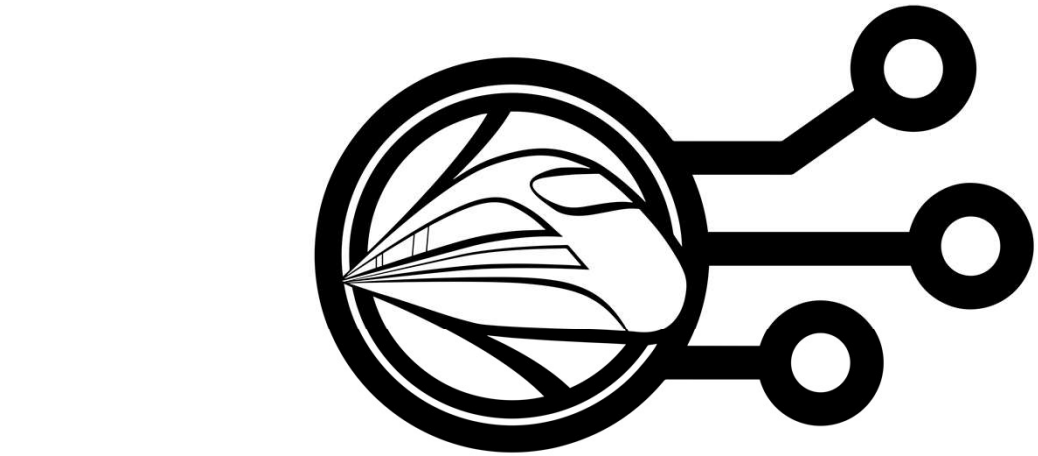


OCORA

Beta – Program Slide Deck

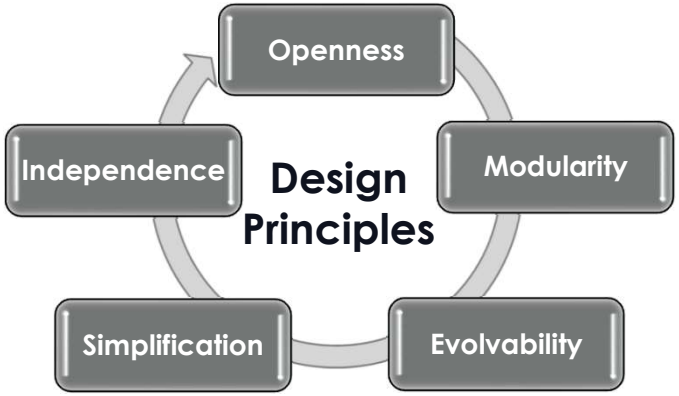
OCORA-20-001-Beta / v1.00 / 29.06.2020 - final

OCORA Beta Release – one pager

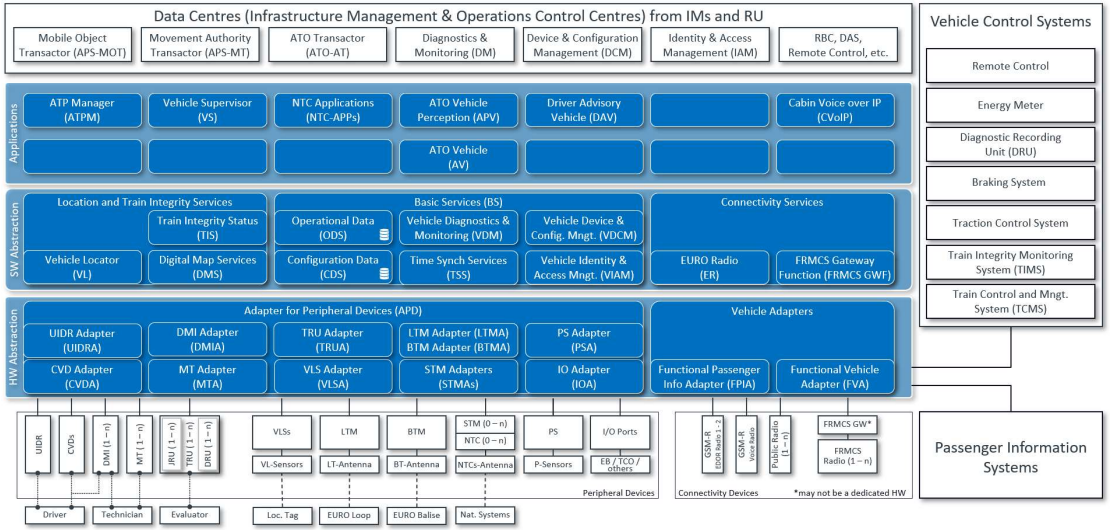
https://github.com/OCORA-Public/Publication

Founding Members

- **OCORA**, the "**Open CCS On-board Reference Architecture**" initiative, whose signatory founding Members are NS, SNCF, DB, SBB and ÖBB, has reached an important milestone with the **Beta Release** of the specifications of the OCORA architecture.
- **OCORA aims** to **reduce life-cycle costs** and **facilitate** the introduction of **innovation** and **digital technologies** beyond the current proprietary interfaces, by establishing a **modular**, **upgradeable**, **reliable** and **secure CCS on-board architecture**.



The OCORA Beta Release is a first comprehensive system description for CCS On-board that will be enhanced with your feedback.



- **OCORA deliverables** are published under the **European Union Public License** (EUPL) and are consequently available for all stakeholders.
- **OCORA plans** a series of **prototypes**, **technical demonstrators** and **tests** in the coming years. The **Gamma Release** is planned for **end of 2020** and **Release 1.0 end of 2021**.

