OCORA

Open CCS On-board Reference Architecture

Alliances

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Revision history

Version	Change Description	Initial	Date of change
0.01	First draft	JBS	26-10-2020
0.02	▪ Final draft adapted in final review	JBS	27-11-2020
1.00	Official version for OCORA Gamma Release	RM	04-12-2020
1.10	▪ Preparation for Delta Release	RM	27-05-2021
1.20	▪ Minor tuning after review with experts	JBS	11-06-2021
	▪		
2.00	Official version for OCORA Delta Release	RM	30-06-2021
	▪		
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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-BWS01-020 – Glossary

[3] OCORA-BWS01-030 – Question and Answers

[4] OCORA-BWS01-040 – Feedback Form

[5] OCORA-BWS03-010 – Introduction to OCORA

[6] OCORA-BWS04-010 – Problem Statements

[7] OCORA-TWS01-030 – System Architecture

1 Introduction

1.1 Purpose of the document

This document focuses on OCORA organisational and technical interfaces with other sector initiatives.

OCORA liaisons and alliances with other sector organisations are necessary to find common understanding and complementarity at expert, corporate and institutional level. OCORA will indeed become an effective open architecture reference it the collaboration support alignment between sector initatives.

This document aims to provide the reader:

- An overview of OCORA collaboration with other entities (e.g. sector project or associations).
- Details on why those collaborations contribute to OCORA value creation, what are the collaboration elements and how they allow to find common understanding and complementarity on a sector scale.
- Perspectives on how the OCORA collaborative approach is intended to be scaled.

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 [4].

1.2 Applicability of the document

The document is informative. 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 the OCORA Delta release, together with the documents listed in the release notes [1]. Before reading this document, it is recommended to read the Release Notes [1]. If you are interested in the context and the motivation that drives OCORA we recommend to read the Introduction to OCORA [5], and the Problem Statements [6]. The reader should also be aware of the Glossary [2] and the Question and Answers [3].

2 Overview of OCORA collaborations with other groups

OCORA covers only the train borne part of the overall control-command and signalling infrastructure needed for safe and automatic railway operation (Automatic Train Protection and Automatic Train Operation). A good integration in the overall CCS environment is therefore essential and requests a good collaboration and liaison with related activities, in particular with the following:

- RCA (Reference CCS Architecture), EUG (ERMTS Users Group) and EULYNX
- Localization: EUG working group "Localization"
- FRMCS: UIC working group “Telecom On-Board Architecture”
- ERA: Topical Working Group train architecture through CER (Community of European Railway) CCS SG
- S2R (Shift2Rail): Linx4Rail

Prior to this OCORA Gamma Release, alignment was done with RCA, FRMCS, and EUG. As a result, it can be said that a common view is shared, and the identified Problem Statements are aligned. Collaborative meetings and joint alignment groups are in progress to reach a pragmatic and efficient cooperation as it has started in Shift2Rail through the LinX4Rail project.

