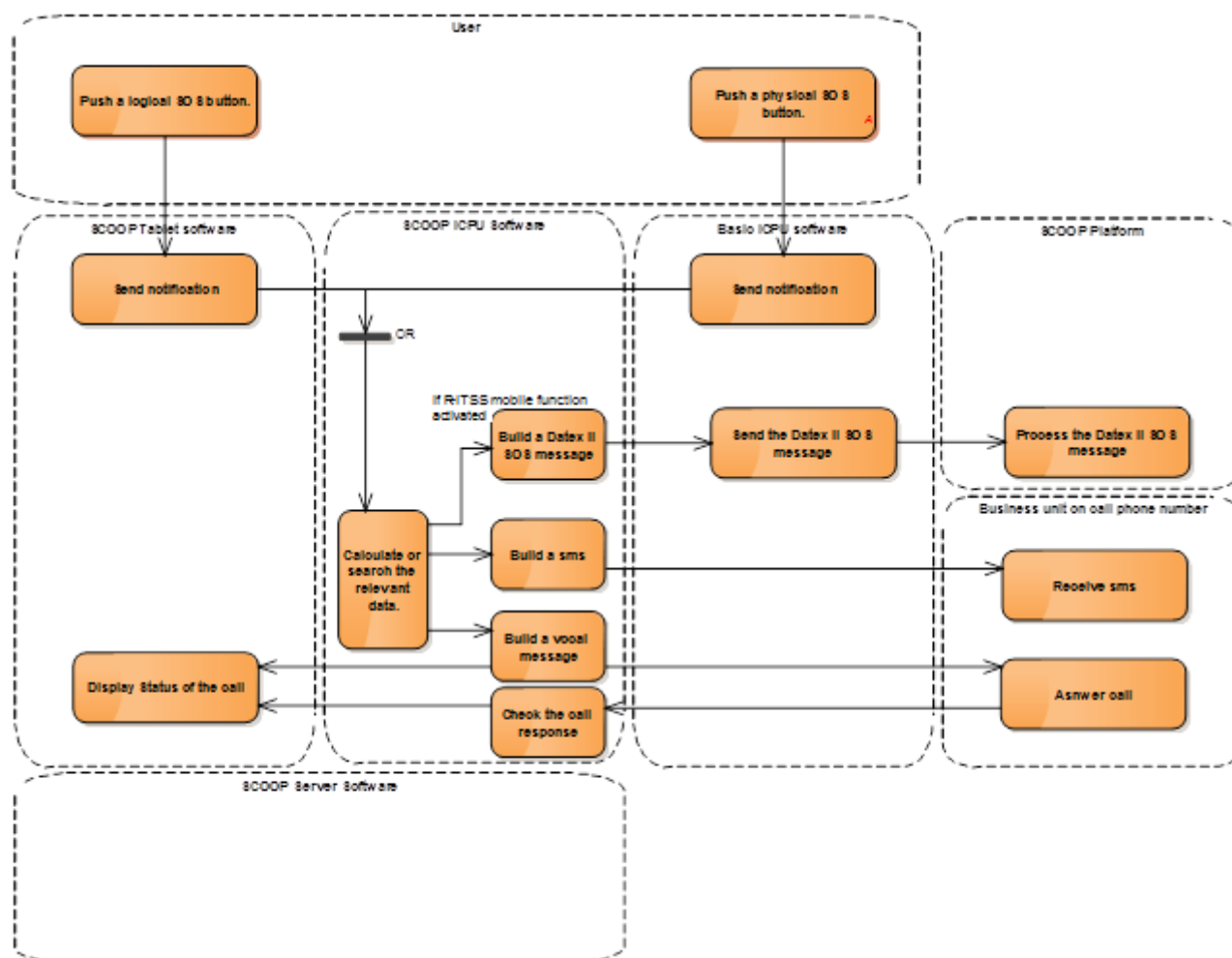


Figure 11 : Internal SCOOP software process for emergency call

Requirement n°64. Once a SOS button is triggered, the SCOOP software shall send a vocal SOS message to a number already registered.

Requirement n°65. Once a SOS button is triggered, the SCOOP software shall send a sms to a number already registered.

Requirement n°66. Once a SOS button is triggered and if the mobile R-ITS-S function is activated, the SCOOP software shall send an SOS message to the SCOOP Platform.