Beta – Program Slide Deck

Agenda

- Introduction into OCORA
- Timeline
- Alliances
- Beta Release Overview
- Gamma Release Overview
- Industry Dialogue

Introduction

OCORA-20-001-Beta / v1.00 / 29.06.2020 - final

Introduction

Topic Overview

- Who
- Why – Goals – Motivation – Objectives - Benefits
- Key Principles
- What (Scope)
- Problem Statements
- Reference to Technical Slide Deck, Program Poster & Technical Poster

Introduction

Who is OCORA

Open CCS On-board Reference Architecture

- **5 founding members**

- **March 2019** : Memorandum of Understanding.
- **October 2019** : OCORA Governance in place with a Steering Committee and open to railway companies willing to contribute to the collaboration.
- OCORA is a **collaborative platform gathering engineering resources** working on **ERTMS and beyond**

OCORA IS…	OCORA IS NOT…
Open Cooperation	Not a Representative Body/Organisation
A set of public specifications	Not a product
For the On-board CCS	Not for Trackside CCS

Introduction

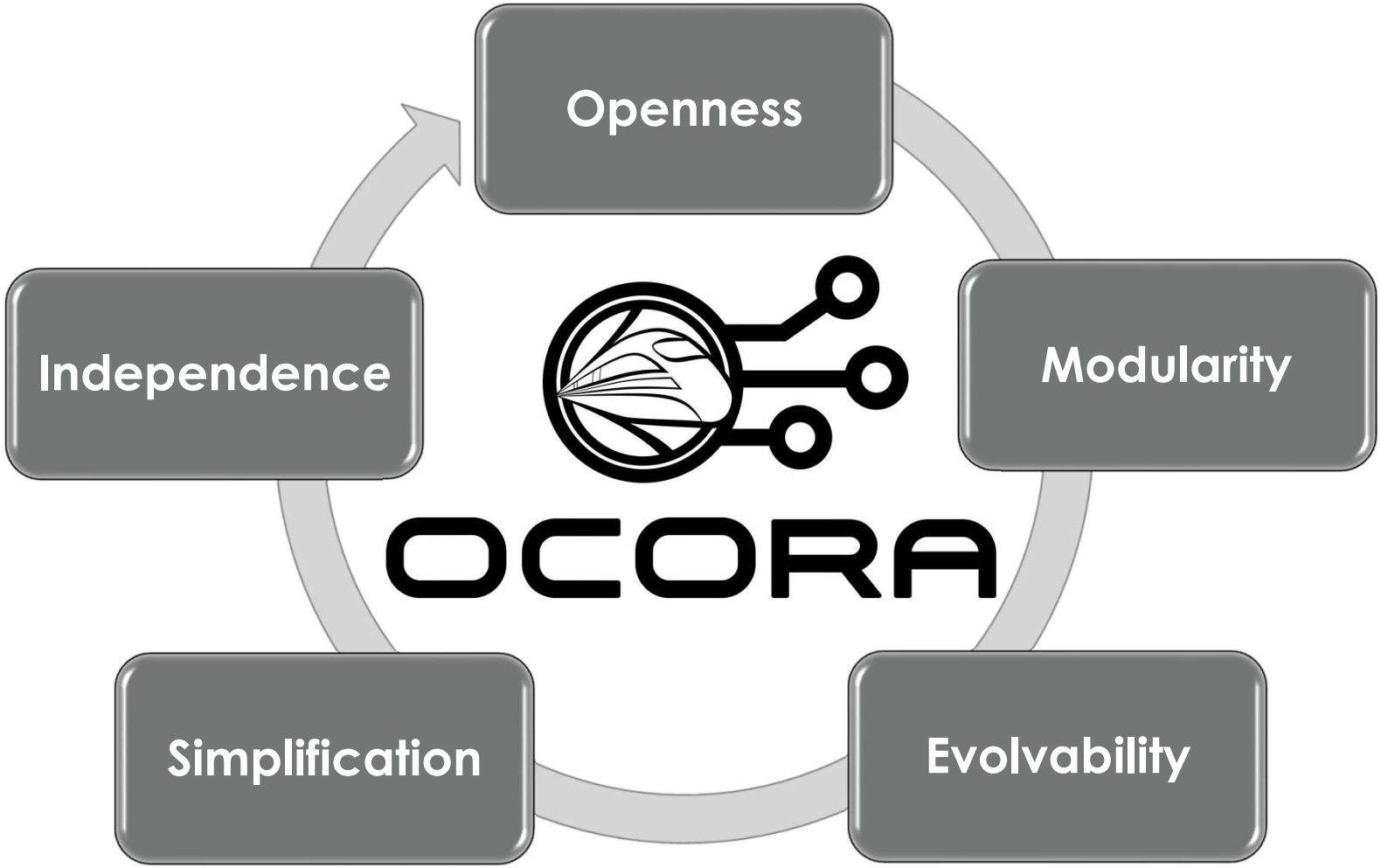
Why – Goals – Motivation – Objectives - Benefits

Triggers	Supported goals	Scope	Harmonized architecture	Target
– **Inter-modal competition** – **Learnings from ETCS** – **Replacement needs** – **Fast migration** – **Innovation / digital trans-formation**	– **Cost↘** – **Reliability ↗** – **Capacity ↗** – **Safety ↗**	**IN**: on-board Control and Command Systems **OUT**: Track-Side CCS, Train Control Management System, Future Mobile Radio	– **Reference requirements → verifiable products** – **Model based standardised interfaces and functions** – **Economic modeling**	– **Openness** – **Modularity** – **Evolvability** – **Simplification** – **Independence** **Migration** – **Upgradable and exchangeable components** – **Compatibility framework**

Foundation — **ETCS + Pervasive Mobile Communication for Railway**

Introduction

Key Principles



Introduction

What (Scope)

OCORA targets a comprehensive and coherent set of specification for a modular CCS On-board environment published through consecutive OCORA releases.