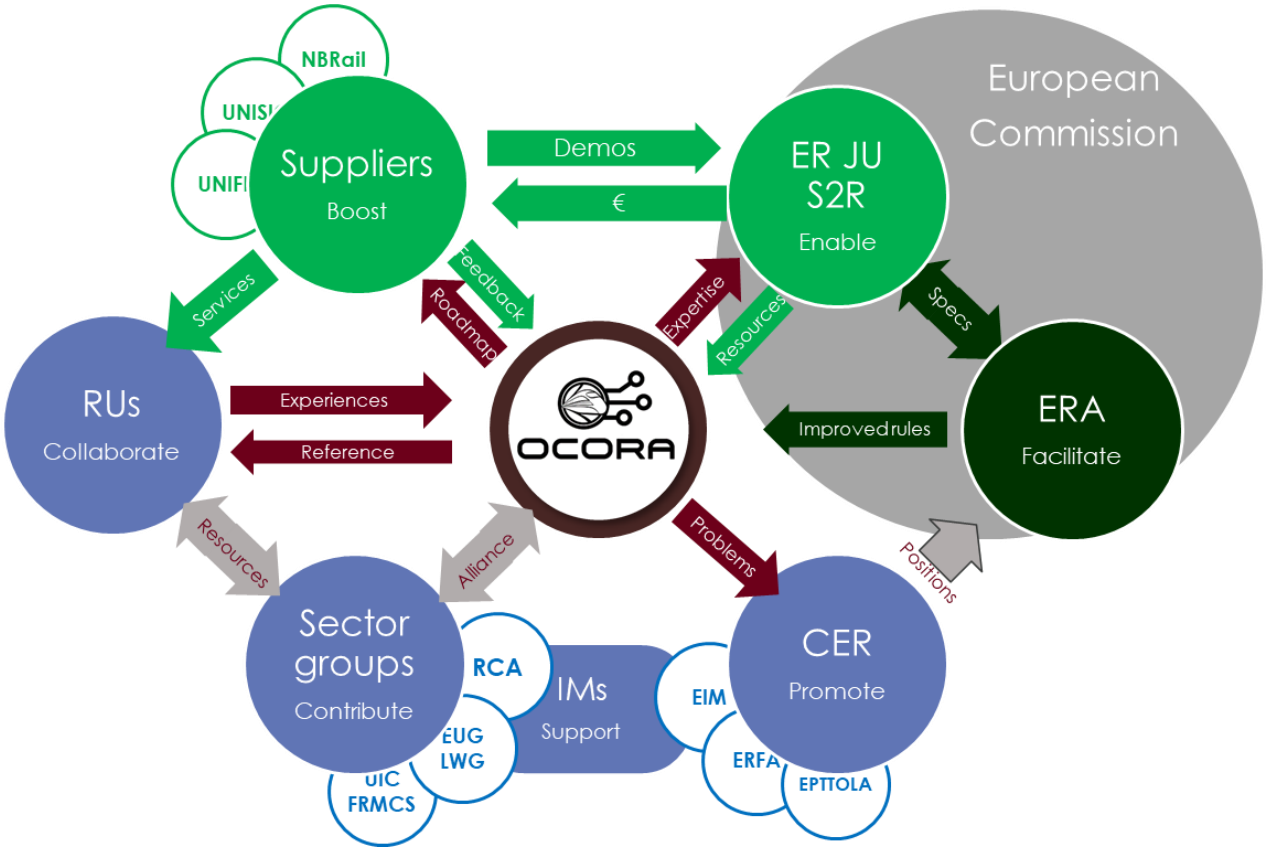

Figure 1 - high level OCORA environment

OCORA partners target complementarity between sector activities. OCORA can gain support and provide support through collaboration with other sector groups:

- Sector groups driven by operators can contribute to the definition of OCORA external interfaces, in particular for components of mutual interest
- CER as representative body is a forum to position OCORA production into the regulatory environment
- ERA will support the market uptake of OCORA compliant solutions with optimised acceptance based on better rules
- S2R and its successor are the natural place for industry dialogue and partnering activities (e.g. models, PoC, prototype, MVP…) and harmonization of the architectural approaches (Linx4Rail)
- Proactive contributions from suppliers will boost OOCRA results. Manufacturers experience is essential for achieving informed architectural decisions.

3 Description of OCORA collaborations with other groups

3.1 Regulatory and institutional domain interest groups

3.1.1 Community of European Railways (CER)

OCORA input for the TSI revision 2022 is channelled through CER. OCORA Core Team members act on behalf of CER as speakers in CER working groups and groups where user input is infused through CER, such as the ERA Topical Working Groups. CER is of paramount importance to OCORA to provide a voice for the OCORA collaboration in the European theatre and to inform and involve colleague railways in the progress and activities of OCORA. OCORA intends to support and reinforce wherever necessary the role of CER as the voice of European railways and will continue to provide resources to enable CER to act in an effective way in the European arena.

