OCORA

Open CCS On-board Reference Architecture

TWS15: Prototyping SS-149 “Online Monitoring System”

Concept description

Document ID: OCORA-TWS15-050

Version: 1.00

Date: 23.06.2022

Management Summary

In this technical workstream, a prototype is implemented for the validation of SUBSET-149, which is currently being developed, not as part of the OCORA initiative, but with overlapping resources. The aim is to demonstrate the feasibility of the implementation and to incorporate findings into the formulation of the SUBSET.

Various partner RUs have been found for the prototype. No prototype has yet been realised, which is the reason this document only describes the concept for the technical implementation and the evaluation of the findings. It is expected that concrete results can be presented in the next OCORA release.

Revision history

Version	Change Description	Initial	Date of change
0.10	▪ Initial draft	FT	31.05.2022
1.00	▪ Final Version ready to release	RM	23.06.2022

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References

Reader's note: please be aware that the numbers in square brackets, e.g. [1], as per the list of referenced documents below, is used throughout this document to indicate the references to external documents. Wherever a reference to a TSI-CCS SUBSET is used, the SUBSET is referenced directly (e.g. SUBSET-026). OCORA always reference to the latest available official version of the SUBSET, unless indicated differently.

[1] OCORA-BWS01-010 – Release Notes

[2] OCORA-BWS01-040 – Feedback Form

[3] NNTR CH-TSI CSS-026 "Online monitoring of trackside equipment on vehicles", June 2021

1 Introduction

1.1 Purpose of the document

The purpose of this document is to describe the prototype for the validation of ERTMS SUBSET-149, which is currently developed under the lead of UNISIG.

This document is addressed to experts in the CCS domain and to any other person, interested in the OCORA concepts for on-board CCS. The reader is invited to provide feedback to the OCORA collaboration and can, therefore, engage in shaping OCORA. Feedback to this document and to any other OCORA documentation can be given by using the feedback form [2].

If you are a railway undertaking, you may find useful information to compile tenders for OCORA compliant CCS building blocks, for tendering complete on-board CCS system, or also for on-board CCS replacements for functional upgrades or for life-cycle reasons.

If you are an organization interested in developing on-board CCS building blocks according to the OCORA standard, information provided in this document can be used as input for your development.

1.2 Applicability of the document

The document is currently considered informative but may become a standard at a later stage for OCORA compliant on-board CCS solutions. Subsequent releases of this document will be developed based on a modular and iterative approach, evolving within the progress of the OCORA collaboration.

1.3 Context of the document

This document is published as part of an OCORA Release, together with the documents listed in the release notes [1]. This document describes the concept and the methodology to gain the expected experience within the technical workstream 15 of the OCORA initiative. As part of the validation of SUBSET-149, a proof of concept as defined by the online monitoring system document is reproduced. Experiences and findings from the prototype will be incorporated into the further development of SUBSET-149.

2 Objective of TWS15: Prototyping SS-149 Online Monitoring System

Following the definition of the workstream, it shall prototype a SS-149 implementation and show relevant functions from an IM and RUs perspective.

Objectives are:

1. Verification, if the draft version of SS-149 is capable to serve IMs for trackside malfunction identification (e.g. recognise Balise failures).
2. Verification, if the draft version of SS-149 draft is capable to serve RUs for online monitoring of CCS on-board, at the current stage more specifically for the ETCS on-board.
3. Provide relevant input for SS-149 improvements.
4. Provide input for implementation variants regarding the amount of data to be transferred and stored, resulting operational costs and responsibility split between IM and RU.

In the first phase of the project, the prototype is being implemented to generate and receive on the server side the necessary data for evaluation. The requirements and procedure are described in chapter 3. In the second phase it is planned to have an exchange based on the evaluated data in order to assess the achievement of the objectives 1 to 4, this is described in chapter 0 of this document.

Within the workstream, the experience of RU/vehicle keepers that already operate their own OMS, which includes the ETCS system, is to be used and integrated.