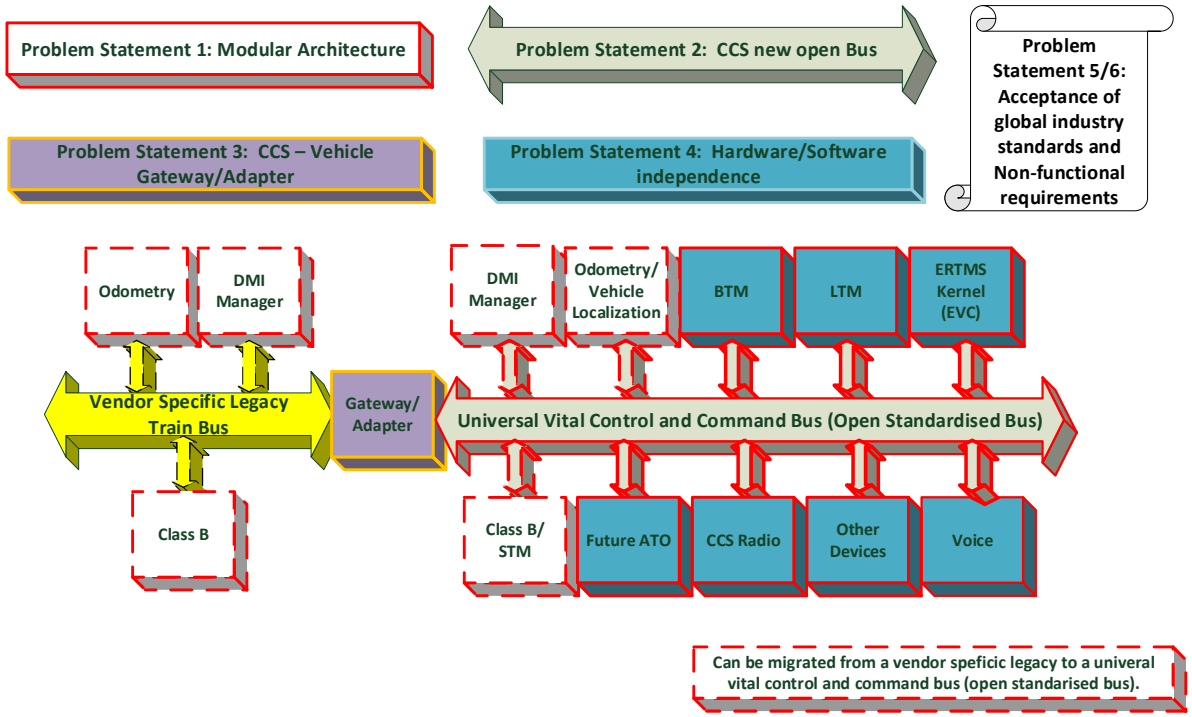
Anticipated results from the OCORA collaboration as defined in the OCORA MoU are:

- A reference architecture guiding the development of (a specification for) a consistent and modular On-board CCS system.
- An economic evaluation supporting the OCORA architecture and approach.
- Robust interface specifications allowing for smooth evolution and migration.
- Improvements of the regulatory framework as a enabler for technology and migration uptake.
- So called “demonstrators”, “real life application” of products to showcase usability and applicability in test environments.
- A ‘Minimum Viable Product’ or MVP, the condensed version providing the core functionality of the OCORA platform for both validation and verification as well as authorization purposes.
- Publications targeting the dissemination of OCORA results to the benefit of stakeholders in the European railway community.

Introduction

Problem Statements

- 6 majors problem fields are identified with CCS On-board and their related regulatory frame.
- Resolving these problem statements will need a sectoral dialogue.



Introduction

OCORA Beta Release Communication Material

- OCORA-20-001-Beta Program Slide Deck (this document)
  - Official slide set for presenting program aspects (e.g. problem statements, road map, etc.)
- OCORA-20-002-Beta Technical Slide Deck
  - Official slide set for presenting technical aspects (e.g. architecture, UVCC Bus Evaluation, etc.)
- OCORA-20-003-Beta Program Posters
  - Official posters for presenting program aspects (e.g. problem statements, road map, etc.)
- OCORA-20-004-Beta Technical Posters
  - Official posters for presenting technical aspects (e.g. architecture, UVCC Bus Evaluation, etc.)