3.1.2 ERMTS Users Group (EUG)

EUG is the technical body gathering ERTMS users and leading specialised expert working group on TSI specification. OCORA input for the TSI revision 2022 is coordinated with EUG in order not to duplicate activities (e.g. localisation) while keeping consistency on a CCS system scale (e.g. enable alignment with RCA). EUG RU platform is an opportunity to inform and involve colleague railways in the progress and activities of OCORA.

OCORA is liaising with EUG-EULYNX collaboration for RCA in order to achieve convergent and synergetic approaches to system architecture, functional modelling and technologies for CCS. Liaison organised with RCA initiative aims to:

- Maintain the system coherence between the on-board and trackside subsystems
- Exchange strategic, communication and planning
- Develop identified joint topics

EUG Localization working group (LWG) is a group of experts. The mission of LWG is to settle common railways requirements on the expected behaviour of a localisation system in an ERTMS, RCA and OCORA environment to tackle current criticalities and possible future needs and to explore innovative solutions to fulfil such requirements in a cost effective way. Interoperability issues will be talked with priority because candidate to be part of the TSI CCS. Architectural issues will be anyway in the scope of the working group.

3.1.3 Union internationale des chemins de fer (UIC)

UIC is a technical body for the railway operating community. In the CCS domain, their contribution to design future radio communication systems is essential for ERTMS enhancement. OCORA is interfaced with the activities of the group of experts involved in the definition of telecom onboard architecture. No formal liaison is today defined for synchronising the groups but the coordination is managed on an expert level, thus enabling consistence, synergies and complementarity between the two initiatives.

OCORA is also collaborating on the topic cyber security with ER-ISAC. The ER-ISAC is a non-profit organization, hosted/sponsored by UIC, that provides a central resource for gathering information on cyber threats as well as allowing a two-way sharing of information between the private and the public sector about root causes, incidents and threats, as well as sharing experience, knowledge and analysis. The liaison between OCORA and ER-ISAC is to share information, analyse new threat and find common awareness and contributions on cybersecurity domain.

3.2 Industry interest groups

Various industry actor can bring valuable experience benefitting to OCORA. Rolling stock as well as CCS OBU manufacturers but also NoBos and Independent labs can bring valuable contributions on OCORA definition and demonstration.

OCORA is the opportunity to define a pragmatic path for new and promising market. With its open architecture and iterative releases, OCORA offers the possibility for a constructive dialogue with the industry on the concrete solutions, that are needed to meet OCORA objectives and create wealth for the industry.

3.2.1 Union Industry of Signalling (UNISIG)

As holder of ERTMS specification subset, UNISIG collaboration is an asset to progress fast on a sectoral move on the CCS OBU architecture. UNISIG organisation (membership, working groups) and access to knowledge (return of experience on solutions, market forecast) would facilitate OCORA development. Feedbacks and contributions from UNISIG are therefore of key interest for OCORA.

Since the OCORA Gamma release providing a description on how a CCS OBU architecture should be, steps are taken for building a common vision with UNISIG on how OCORA will help building relevant material tender templates for procuring CCS onboard configurations and implementing them in existing or new build trains.

3.2.2 Union des Industries Ferroviaires Européenne (UNIFE)

As the representative body for European supply industry, UNIFE is the association that can facilitate consensus building within EU industry, help disseminating and promote OCORA results as well as support through constructive input. Technology provider, rolling stock suppliers, CCS component manufacturers, many UNIFE members would have benefit to follow and contribute to OCORA.

The OCORA delta release proposes design objectives and requirements and exploratory elements on how new industrial solutions for a digital CCS fitted in existing and future trains and well integrated with infrastructure element. While OCORA will continue to acknowledge UNIFE position, close collaborations with the industry is now being set up (e.g. ongoing work in LinX4Rail) to get input for and dialogue for an optimised economic model and collect proposals to refine the architecture definition and intermediate solutions supporting migration.

3.3 Sector development organizations

Today, Shift2Rail is the central development organizations for the European railway industry. Industry and operators have a key opportunity for setting up partnering activities for developing and demonstrating new solutions. Moreover, with the definition of Linx4Rail project, there is now a place where OCORA results can be acknowledged in order to create synergies and to identify new sectoral collaborative activities.