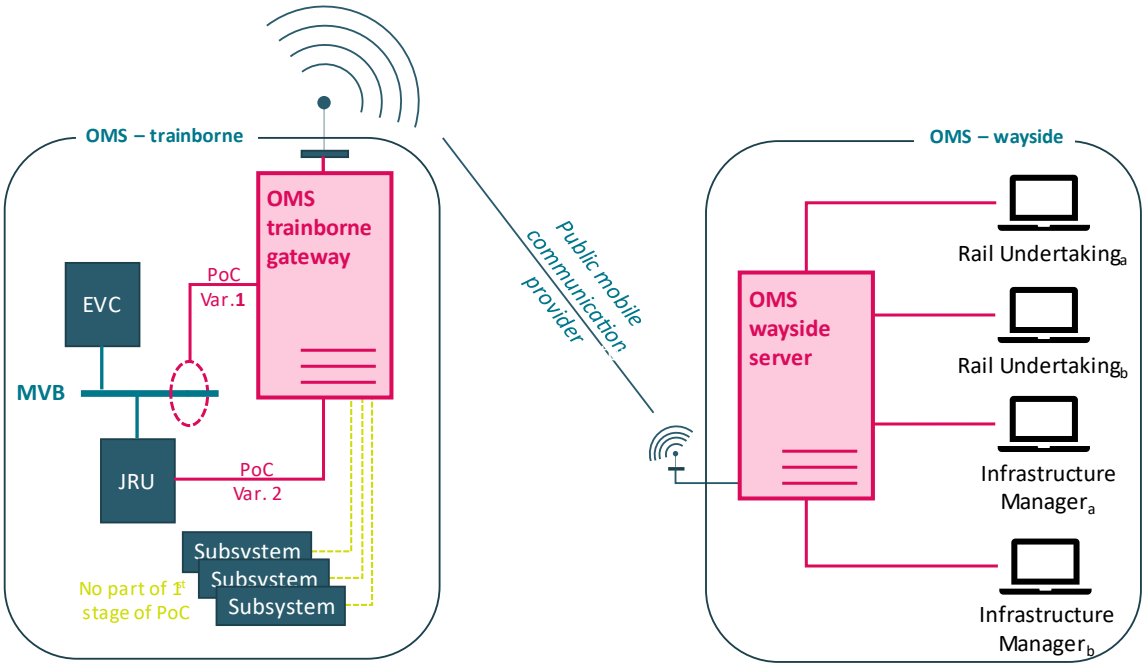

Figure 1 System architecture (trainborne side dependant on integration of JRU & EVC inside the vehicle), whereby the allocation of data to different operators (IM & RU) will (initially) be simplified in the prototype.

3 Data acquisition

Within the scope of the workstream, it is planned to equip two vehicles with the trainborne part of the OMS. For this purpose, clarifications are underway with RUs/vehicle keepers participating in the OCORA initiative; in addition, discussions are underway with vehicle keepers from Switzerland.

Preference should be given to vehicle fleets that already have a functioning OMS for the operation in

Switzerland (according to NNTR CH-TSI CCS-026 [3]) and ETCS OBU with BL3. The results of the data evaluation from the OMS according to SS-149 can be compared with information of the existing results from the OMS of SBB Infrastructure.

3.1 Data acquisition onboard and transmission

The EVC data is read via a project specific interface (that needs to be defined during the proof of concept), compiled by an IOT gateway and sent to the server. For the interface, depending on the technical design and system architecture on-board, different variants are possible, which may be different depending on the provided data and thus in terms of flexibility when expanding the SS-149 or the prototype. As far as possible, hardware already integrated in the vehicle, in particular data interfaces and IOT gateways, should be used in order to reduce risks.

The following variants seem feasible:

- Positioning of the interface between EVC and JRU, thus recording the data connection (Profibus, MVB, etc. depending on integration of JRU & EVC inside the vehicle)
- Positioning of the interface directly at the JRU or EVC, thus reading out the JRU data

The most suitable interface is to be selected based on the boundary conditions onboard.

In order to be able to carry out the prototype within the cost and time schedules, sufficient documentation is required of the communication between EVC & JRU, or the available interfaces documentation provided by the subsystem suppliers, or the system integrator must be available.

Regarding integrating of new components and the use of interfaces to read out data on-board, the following restrictions must be observed:

- The requirements for the components to be integrated and the integration itself must be specified or at least be approved by the ECM & vehicle keeper and assessed according to EU regulation or national processes.
- It needs to be ensured
    - that the non-reactivity of the OMS and the reading out process can be proven by the trainborne OMS supplier.
    - that the selection of gateways and other components is limited to components approved for the railway sector (EMC, fire protection, vibration, etc.) and that the integration specifications (especially antenna) are complied with.

3.2 Ensuring data reception on the server, storage, and display

Both equipped vehicles should transfer the monitoring data to the same wayside OMS server. On the server side, the data is decoded, if necessary, and listed in tabular form according to the message types. It must be possible to filter the message types and all parameters of the messages. The timestamps of message creation, sending and receiving must also be recorded. Ideally, it is also possible to create customised rules that enable the automatic data evaluation generating alert indications.

The storage of all data during the project period is necessary to estimate the expected data volume. The evaluation is made over the whole data volume and the vehicle kilometres operated in ETCS operation.

4 Interpretation of the transmitted data and further development of the SS-149

After generating sufficient data amount for evaluation, the plausibility and usability of the received data is to be discussed in separate workshops with IM and RUs.

To achieve objective 1, a comparison with already available information (SBB Infrastructure OMS) should show that the main goal of an OMS according to SS-149 is achieved.

To achieve objective 2, it should be assessed with the participation of RUs to what extent the availability of OMS data according to SS-149 is useful regarding previously undetected faults or generally fault repairs. For this purpose, the internally available fault reports related to the ETCS systems should be compared with the evaluated SS-149 OMS data.

To achieve objectives 3 and 4, possible adaptations for the SS-149 are to be worked out in workshops with IM and RUs. Agreed adaptations, as far as feasible within the provided setup, could also be implemented right away for validation. A focus in the discussion here is the question of data ownership and the organisation of data access rights.

5 Status and further procedure

Currently, the technical solutions for data acquisition implemented on the vehicles for different vehicle types is still being worked out. Only afterwards a decision can be made about the implementation of the prototype, this from both involved parties: the one that is willing to participate in the PoC with its vehicles and the people from the OCORA workstream.

The aim is to implement the vehicle on-board solution of the OMS during summer 2022 and to publish the findings in the OCORA Release R3 at the end of the year.