Timeline

OCORA-20-001-Beta / v1.00 / 29.06.2020 - final

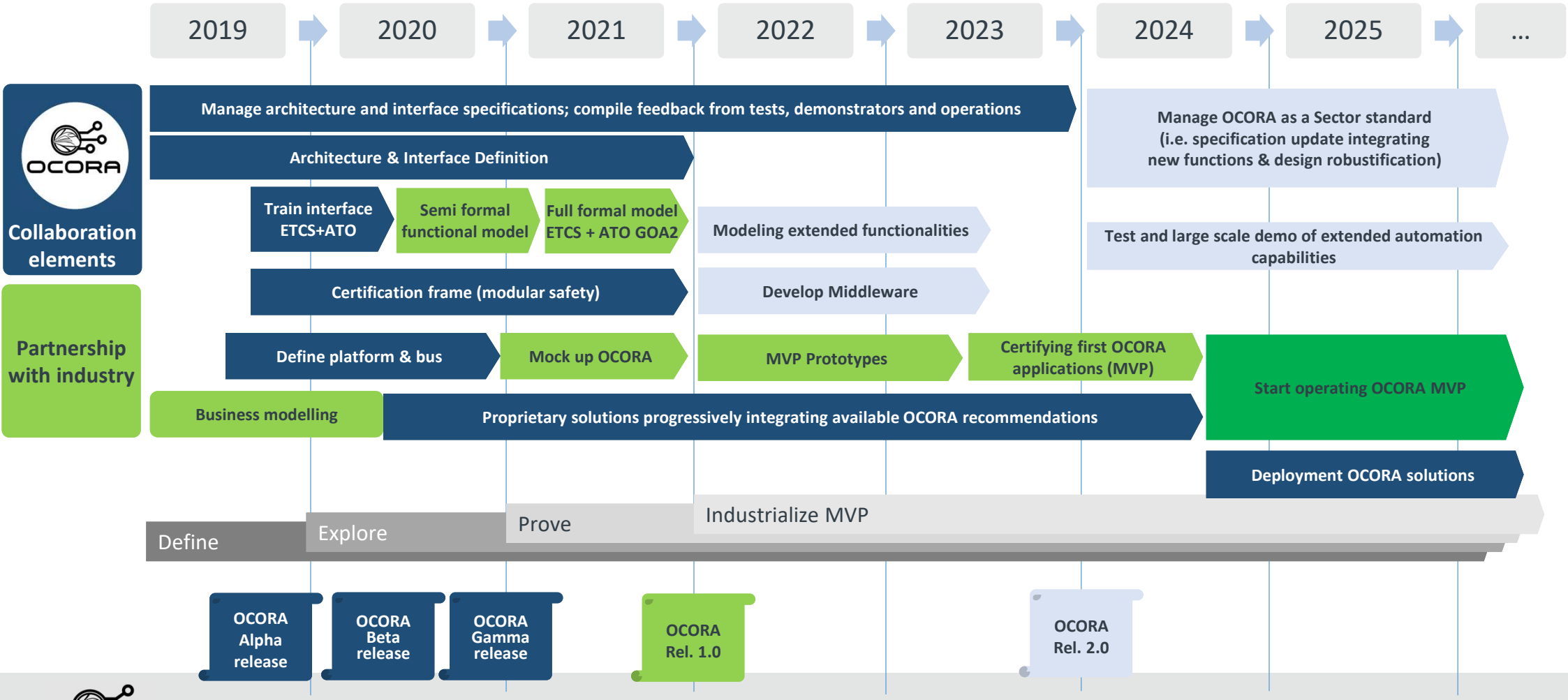
Timeline

Topic Overview

- Roadmap
- MVP
- TSI-2022
- Upcoming Projects

Timeline

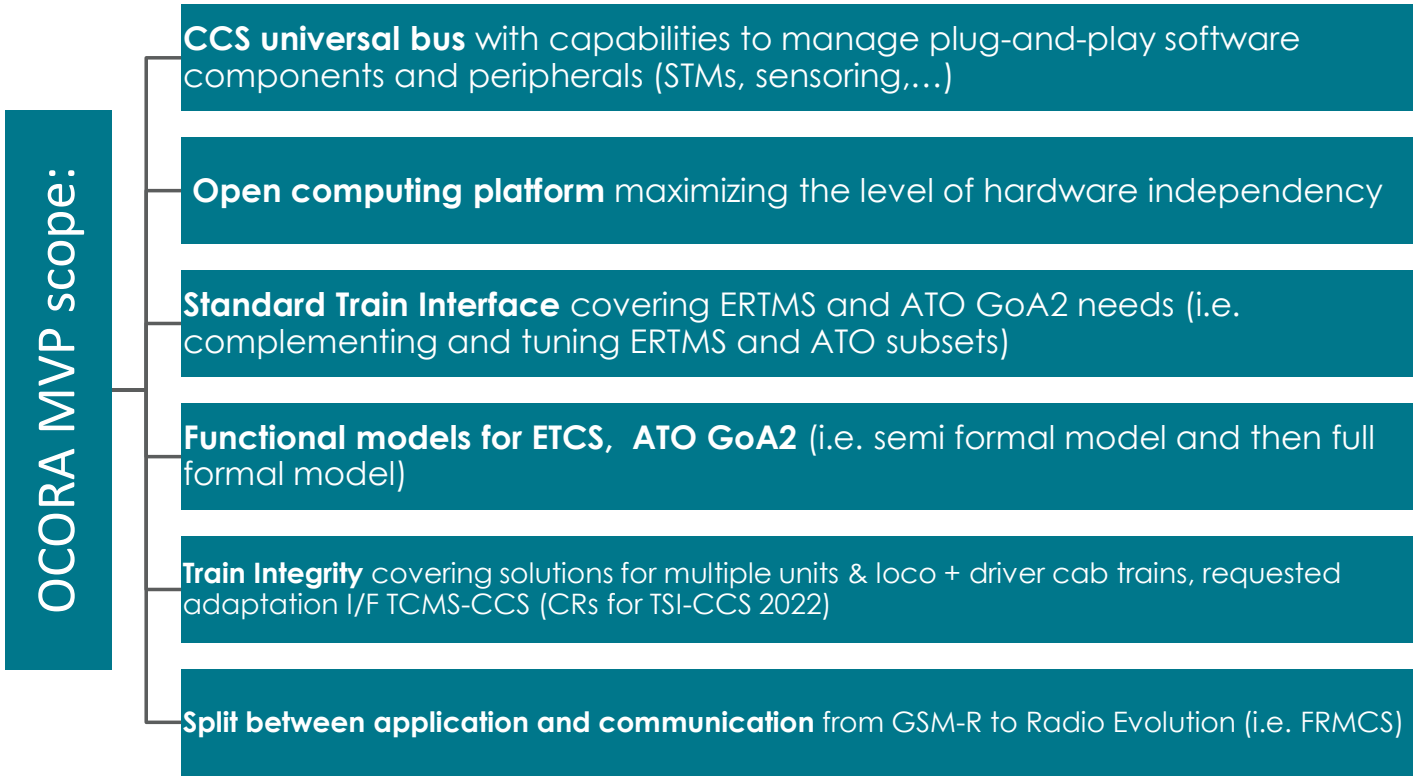
Roadmap



Timeline

OCORA Minimum Viable Product - for OCORA 1st Iteration

The OCORA Minimum viable Product (MVP) is a set of product that covers a minimum but representative set of functionalities allowing to gain valuable return of experience for future/complementary developments.



OCORA roadmap foresees mockup, prototypes and finally the certification for a MVP by 2024.

Timeline

TSI-2022

OCORA input to TSI : requirement consistency and optimal level of granularity for modules supporting innovation and smooth migrations.

OCORA is collaborating with representatives bodies and other sector initatives to support ERA related activities in 2020 and 2021.

Alliances

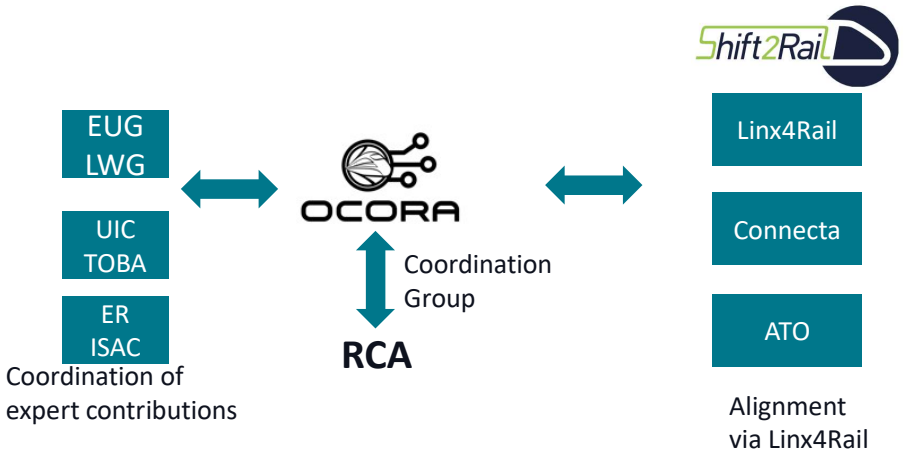
OCORA-20-001-Beta / v1.00 / 29.06.2020 - final