The setting up of the next Europe's Rail Joint undertaking is seen by OCORA as a key opportunity to scale and boost this industry dialogue, as part of the system pillar, as well as develop collaboration and co-finance the demonstration of solutions as part of the innovation pillar.

3.3.1 S2R - LinX4Rail - Architecture

The activities started in Shift2Rail for defining an architecture for the railway system is fed by OCORA. First development allowed to have an architecture release consistent with OCORA design principles and complementary to OCORA descriptions. Close collaboration is to continue over the long run, in order to ensure that fleet owner needs and requirements are well captured and fairly understood by the European supply industry.

3.3.2 S2R – LinX4Rail – convergence and complementarity between projects (e.g. Connecta)

Through Shift2Rail LinX4Rail project, an acknowledgement mechanism is defined to be able to capture the outcome of sector initiative for enhancing and reshaping ongoing Shift2Rail project. In this frame, discussions have started between OCORA and IP1-Connecta project in order to align perspectives and technical solutions for the long term convergence between CCS and TCMS bus technologies. This collaboration allows to find better synergies between the initiatives and converging approaches for standardisation and also future TSI revision.

A more systematic dialogue between OCORA and other S2R project is being progressively organised and extended to other topic.

3.3.3 Towards the new Europe's Rail Joint Undertaking

While S2R has already facilitated first sector discussions on OCORA proposal (e.g. through LinX4Rail project) and start to provide support to OCORA, the new Europe's Rail Joint Undertaking is the opportunity to intensify and accelerate industry resolutions of OCORA problem statement and proposals.

The system pillar is foreseen as a mechanism that will allow sector alignment for the market uptake and migration towards new modular CCS onboard solutions. To meet this purpose, it should help OCORA to define, demonstrate and disseminate specification and engineering tools and methodology that will facilitate deployment and industrialisation. An important enabler for the adoption of those specifications, methods and tools will be to find common understanding on new business cases involving modularity. A value added would be to accelerate standardisation and improve regulations.

The innovation pillar is foreseen as a R&I delivery mechanism that shall run in parallel to the System pillar in order to allow the stepwise development and demonstrations of solutions up to TRL9. The innovation pillar can be a workbench for preparing OCORA minimum viable product but also to increase technical and deployment readiness of OCORA. We expect innovation and system pillar to cross fertilize through appropriate synchronization and integration mechanism allowing to enable executive decisions and rapid sector effectiveness. OCORA is ready to support Europe's rail JU laying the foundation on how innovation boost Europe's rail sector productivity.

In 2021, OCORA technical proposals should be refined to be used as reference for future R&I activities in the ERJU. OCORA will have also to refine its existing liaisons and build new alliances to take into account this changing sector environment.

4 State of play OCORA liaisons

Sector interest group	Collaboration area	Liaison in place
CCS SG (CER)	Preparing TSI 2022 revision Setting sector governance for CCS architecture	OCORA experts sharing achievements for endorsement
TWG Train Modular Architecture (ERA)	Sounding TSI-CCS 2020 On-board preparation	OCORA experts present as CER speakers
RCA (EUG+EULYNX)	Architecture definition and functional decomposition System capabilities and performance requirements (including interoperability) Computing platform Modular safety	Setting up of a coordination group Joint working groups have started
FRMCS (UIC)	On-board telecommunication architecture Safe Communication capabilities Migration from GSM-R	Coordination done through experts involved in both initiatives.
Localisation WG (EUG)	Mission requirement for onboard localisation Interface for localisation peripherals	Coordination done through experts involved in both initiatives.
LinX4Rail (Shift2Rail)	TCMS interface Common sector business objectives Rail system architecture definition and governance	Alignment and collaboration has started
Europe's Rail JU	Preparation of System pillar process for ensuring the sector alignment on CCS onboard architecture traced into Europe's rail architecture Identification of collaboration area for agile prototyping and demonstration of OCORA building blocks up to TRL9	Coordination done through experts involved in sector associations and the preparation of multiannual work programme of the JU

Table 1 State of play OCORA liaisons