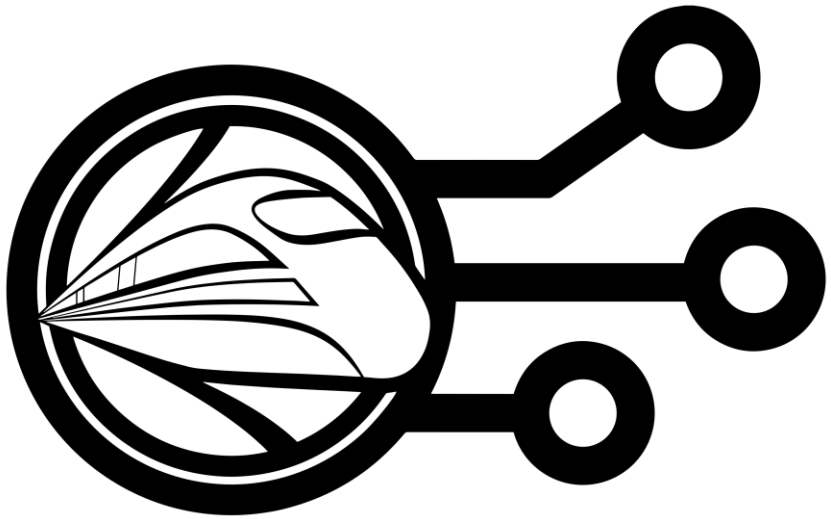


OCORA

Gamma – Executive Summary Slide Deck

OCORA-20-002-Gamma / v1.00 / 04.12.2020 - Final

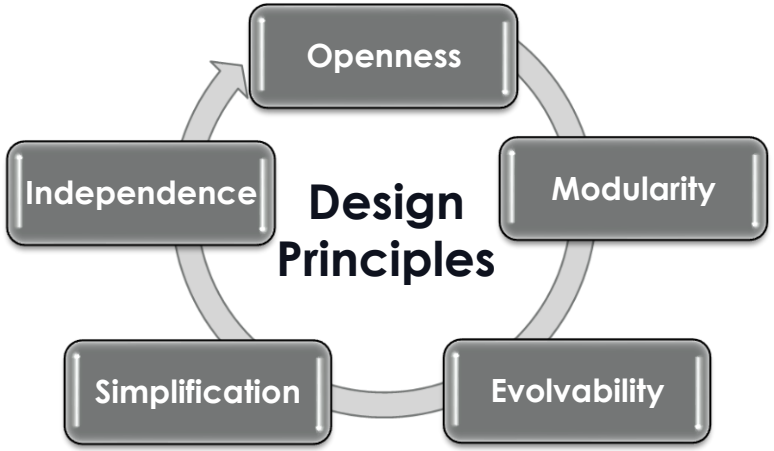
OCORA Gamma Release – one pager

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

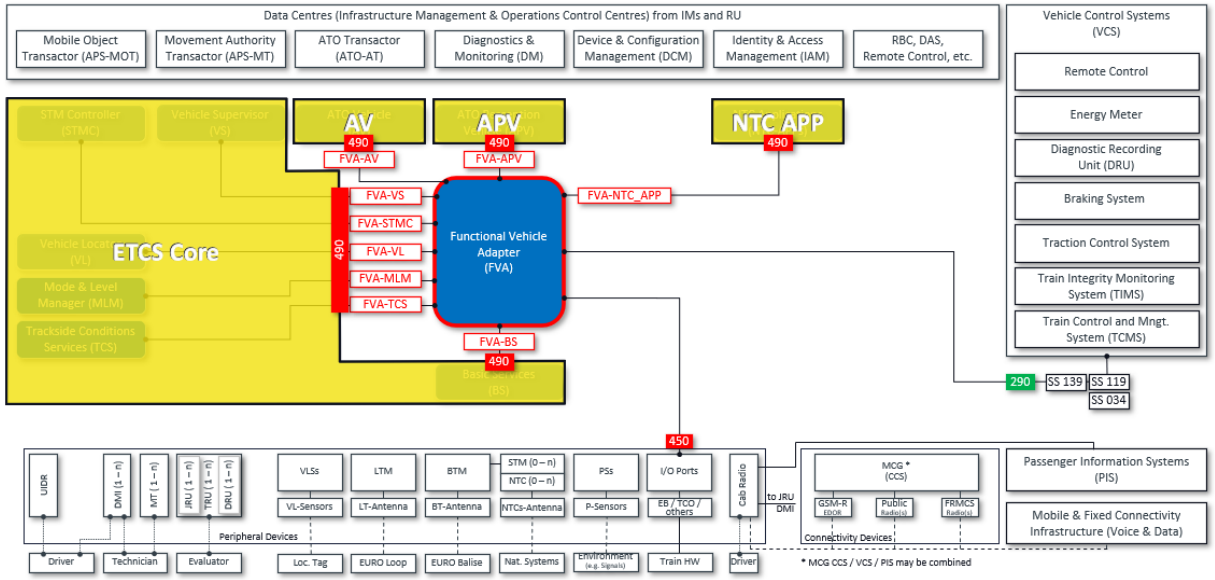
Founding Members

OCORA, the "**Open CCS On-board Reference Architecture**" initiative, whose signatory founding Members are NS, SNCF, DB, SBB and ÖBB, has reached a next important milestone with the **Gamma 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 Gamma** Release descripts **CCS On-board** and includes **sector feedback** based on the Beta Release. It **is feeding TSI-2022 and S2R-2 with qualified technical input**.



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 **Delta Release** is planned for **mid 2021** and **Release 1.0 end of 2021**.