Alliances

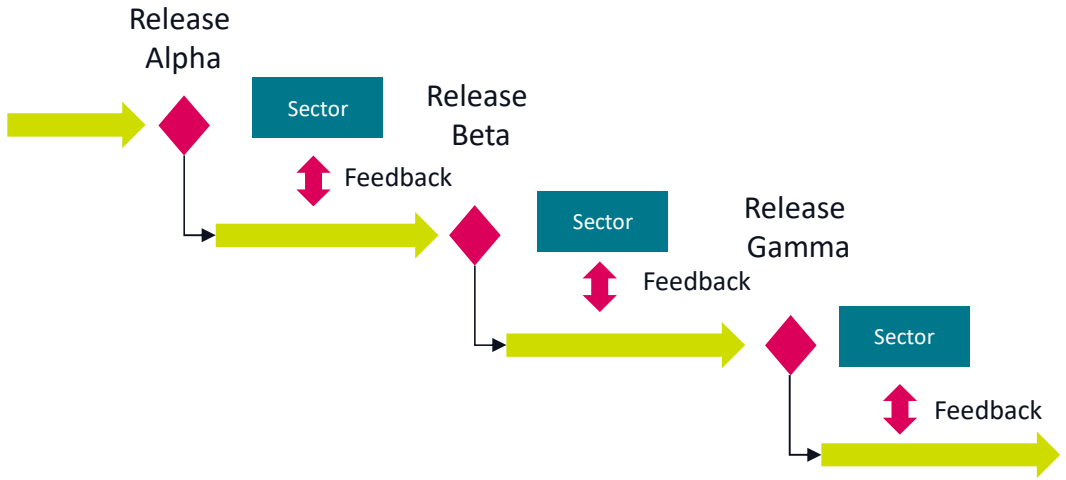
OCORA collaboration with many sectoral groups

OCORA covers explicitly CCS On-board, 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.



OCORA and other sector initiatives



OCORA iterative stakeholder involvement

Alliances

Ongoing liaisons

Sector interest group	Collaboration area	Liaison in place
CCS SG (CER)	Preparing TSI 2022 revision Setting secto governance for CCS architecture	OCORA experts sharing achievements for endorsement
TWG Train Modular Architecture (ERA)	Sounding TSI-CCS 2020 On-board preparation	Some OCORA experts present as CER speaker
RCA (EUG+EULYNX)	Functional decomposition Performance requirements (including itneroperability) Computing platform Modular safety	Setting up of a coordination group Joined working groups have started
FRMCS (UIC)	On-board telecommunication architecture Safe Communication capabilities Migration from GSM-R	Coordination done through experts involved in both initatives.
Localisation WG (EUG)	Mission requirement for onboard localisation Interface for localisation peripherals	Coordination done through experts involved in both initatives.
LinX4Rail (Shift2Rail)	TCMS interface Common sector business objectives Rail system architecture definition and governance	Alignment and collaboration has started

- Liaisons statements to be formalised
- OCORA assumes that a frequent, well-structured and open, unbiased exchange of views and ideas with its suppliers is fundamental to initiate customer oriented product and service development. Formalised liaisons with suppliers and industry interest groups (e.g. UNIFE/UNISIG) are therefore a sensible objective for OCORA collaboration.

Beta Release Overview

OCORA-20-001-Beta / v1.00 / 29.06.2020 - final

Beta Release Overview

Topic Overview

- Motivation & Purpose
- Released Content
- Business Rationale
- Business Objective and Economic Model
- High Level Methodology
- High Level Tooling
- Acceptance of Global Standards

Beta Release Overview

Motivation & Purpose

Beta release to refine the architecture, bulding on alpha release

- Start modeling design objectives and requirements
- Identification of design criteria

Feedbacks on Alpha release

Beta release to provide a first definition of the CCS onboard architecture

- Engage a proactive industry dialogue
- First recommendations for future projects and TSI revision

Enable modeling and alignment

Beta Release Overview

Released Content

Doc ID	Doc Title (Link to Doc in Preparation)	Content
Release Documentation		
OCORA-10-000-Beta	Documentation Plan	This document
OCORA-10-001-Beta	Release Notes	General information about the release: why and what to read / feedback possibilities / etc.
OCORA-10-002-Beta	Review Plan	Defines who must review what section, including review deadlines
OCORA-10-003-Beta	Feedback Form	Excel Form allowing to provide review feedback
Communication Material		
OCORA-20-001-Beta	Program Slide Deck	Official slide set for presenting program aspects (e.g. problem statements, road map, etc.)
OCORA-20-002-Beta	Technical Slide Deck	Official slide set for presenting technical aspects (e.g. architecture, UVCC Bus Evaluation, etc.)
OCORA-20-003-Beta	Program Posters	Official posters for presenting program aspects (e.g. problem statements, road map, etc.)
OCORA-20-004-Beta	Technical Posters	Official posters for presenting technical aspects (e.g. architecture, UVCC Bus Evaluation, etc.)
Program Documentation		
OCORA-30-001-Beta	Introduction to OCORA	Outlining the OCORA initiative and providing an introduction
OCORA-30-002-Beta	Problem Statements	Problem Statements for CCS On-board
OCORA-30-003-Beta	Road Map	Presenting and explaining the OCORA road map
OCORA-30-004-Beta	Business Objective and Economic Model	Presenting and explaining the OCORA economic evaluation
OCORA-30-005-Beta	Alliances	Providing an overview on OCORA alliances / liaisions
OCORA-30-006-Beta	High Level Methodology	Presenting the methodology used in the OCORA program
OCORA-30-007-Beta	High Level Tooling	Presenting the tooling used in the OCORA program
OCORA-30-008-Beta	Acceptance of Global Standards	Proposal for global standards to be used for OCORA based tenders
OCORA-30-009-Beta	Minimal Viable Product (MVP)	MVP for 1st Iteration
OCORA-30-010-Beta	Set of Requirements	Proposal for OCORA requirements
Technical Documentation		
OCORA-40-001-Beta	System Architecture	Design goals, design principles, various architectural views, component and IF identification
OCORA-40-002-Beta	System Architecture – Capella Model	Proposal for OCORA Capella model
OCORA-40-003-Beta	UVCC Bus Evaluation	Evaluation of Bus Technology
OCORA-40-004-Beta	Computing Platform - Whitepaper	Description of the inteded computing platform (hardware & runtime environment)
OCORA-40-005-Beta	CCS-TCMS Interface - Introduction & Overview	Proposal for OCORA CCS Vehicle Interface description for ETCS and ATO
OCORA-40-006-Beta	CCS-TCMS Interface - ETCS Functionality (SS119)	Application SS 119 (ETCS OBU – Vehicle interface)
OCORA-40-007-Beta	CCS-TCMS Interface - ATO Functionality (SS139)	Application SS 139 (ATO OBU – Vehicle interface)
OCORA-40-008-Beta	(Cyber) Security - Overview & Plan	Proposal for OCORA cyber security approach
Supporting Documents		
OCORA-90-001-Beta	Question and Answers	Answers to questions from various stake holders
OCORA-90-002-Beta	Glossary	Terms, Definitions, Abbreviations, and Acronyms used in OCORA documentation

The **OCORA Beta Release** is a set of documentation defining objectives and requirements on a reference architecture for the CCS onboard subsystem.

