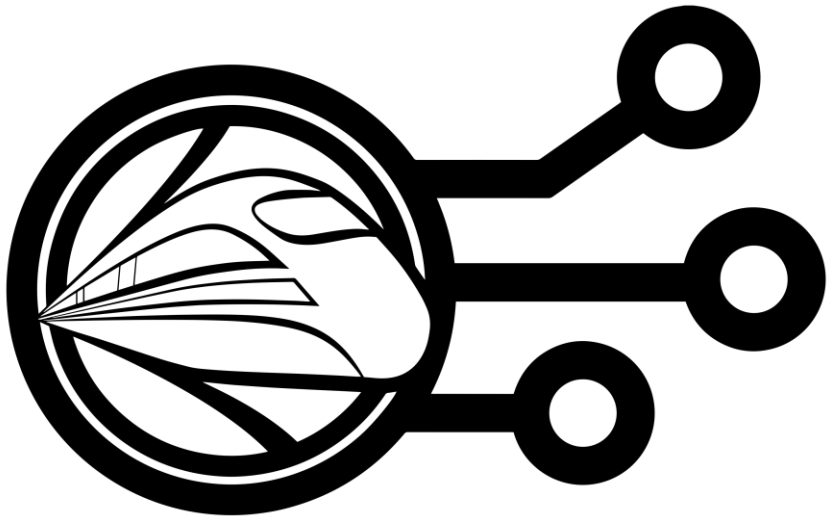


OCORA

Executive Summary Slide Deck

OCORA-BWS02-010 / v1.00 / 30.06.2021 / Delta Release

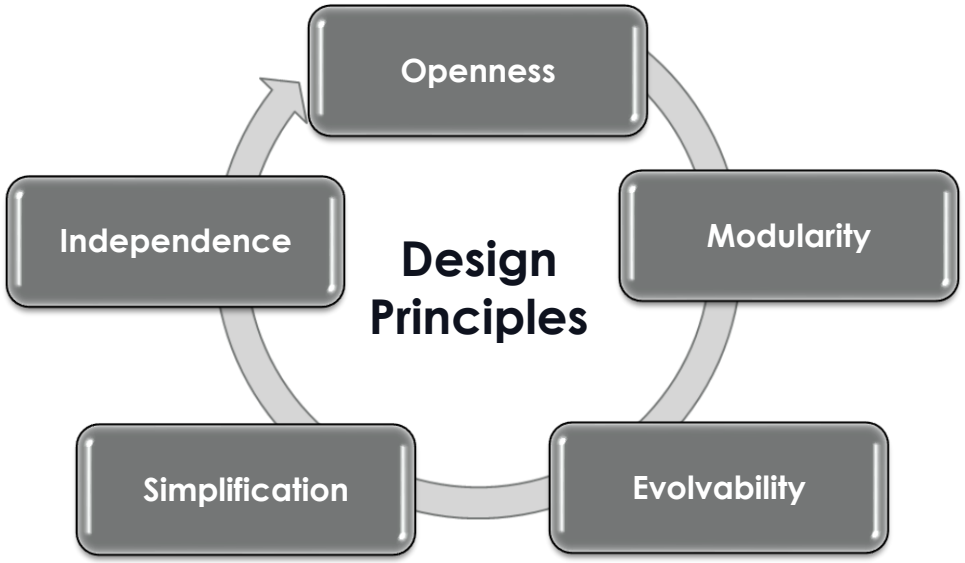
OCORA Delta Release - OnePager

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

Founding Members

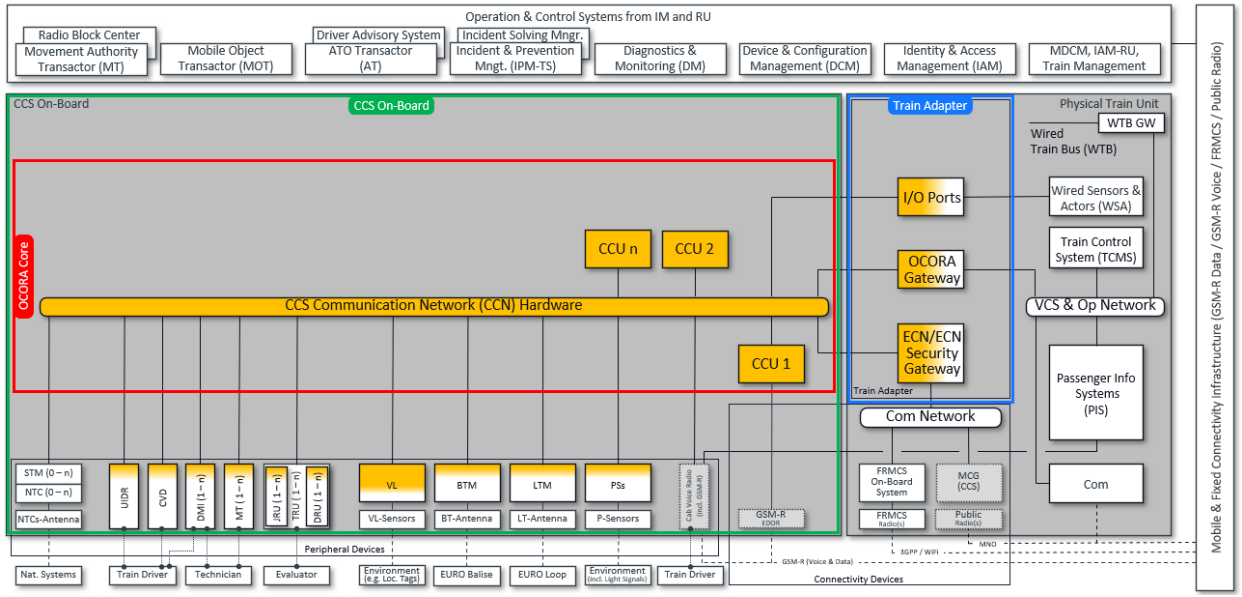
OCORA, the "**Open CCS On-board Reference Architecture**" initiative, whose signatory founding Members are NS, SNCF, DB, SBB and ÖBB, has reached a next important milestone with the **Delta Release** of the specifications of the OCORA architecture.

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 Delta** Release descripts **CCS On-board** and includes **sector feedback**. It **is again feeding TSI-2022 and prepares for Europe's Rail Joint Undertakings System- & Innovation-Pillar.**

Physical Architecture – OCORA Scope



OCORA deliverables are published under the **European Union Public License** (EUPL) and are consequently available for all stakeholders.
The OCORA **Release 1.0** is planned for **end of 2021.**

Introduction

Who is OCORA - **O**pen **C**CS **O**n-board **R**eference **A**rchitecture

March 2019
- **Memorandum of Understanding - 5 founding members (NS, SNCF, SBB, ÖBB, DB)**
- OCORA is a **collaborative platform gathering engineering resources** working on **ERTMS and beyond**

October 2019
- **OCORA Governance** in place, with an active Steering Committee
- Open to railway companies willing to contribute to the collaboration

November 2019
- **OCORA Alpha Release**, first publication
- Alpha outlines the Who, the How and the Why

July 2020
- **OCORA Beta Release**, first comprehensive CCS On-board description
- Based on Beta OCORA starts Sector / Industry Dialogue

December 2020
- **OCORA Gamma Release**, updated CCS On-board description, including Sector / Industry feedback
- Gamma is feeding TSI-2022 and S2R-2 with qualified technical input

July 2021
- **OCORA Delta Release**, updated CCS On-board description, including Sector / Industry feedback
- Delta is again feeding TSI-2022 and prepares for Europe's Rail Joint Undertakings System- & Innovation-Pillar.