OCORA Business Rationale

OCORA business rationale

- keep up competition with modal competitors, investing heavily in digitalization 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, localization) in the CCS onboard, as a bottleneck for enhanced railway offers
- Anticipate technology lifecycles

Short term objectives

- 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

Problem Statements

Current ETCS On-board solutions…

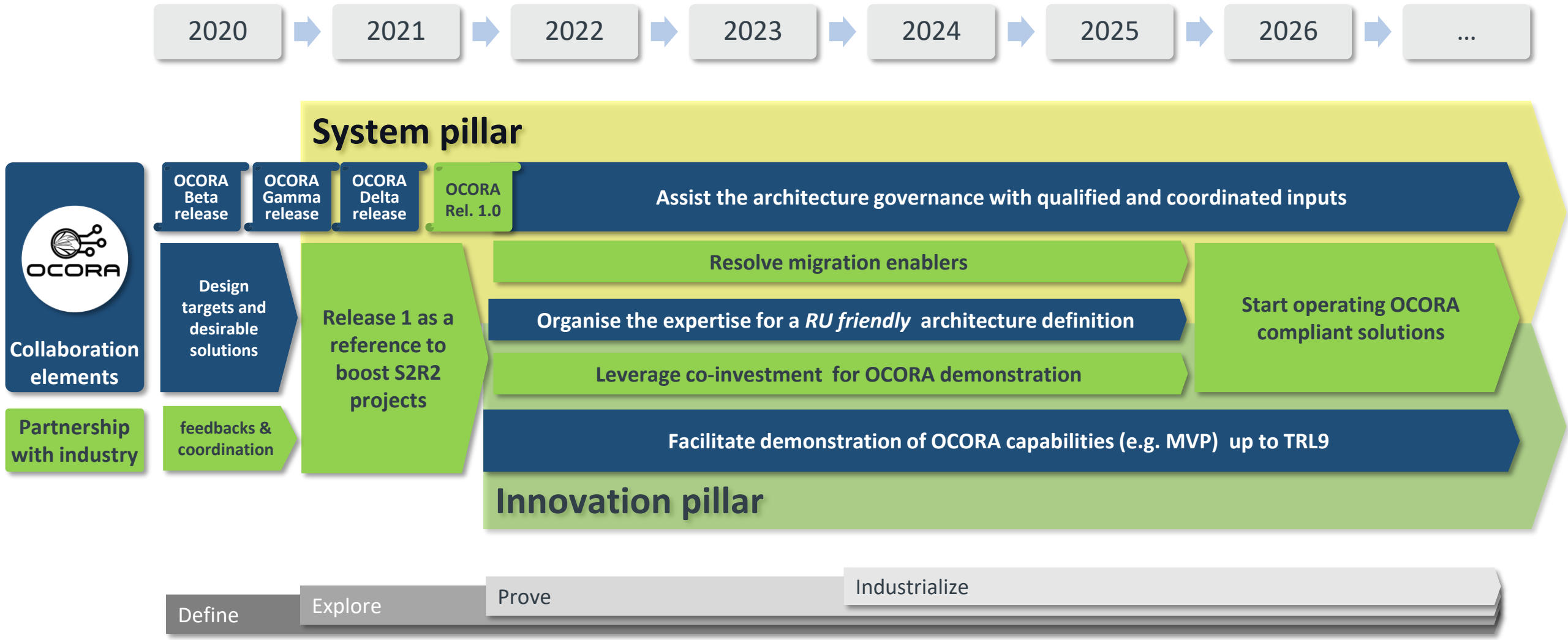
1. are based on the **TSI specifications** ensuring interoperability, but the **subset specifications are incomplete and ambiguous**. Therefore, interoperability is not a given.
2. are **more expensive than technologically justifiable**. This seems to be a result of **high integration engineering and 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:

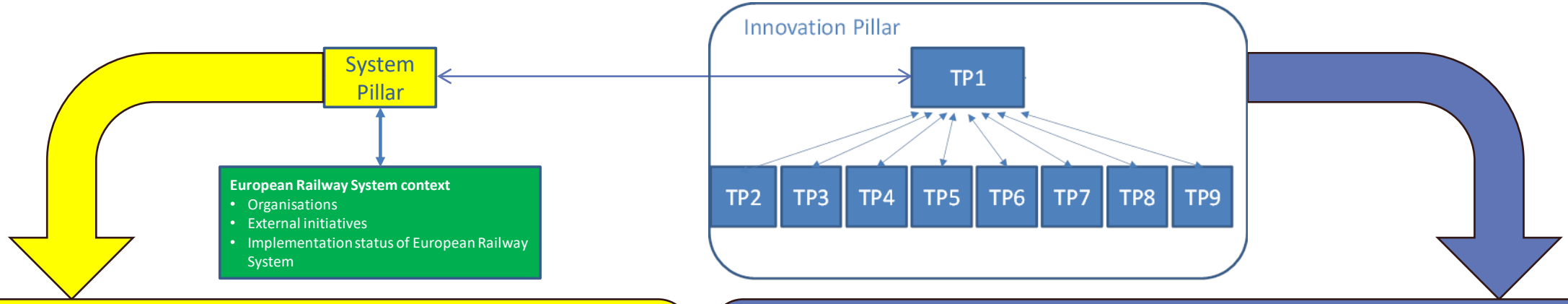
- The benefit of ETCS On-board only pays off, if the ERTMS rollout progresses in Europe on large scale.
- The ETCS On-board functions as such also need some improvements (e.g. braking curve, odometry accuracy, etc.) to serve current operational needs.
- Difficult, expensive and time consuming ETCS On-board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

OCORA Gamma Road-Map

Principles for a new Long term roadmap



Preparing the next Europe's Rail Joint Undertaking



OCORA supporting the System Pillar is a one off opportunity to establish an executive sector governance for the European railway system architecture