Requirement n°67. Once a SOS button is triggered, the SCOOP software shall display the status of his call.

2.3 Support requirements

2.3.1 Start-up of the Vro-ITS-S

At each start up, the SCOOP software shall

- display the home page,
- download the configuration from the SCOOP server software, including:
 - the base map,
 - the business routes,

- the activity, sub activity, use cases
- the rights database of all the persons of their business unit, from the scoop server,
- exchange with basic ICPU software the relevant settings (e.g. installation mode),
- if necessary, download update files.

Note: to optimise bandwidth, these downloads can only concerned the modified data.

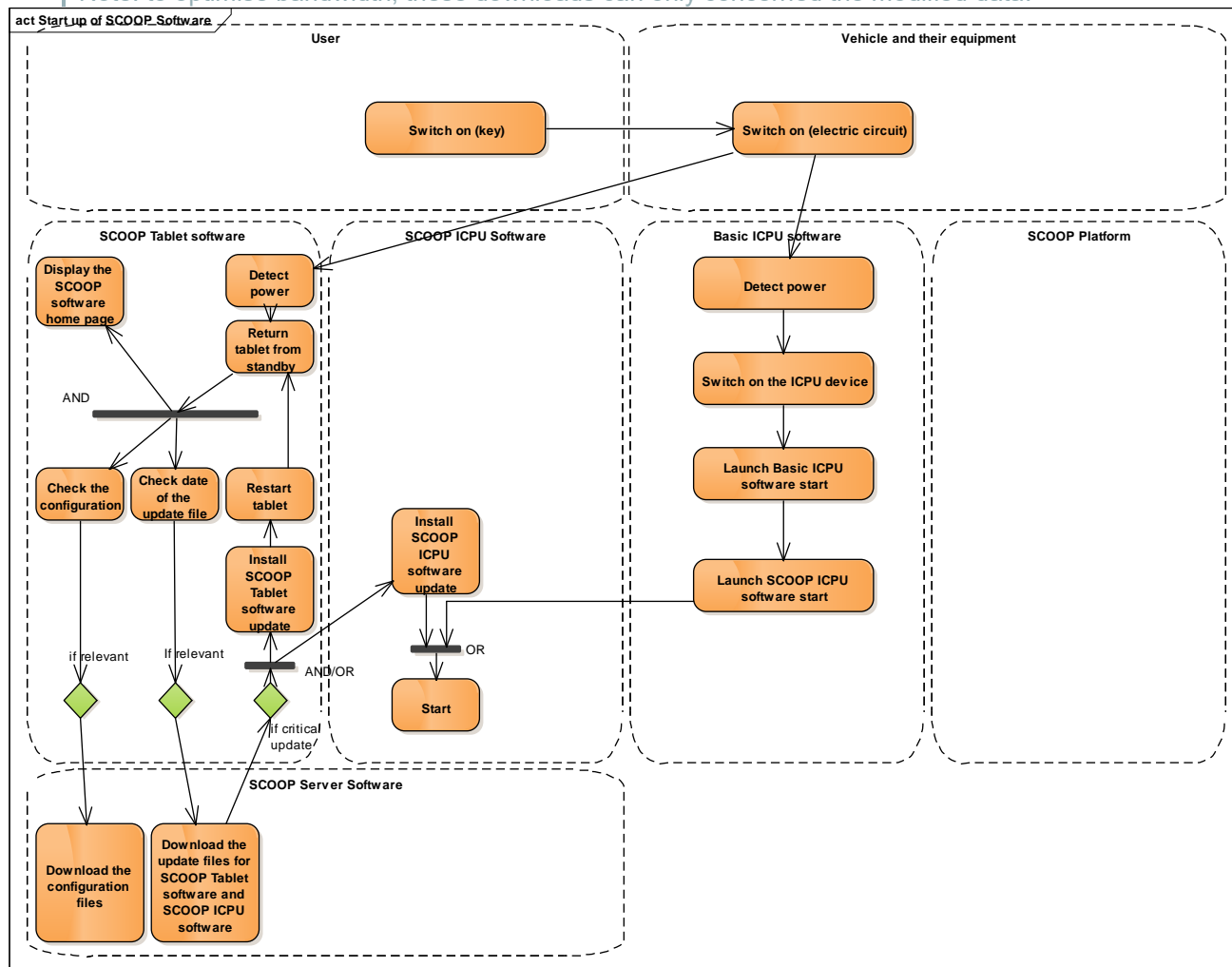


Figure 12 : Internal SCOOP software process for starting up

2.3.2 Switch off

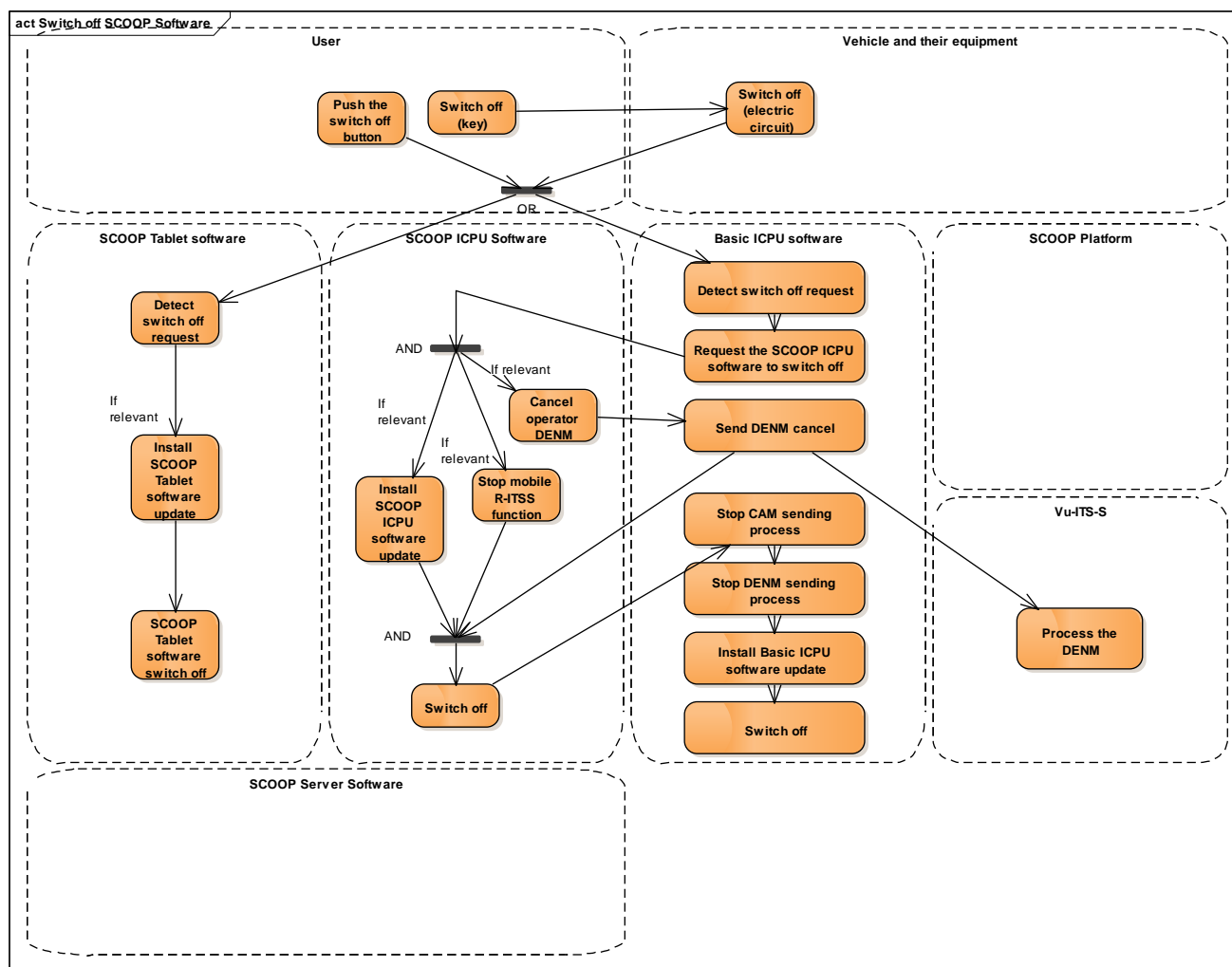


Figure 13 : Internal SCOOP software process for switching off

Requirement n°68. The SCOOP software shall offer the possibility to a person to switch off the Vro-ITS-S, for privacy purpose.

Requirement n°69. After the vehicle stops and the driver turns off the power, the SCOOP software shall switch off.