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

Problem Statements - Current ETCS On-board solutions…

1. are based on the **TSI specifications** ensuring interoperability, but the **subset specifications are incomplete and ambiguous**. Therefore, interoperability is not a given.
2. are **more expensive than technologically justifiable**. This seems to be a result of **high integration engineering and certification efforts**, as well as **small batch sizes** and **high project risks**.
3. are **difficult to be integrated into existing vehicles**.
4. are **difficult and time consuming to adapt/change/update/upgrade**:
   - In the case of patching in non SIL area (e.g. cyber- security patching)
   - In the case of error correction in SIL area
   - In the case of baseline upgrade (e.g. ETCS baseline 2 to 3)
   - In the case of functional enrichment (ex. base for game changer introduction is not a given)
5. do **not respect different, non-overlapping life cycles** (e.g. vehicle vs. CCS vs. connectivity).
6. are **difficult to maintain** (e.g. maintenance, monitoring, diagnose possibilities very limited).
7. are **lacking built-in cyber security**, since this is a newer topic, especially in combination with 4 + 6.
8. are **performing below expected availability and reliability** (from overall ETCS system perspective).

In addition:

- The benefit of ETCS On-board only pays off, if the ERTMS rollout progresses in Europe on large scale.
- The ETCS On-board functions as such also need some improvements (e.g. braking curve, odometry accuracy, etc.) to serve current operational needs.
- Difficult, expensive and time consuming ETCS On-board fitments in general, are delaying national deployment plans, impacting trackside investments, and postponing ERTMS rollouts.

Release Overview

Business Rationale

OCORA business rational

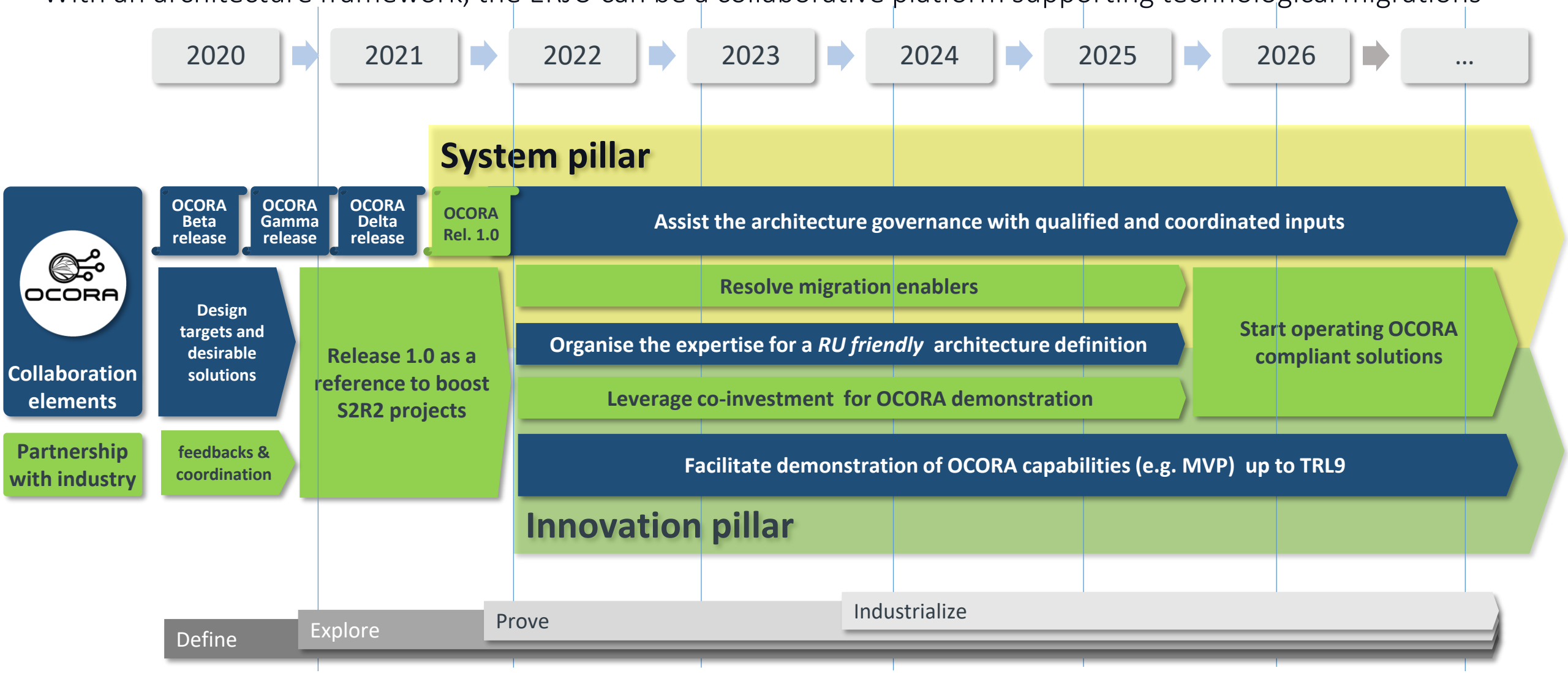
- keep up competition with modal competitors, investing heavily in digitalisation and automation
- embed innovative technologies in railway physical assets, planning systems and operations for boosting productivity, controlling cost and risk levels, and improving performance
- fast and affordable integration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