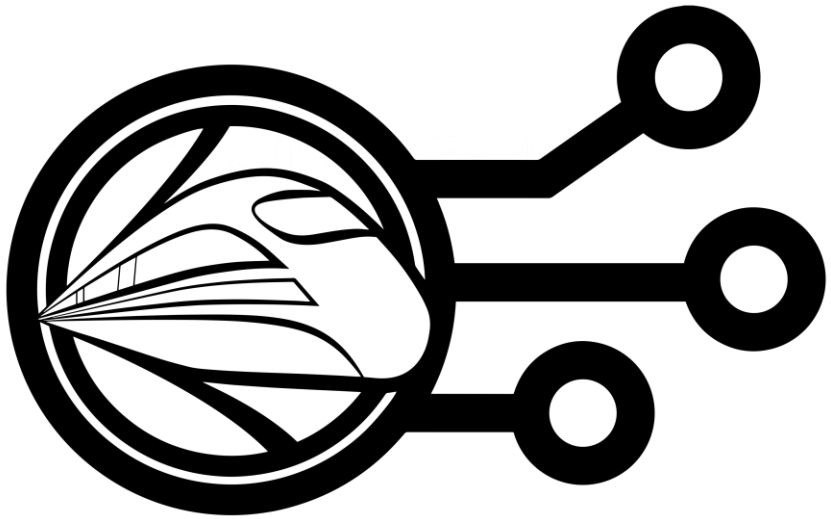
- Release reference version of the railway architecture including OCORA
- Develop economic model and guidance for implementation
- Ease safety demonstrations, enable modularity and transitions
- Promote OCORA as best practice to accelerate benefits and deployments

System Pillar and OCORA to boost sector benefits

OCORA supporting the Innovation pillar provides a one off opportunity to accelerate industrial and deployment readiness of future-proof CCS design:

- Support compliance of R&I with high level design principles
- Organise demonstration of OCORA MVP (including minimum viable digital map) over FRMCS by 2025, demos advanced functionalities, sensors and full middleware by 2028
- Build a common test environment and tools to move towards digital continuity and zero onsite testing
- Develop advanced solutions for automation and autonomy

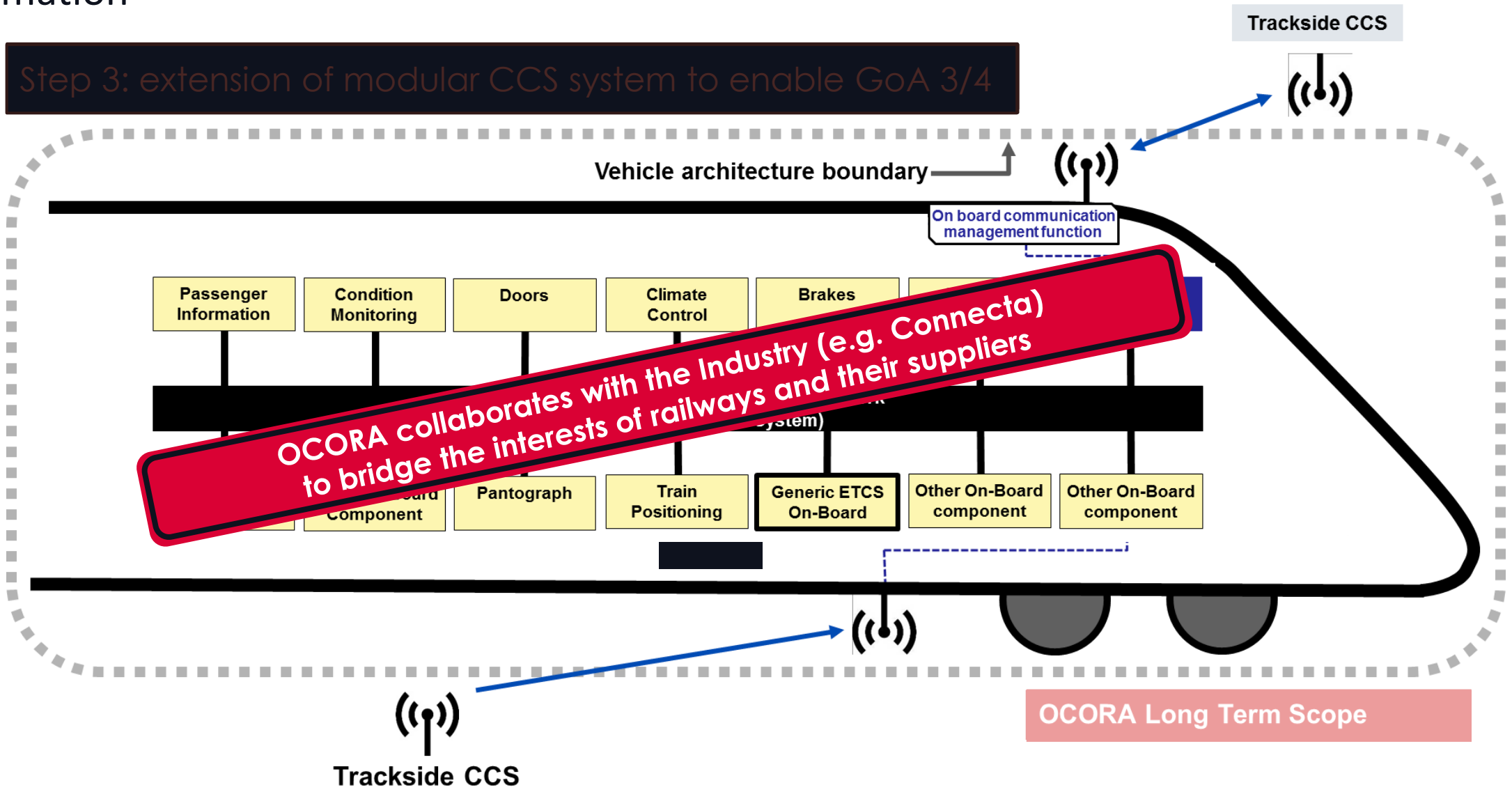
Collaborative R&I will nurture OCORA and vice versa