Requirement n°70. Before switching off, the SCOOP software can offer the possibility to confirm the switching off. Without confirmation within a configurable time, the SCOOP software shall switch off.

Requirement n°71. Before each Vro-ITS-S switch off, the SCOOP software shall ends all their process:

- cancel all their currently sent DENM,
- if necessary, install the downloaded update files, (See chapter 2.3.4)
- stop the basic ICPU software device and put the tablet device to sleep.

2.3.3 Authentication

Description:

The authentication is necessary for two types of users of the Vro-ITS-S:

- operator users,
- tablet administrator.

For some actions mentioned in this document, the person do not need to authenticate, for example send a manual DENM in a user mode.

Requirement n°72. An operator user shall only access the activities his rights allow him.

Example:

- A “patrolman”, which can run the entire user mode, which can have the mobile R-ITS-S function activated, and which can only run the activity “Patrol” in the operator mode.
- A “Roadwork user”, which can run the entire user mode, which can have the mobile R-ITS-S function activated, and which can only run the activities “Fix roadworks” and “mobile roadworks” in the operator mode.

Requirement n°73. A tablet administrator can administrate the SCOOP tablet locally.

Rights for the SCOOP server shall also be managed.

Requirement n°74. A “General server administrator” shall be able to modify all the data of the system in the server: all persons, vehicles, tablets, business, SCOOP software versions available...

Requirement n°75. A “business unit XX - Server administrator” shall be able to modify the data that concern their own business unit: such as vehicle, tablet, user...

The administrator configures the rights, persons and activities on the SCOOP server software.

At each start up, the Vro-ITS-S download the rights database of all the persons of their business unit, from the scoop server. The Vro-ITS-S shall not delete the downloaded database unless a new one is downloaded.

At each authentication needed, the SCOOP software verifies if the person is in the database, and if their rights allow him to do what he asks for.

Note: for storage consideration, an other mechanism can be provided.

- The Vro-ITS-S does not download the database at each start, but checks if the persons in their local database are still present in the SCOOP server software database, and updates their database.
- Each time a user request an authentication, the SCOOP tablet software checks with their local database :
 - if the person is already present and information matches (same password, authorized activities...), then the authentication succeed,
 - if the information does not match or if the person is not present in the local database, then the authentication fails.

Requirement n°76. The SCOOP software shall inform the user if the authentication succeeds or fails.

2.3.4 Update

Requirement n°77. Each part of the SCOOP software can be updated independently from one to another.

2.3.4.1 SCOOP tablet software and SCOOP ICPU software

Description:

The administrator drops update files for the SCOOP tablet software or for SCOOP ICPU software on the SCOOP server, into a specific directory.

At each start up, the SCOOP software checks the date of the last update for each part of the SCOOP software. If the SCOOP software version date is earlier than the date of the file on the SCOOP server software, then the SCOOP software downloads from the SCOOP server software the most recent file.

Requirement n°78. This process shall be hidden to the user, so he can use the SCOOP software while downloading.

Requirement n°79. At each switch off, if an update file on the Vro-ITS-S is more recent than the installed software, then the SCOOP software shall automatically be launched so the SCOOP software can be effective to the next start-up.

Requirement n°80. During the updating process, a message shall be displayed on the tablet to inform the user of the current updating.

2.3.4.2 SCOOP server software

Requirement n°81. An administrator shall be able to update locally the SCOOP server software without losing the configuration (rights, use cases...).

2.3.5 Monitoring Vro-ITS-S

The SCOOP software shall know the status of their internal components:

- Power source,
- GPS Antenna,
- ITS G5 Antenna,
- Tablet battery level.

The SCOOP software shall know the status of all the necessary connections, that is to say connections with:

- Basic ICPU software,
- SCOOP server software,
- Vro-ITS-S server,

- SCOOP platform,
- vehicle CAN bus,
- any secondary equipment connection.

The SCOOP software shall know the status of the technical connection between tablet and ICPU.

Requirement n°82. A human, depending on his rights and the running mode, can see some or all the status.