Release business rational

- Align operators' vision on design objectives and requirements for CCS On-board architecture
- Intensify the sector dialogue on new generation products and migration’s drivers

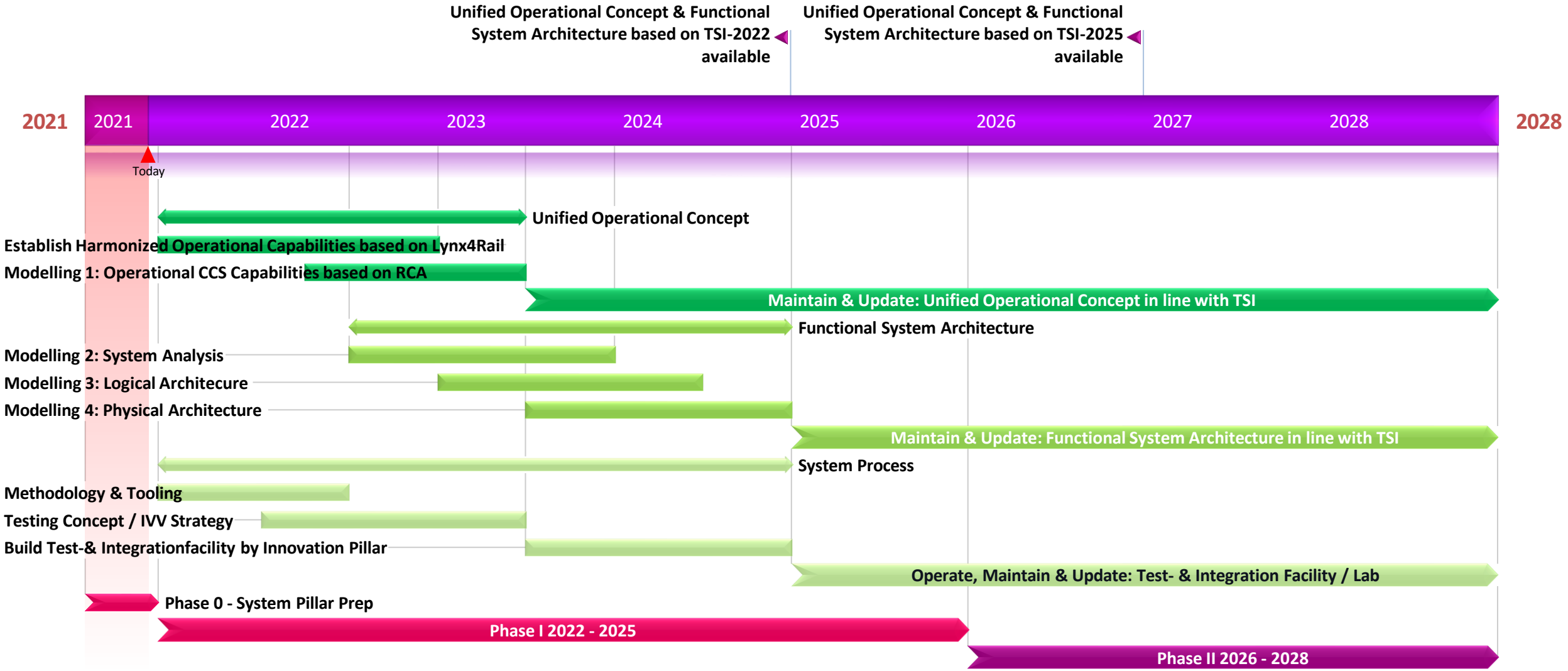