Documentation can be found under:
https://github.com/OCORA-Public/Publication

Beta Release Overview

Business Rationale

OCORA business rational

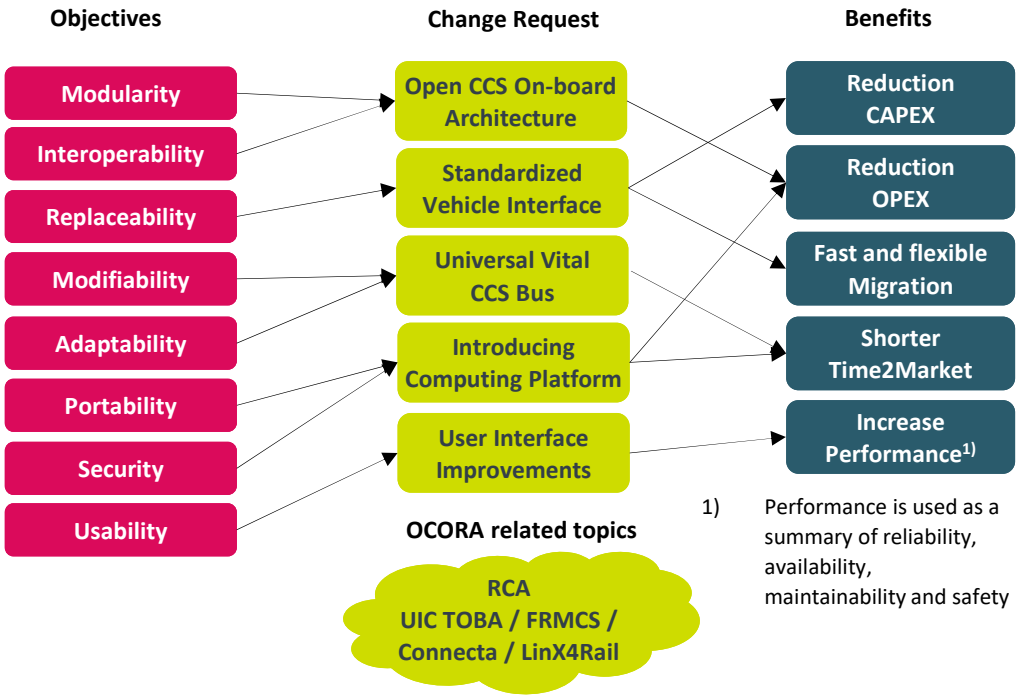
- keep up competition with modal competitors, investing heavily in digitalisation and automation
- embed innovative technologies in railway physical assets, planning systems and operations for boosting productivity, controlling cost and risk levels, and improving performance
- fast and affordable integration of the game changers (ERTMS, ATO, radio, localisation) in the CCS onboard, as a bottleneck for enhanced railway offers
- Anticipate technology lifecycles

Beta release business rational

- Align operators' vision on design objectives and requirements for CCS On-board architecture
- Allow for an industry dialogue on new generation products and migration’s drivers

Beta Release Overview

Business Objective and Economic Model



1) Performance is used as a summary of reliability, availability, maintainability and safety

Economic assessment for OCORA

- help fleet owners and suppliers to build good business cases for CCS onboard migrations with OCORA
- help the TSI revision process by providing quantitative and qualitative assessment

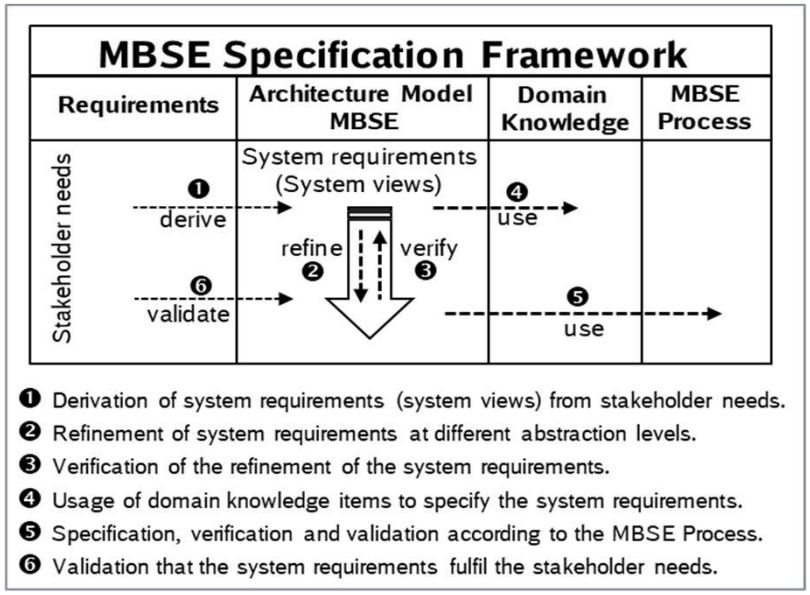
A collaborative economic modelling roadmap

- main hypothesis and objectives for an economic evaluation are defined in the Beta release
- Need to build with the industry a comprehensive model allowing to maximise feasibility and value
- Collaboration within Linx4Rail will help setting common understanding on business enablers

