EGNOS for Rail – E4R

Context, status & roadmap

02/10/2025

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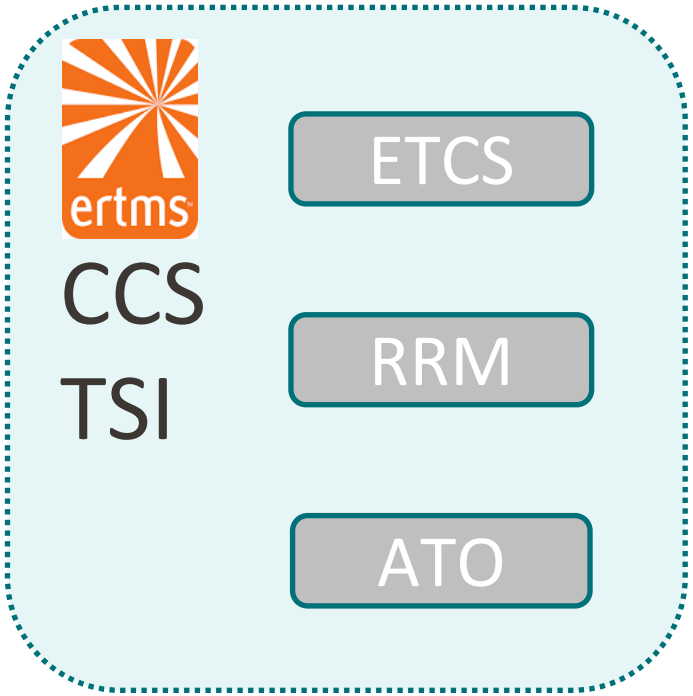
Rail context and activities

1. ERTMS
2. Europe’s Rail
3. Rail roadmap
4. FP2-R2DATO localisation activities

European Rail Traffic Management System (ERTMS)

➔European standard for signaling and speed control that ensures interoperability of the railway systems

➔Defined by the Technical Specification of Interoperability (TSI)



The ERTMS Control & Command System consists of:

- Continuous supervision of train movement (maximum speed and braking curves) ensured by the Automatic Train protection (ATP) system of the European Train Control System (ETCS)
  → ETCS L1 and L2 Fixed Block or L2 Hybrid
- Railway Radio Mobile (RRM) is the European radio communications system for railway operations
- Autonomous Train Operation (ATO) automates the operations of the train up to Grade of Automation 2 (GoA2)

Europe's Rail Joint Undertaking (2023 – 2029)

European program for Rail development to foster innovation in rail, to facilitate sustainable and smart mobility through a substantial digital transformation of rail.

Program based on **two streams** of activities:

- **Innovation Pillar**: demonstrations of new features for ERTMS.
  - For the onboard ERTMS CCS → Flagship Project 2, **FP2-R2DATO**.
  - These demonstrations notably aim at:
    - Refining the train architecture to make it modular.
    - Defining a new level of train signaling (L2 Moving Block) including the possibility to use different positioning sensors, notably GNSS (GPS and Galileo) & EGNOS.
    - The new safe positioning module will be called ASTP for Advanced Safe Train Positioning.
- **System Pillar**: update proposals of the TSI's