Roadmap

With an architecture framework, the ERJU can be a collaborative platform supporting technological migrations



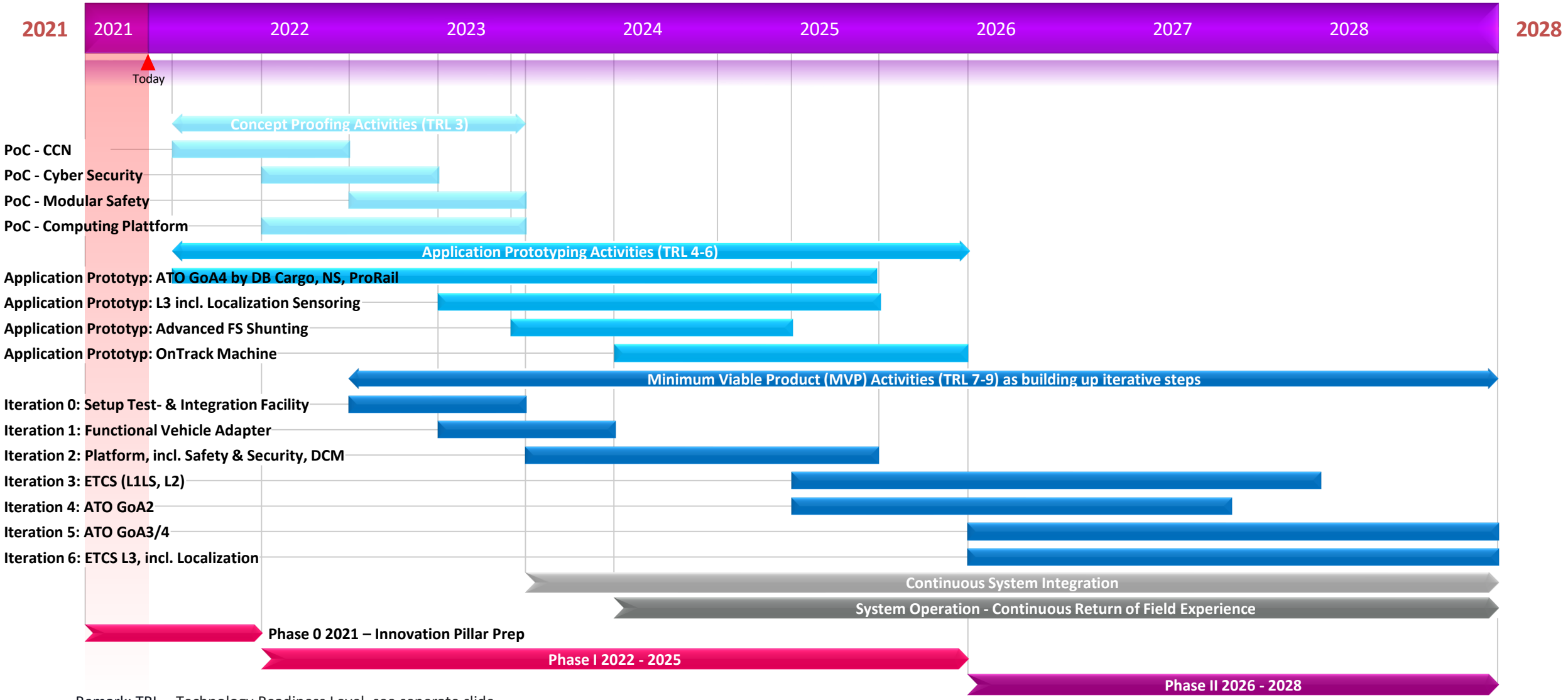
Europe's Rail JU –Roadmap for CCS On-board