OCORA

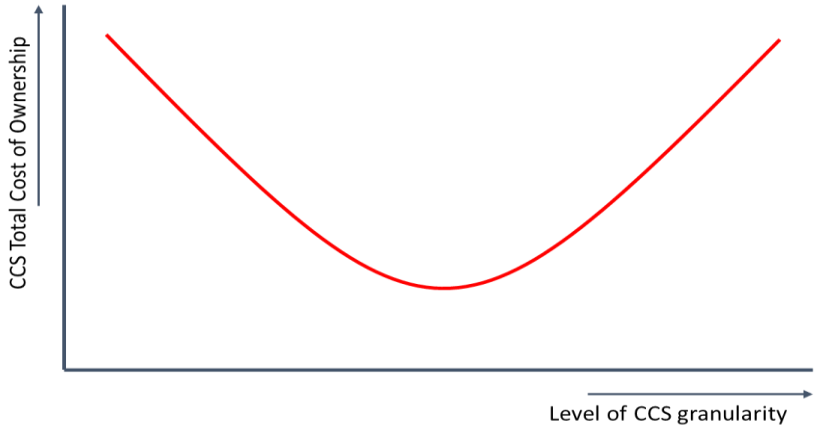
QUESTIONS?

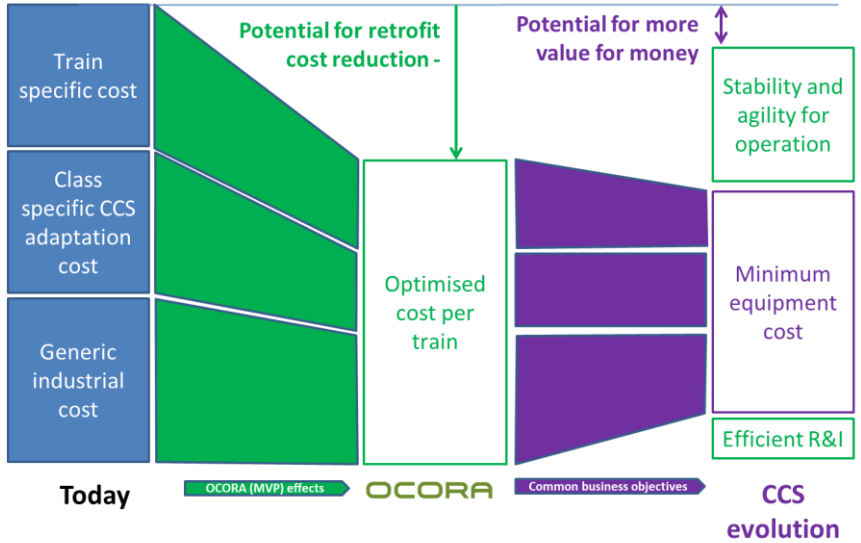
OCORA aims to pave the path to cost effective rail vehicle automation



Gamma release overview

Preliminary ideas on the 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 focuses 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.