Requirement n°83. Before choosing a mode, the SCOOP software shall inform the human of the essential status:

- Basic ICPU software is operational (this indicator shall gather all the status needed, at least: the Wi-Fi status between devices, the basic ICPU software status, and the SCOOP ICPU software)
- Connection with SCOOP Platform is operational (this indicator shall gather all the status needed, at least: the Wi-Fi status between devices, the basic ICPU software status, the SCOOP ICPU software, the cellular connection with SCOOP Platform)

Requirement n°84. The SCOOP software shall alert if connection with ICPU fails.

Requirement n°85. In the administrator mode, the administrator can access all indicators and alerts.

Moreover, the Vro-ITS-S shall create different types of logs:

- T-logs, specified in the SCOOP project for technical evaluation purposes of the SCOOP system,
- U-logs, specified in the SCOOP project for behaviour evaluation purposes of the SCOOP system,
- Tablet logs, for errors analyses during the Vro-ITS-S normal use.

Requirement n°86. Regularly, the SCOOP software shall create tablet log, and sends them to the SCOOP server software.

Requirement n°87. When requested by basic ICPU software, the SCOOP software shall contribute to basic ICPU software logs (Tlogs, Ulogs, and others log).

2.3.6 Administrate the Vro-ITS-S

2.3.6.1 Configure the system from the SCOOP server software

Description

A configuration file for the SCOOP software, is recorded in a repository on the SCOOP server software, each Vro-ITS-S scans this server at their start-up and downloads the concerning file.

Note: different repositories or different filenames can be used for different configurations

See the SCOOP server software chapter **Erreur ! Source du renvoi introuvable.**, for the details on the configuration file.

2.3.6.2 Run the administrator mode on the Vro-ITS-S

Description:

A tablet administrator, with appropriate rights, shall be able to modify on the tablet, the tablet settings.

This mode is particularly useful for the first installation of the Vro-ITS-S.

In the administrator mode, an administrator can also have access to all the details about each status of the connections set in the chapter 2.3.5.

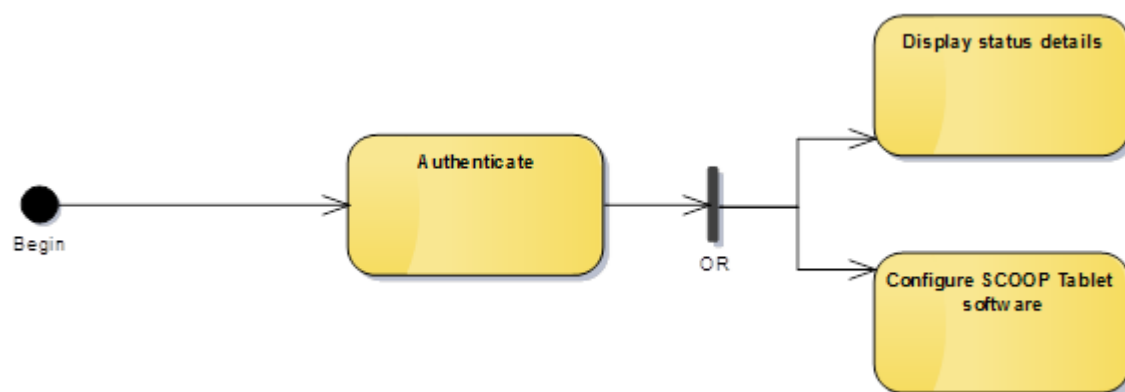


Figure 14 : Actions an administrator can do in the administrator mode

Requirement n°88. In the administrative mode, no DENM can be sent by the SCOOP software

Note: Basic ICPU software can send the automatic user DENM, and shall send the CAM.

2.3.7 Manage the cartography

Description:

The SCOOP software displays, a base map with a road reference frame.

The SCOOP Platform manages the road network.

Requirement n°89. The SCOOP software server shall download the road network from the SCOOP Platform and provide it to the Vro-ITS-S.

Requirement n°90. The Vro-ITS-S shall download from SCOOP software server, this road network, in order to be accessed offline.

This road network is not only the road operator one.

Requirement n°91. The SCOOP server software shall manage tiles for the base map.

Requirement n°92. The Vro-ITS-S shall download from the SCOOP server software, the relevant tiles.

| Note: For technical purposes, the tiles can be calculated and stored in another server.

Requirement n°93. The tiles shall be stored in the Vro-ITS-S in a relevant way, at least for the business unit considered.

For example, the tiles shall be stored for the entire road operator network, or for the road network of the user's business unit.

3 Important note

This document will be completed with more detail in a future version.