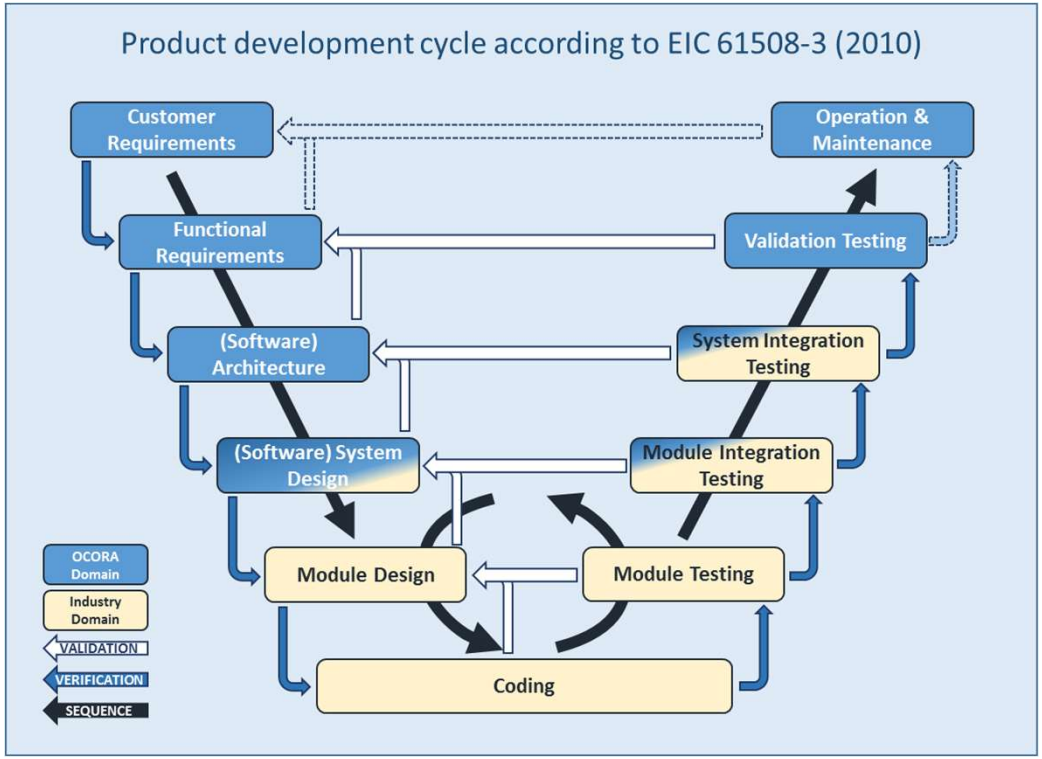
Beta Release Overview

High Level Methodology

- A model based system engeering approach



- Need to anticipate split of responsibilities



OCORA preferential distribution of responsibilities in relation to suppliers

Beta Release Overview

High Level Tooling

- Common approach to tooling is a prerequisite for collaborating on an architecture.

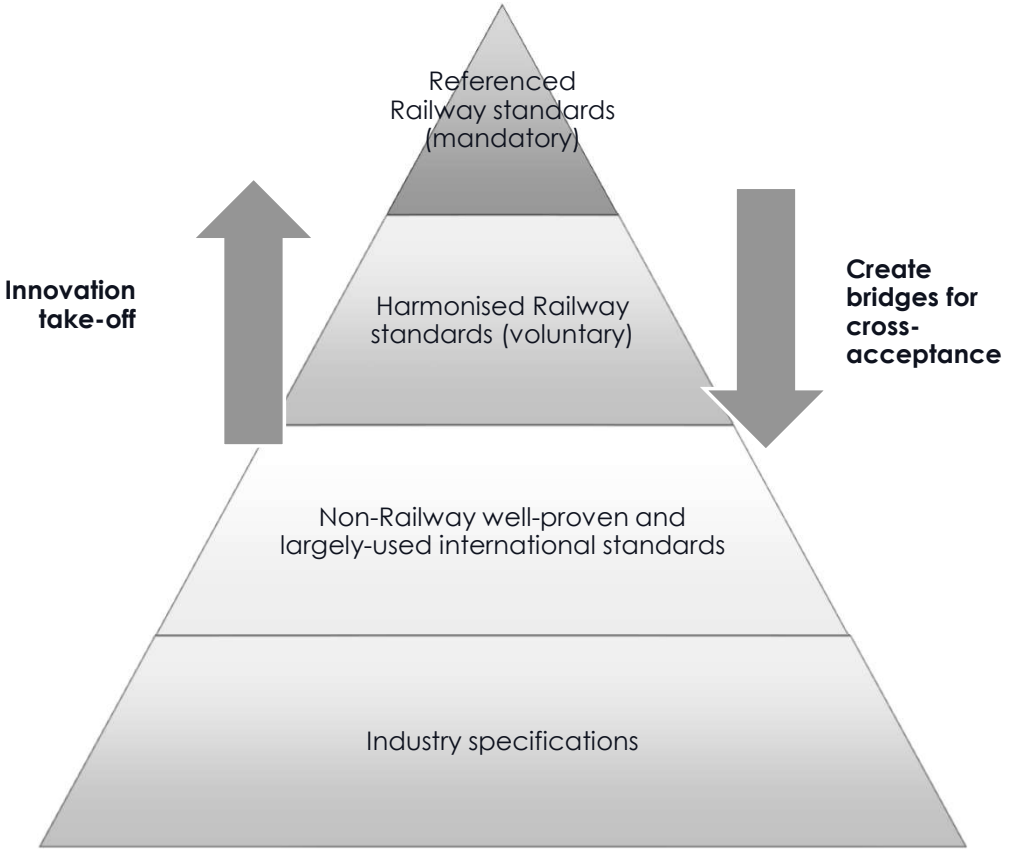
Tool Name	Purpose
MsOffice (Word, Excel, PowerPoint, Project)	General Purpose
Webex	Telco
Public Repository	https://github.com/OCORA-Public
Internal Repository	https://github.com/openETCS/OCORA
Polarion	Requirement Engineering and Management
Capella	Model-based Systems Engineering
SCADE	Model-based Software Development

Additional tools (ex. Use-Cases, Testing) might be listed at a later stage once the OCORA collaboration reaches later phases.

Beta Release Overview

Acceptance of Global Standards

- OCORA targets:
  - boost innovation and improve technical and operational performance in the CCS railway industry, by the means of standardization
  - Facilitate for the railway industry the use of off-the-shelf components compliant with well-proven and largely-applied standards
  - Reduce the time necessary to introduce new technologies in the railway industry
  - Allow for safety-related electronic systems the use of well-proven and largely-applied standards
  - Better highlighting and isolating in EU railway standards the railway-specific parts
- Beta release :
  - A first deep dive into IEC61508 - EN5012x cross-acceptance,
  - OCORA is proposing to further study this item with European organizations (CER, EIM, CENELEC, JPCR, NBRAIL, ERA…)



Gamma Release Overview

OCORA-20-001-Beta / v1.00 / 29.06.2020 - final

Gamma Release Overview

Topic Overview

- Motivation & Purpose
- Foreseen Content

Gamma Release Overview

Motivation & Purpose

Gamma release to complete the architecture description reflected in the beta release

- Refined design objectives and requirements folloing industry dialogue
- Identification and resolution of design choice supporting OCORA business objectives

Gain relevance from feedbacks

Gamma release to integrate sector contributions and enable PoC.