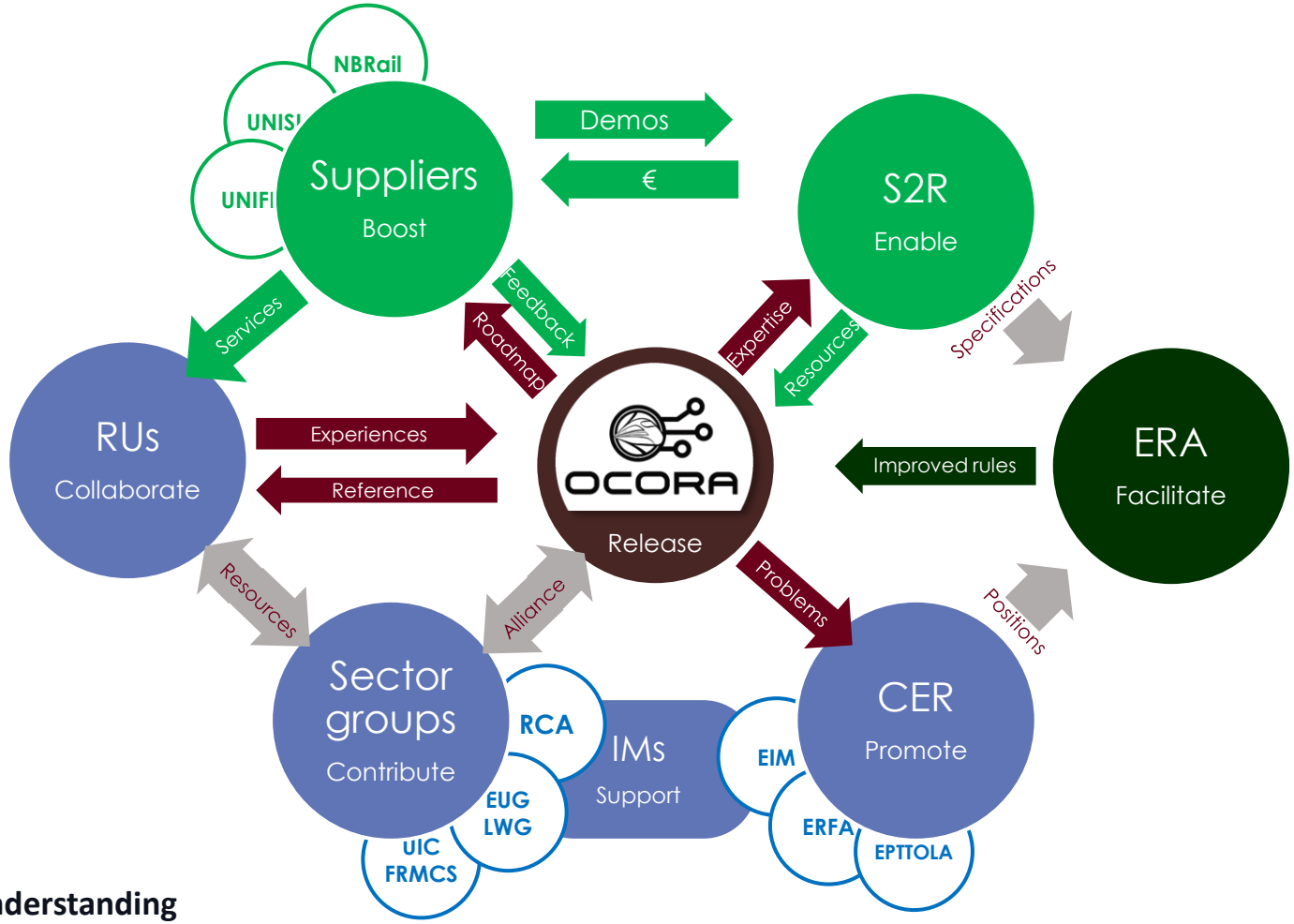
Sector Dialogue

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

OCORA collaboration is open to support:

- ➔ 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.