System Pillar



Europe's Rail JU –Roadmap for CCS On-board

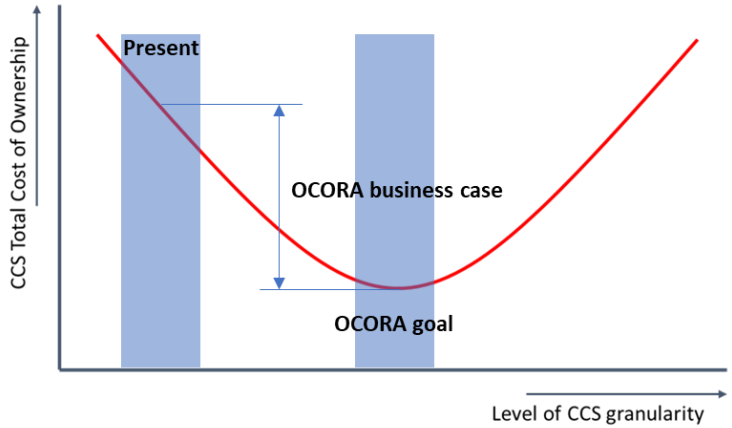
Research- & Innovation Pillar

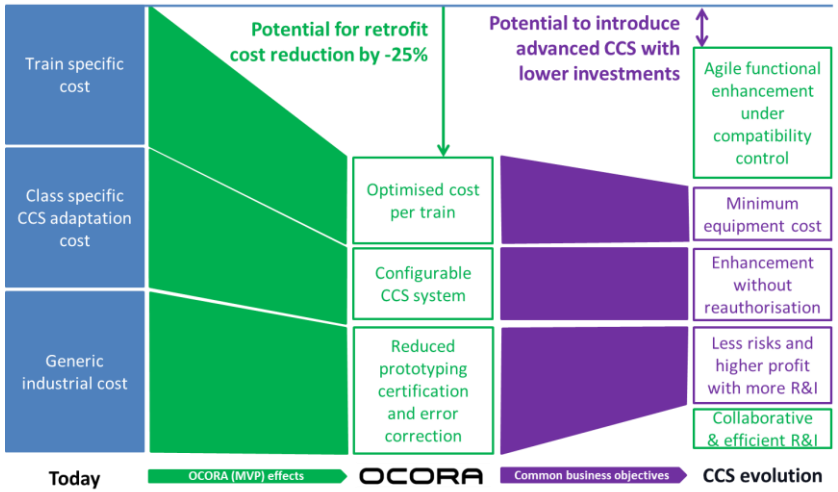


Remark: TRL = Technology Readiness Level, see seperate slide

Release Overview

An economic model to discuss the optimal level of granularity





The development of the OCORA economic model, intends to provide tools for:

- Getting a clear view on the economic driver for the modularization of the on-board. To this end the model focus on 3 cost categories:
  - Generic industrial cost for developing certified CCS onboard sub systems
  - Cost for authorising operation with a new CCS configuration in a class of vehicle
  - Train specific cost for fitting or upgrading CCS building blocks
- Studying the impact of technology life cycle on the total cost of ownership. To this end scenario are defined for comparison purpose:
  - Todays situation with slow deployment and small project size, based on reference values derived from EC studies on ERTMS.
  - OCORA MVP scenario to model the economic impact of the modularisation of CCS onboard architecture
  - CCS evolution scenarios allowing to investigate impact of larger market, enhanced functionalities and accelerated upgrade scheme
- Optimising the contribution of OCORA breakthrough to Common business objectives. An open dialogue with the industry creates mutual benefit.