- Enable mock up for technical solution and detailed functional modeling as first steps towards prototypes
- Shape a consistent and comprehensive frame for buidling industry partnerships and long term financing

Deliver relevance and certainty

Gamma Release Overview

Foreseen Content

Title	Release Content
Program documentation	
Introduction to OCORA	Introduction and Problem Statement Update
Road Map	Roadmap Update
Business Objective, Economic Model	Business Case
Alliances	UNISIG, shaping S2R2
High Level Methodology & Tooling	Methodology and Tooling update for Gamma
Acceptance of Global Standards	Update
Technical documentation	
System Architecture	CCS On-board Reference Architecture
UVCC Bus Evaluation	UVCC Bus Definition OSI 5-6
Computing Platform	Introduction & Overview
CCS-TCMS Interface	2nd Iteration CCS-TCMS Interface for ETCS and ATO
Set of Requirements	2nd Iteration of High Level Requirements
(Cyber-) Security	Specification Security for CCS On-board
Modular Safety	Introduction & Overview

Sector Dialogue

OCORA-20-001-Beta / v1.00 / 29.06.2020 - final

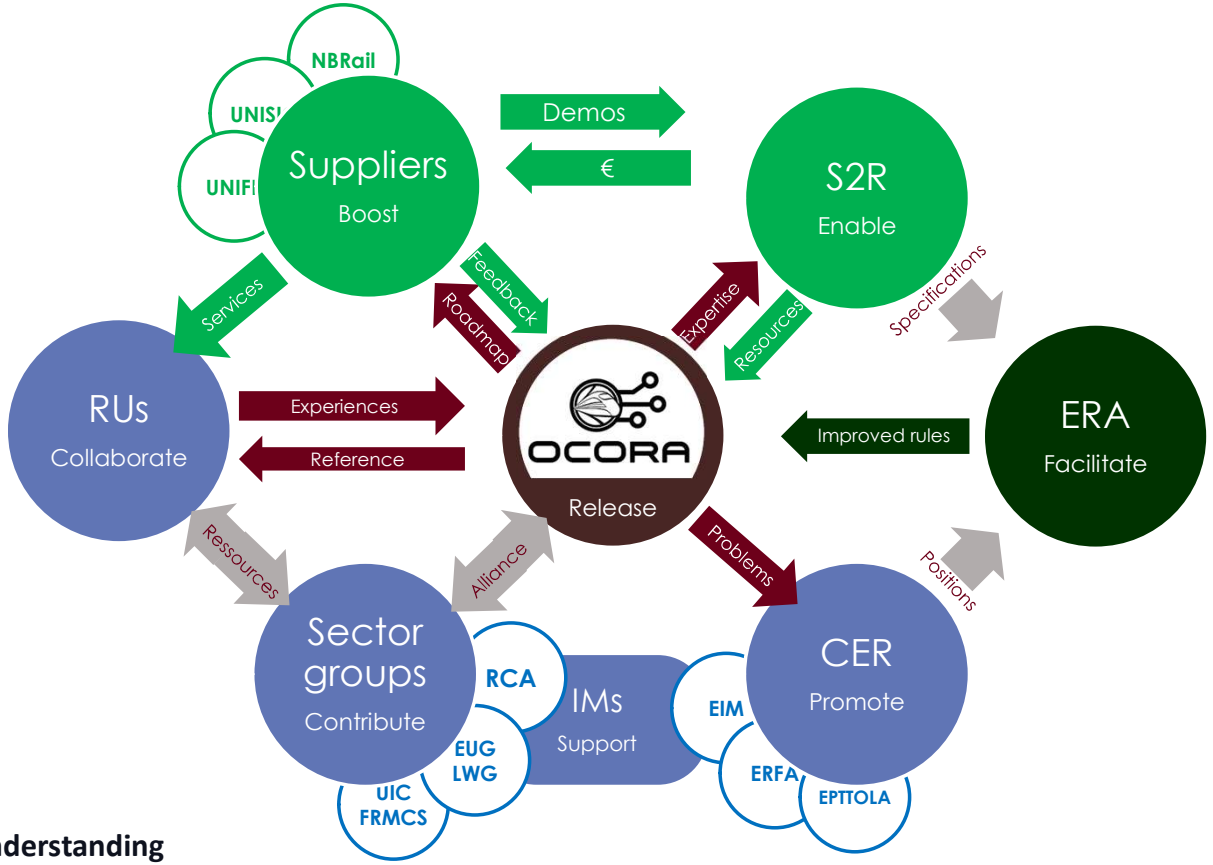
Sector Dialogue

OCORA, as an open architecture reference, support alignment between sector initatives

OCORA collaboration is open to support:

- ➔ S2R: financing and an agile frame for industry partnering
- ➔ Suppliers : joined activities (e.g. models, PoC, prototype, MVP…)
- ➔ ERA : optimised acceptance based on just rules

Other fleet owners and any expert or EU citizen are welcome to join as supporter or contributors.



OCORA liaisons and alliances allow to find common understanding and complementarity at expert, corporate and institutional level.

Sector Dialogue

OCORA Beta Imprint

- Publisher: OCORA Cooperation
- Channel: OCORA publishes exclusively over https://github.com/OCORA-Public/Publication
- OCORA liaison partners: UIC TOBA, RCA, CER
- Any feedback for OCORA is welcome! If you would like to attend a workshop or give a feedback, please contact jean-baptiste.simonnet@sncf.fr . For specific feedback the OCORA-10-003-Beta, Feedback Form shall be used.
- For active collaboration (within the OCORA framework) the OCORA Code of Conduct must be accepted and signed. In case of interest for active collaboration and you are eligible to become a partner according to the OCORA Code of conduct, please drop a "interest of becoming a OCORA member by mail" to rolf.muehlemann2@sbb.ch .
- All OCORA deliverables and work will be published and licensed under the dual licensing Terms EUPL 1.2 (Commission Implementing Decision (EU) 2017/863 of 18 May 2017) and the terms and condition of the Attributions- ShareAlike 3.0 Unported license or its national version (in particular CC-BY -SA 3.0 DE).