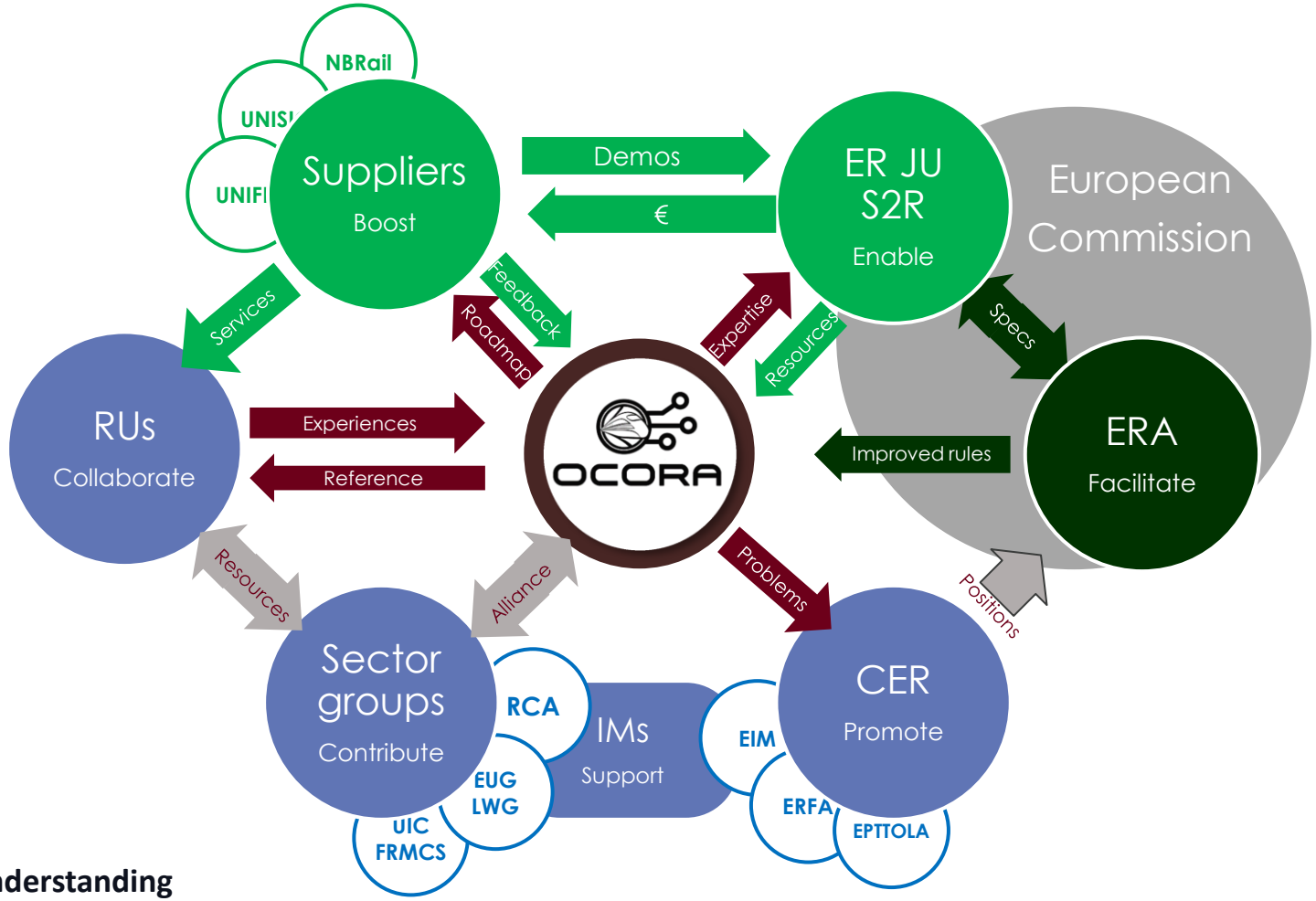
Sector Dialogue

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

OCORA collaboration is open to support:

- ➔ ER JU / 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 Release 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-BWS01-040 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).