ASTP & Benefits

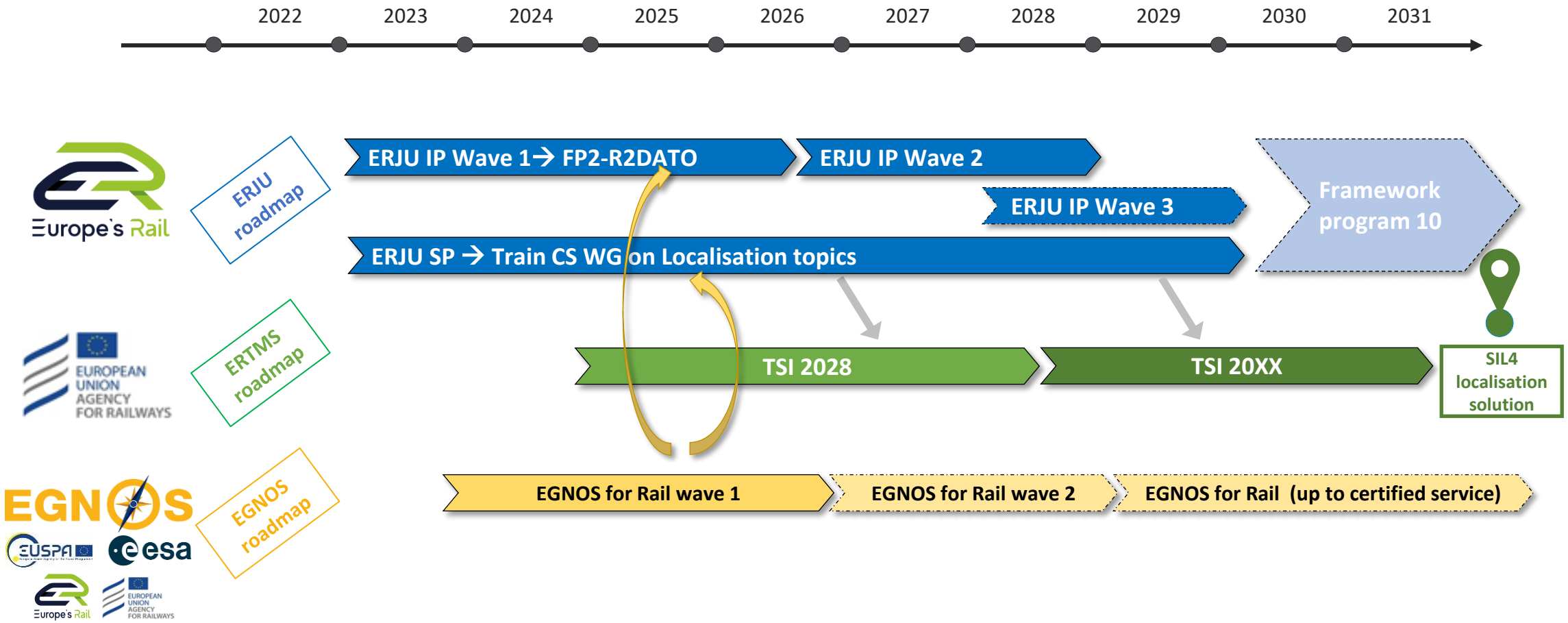
The Advanced Safe Train Positioning (ASTP) module

- targeting to reach SIL4 (Safety Integrity Level 4 -> 10^{-9}e/h).
- defined as a grey box with standardised interfaces
  - Ongoing debates to define the shade of grey for the box (fixed sensor types to be used?, sensor fusion architecture constraints ?, digital map layer availability, etc)

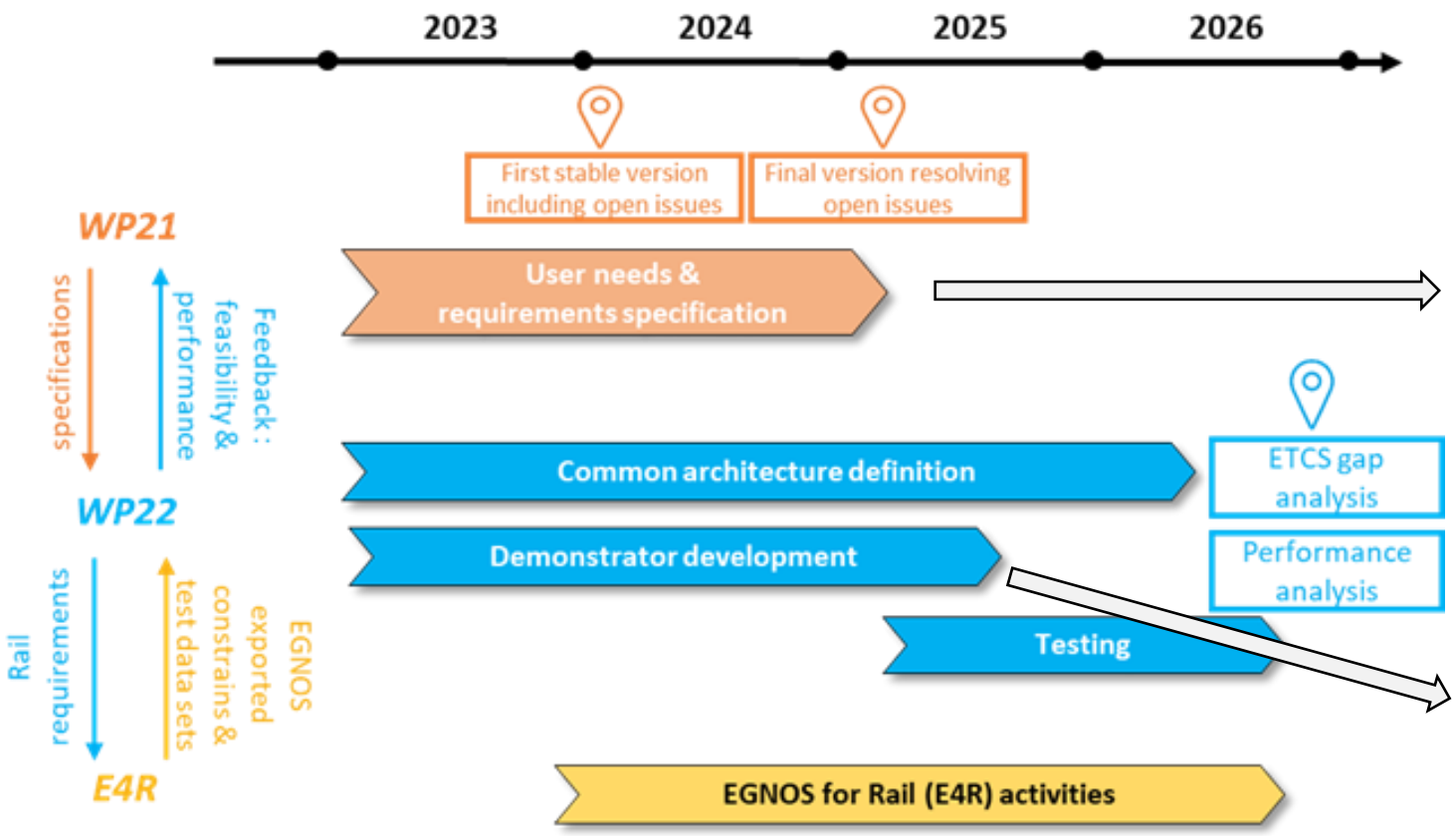
Expected benefits of ASTP in ERTMS:

- Integration of less complex technologies in the vehicle (e.g. RADAR and tachometers)
- A module with standardized interfaces
  - → Choice of supplier
  - → Framework for developments and associated costs
- One localisation function on board for all users (ATP, ATO, passenger information, JRU, etc.)
  - → Limit the amount of equipment in the train and on the roof
  - → Limit associated costs
- Significantly reduce the number of trackside equipment's used for location purposes
  - → CAPEX and OPEX for track maintenance
  - → Less complex maintenance operations

ERTMS & LOCALISATION roadmap



FP2-R2DATO: Localisation activities



Specifications provided as inputs for the System Pillar work

8 demonstrators based on multi sensors fusion

- All of them use GNSS
- 6 of them depends on EGNOS to achieve the required safety objectives (SIL4)

EGNOS for Rail

1. E4R context & framework
2. Objectives
3. E4R activities overview

EGNOS For Rail context & framework

Context: E4R was initiated after the start of FP2-R2DATO and is tightly linked to the objectives of Europe's Rail and R2DATO.

Partners: Europe's Rail ⇄ FP2-R2DATO *System Pillar* + ESA, EUSPA, EUROPEAN UNION AGENCY FOR RAILWAYS

Each entity come with their own budget

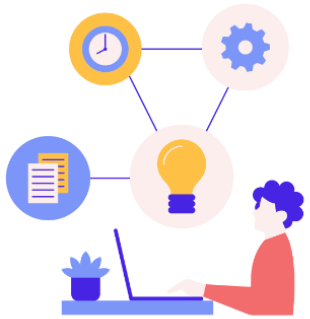
ESA activities supported by on the ongoing study, HE-NAV-024, realised by two industrial consortia (led by TAS-F and Airbus D&S)

Duration: **31 months** Starting date: **Nov 23** End date: **May 26**

EGNOS for Rail objectives

OBJ 1

Preparing EGNOS for Rail service demonstrator data to be used by the ASTP demonstrators of the ERJU flagships projects



Make solid demonstrations of performance for the ASTP demonstrators depending on EGNOS

OBJ 2

Defining the boundaries of a future EGNOS for Rail service in line with rail needs and preparing the certificability

Facilitate the introduction of GNSS-based localisation solution in ERTMS TSI

E4R activities overview

Space & Rail Roadmap (ERJU, ERA, EUSPA, ESA):

- Long term roadmap: identification of the main milestones on rail and space sides
- Short term: EGNOS service demonstrator framework clarification for ERJU IP wave 2

Legal framework and certification (EUSPA, ERA):

- Overall authorisation and certification approach for EGNOS in ERTMS
- EGNOS for Rail legal framework definition (Service Provision Scheme, Service Level Agreement)

Rail Operational needs and Space/Rail interface definition (ERJU, ESA):

- Rail operational needs & ASTP requirements (R2DATO WP21 deliverables)
- Space / Rail dissemination interface

EGNOS Service and System definition (EUSPA, ESA)

- EGNOS Service concept definition
- SARPS+
- Preliminary MOPS for GNSS onboard receiver

System performance evaluation and tooling (ESA)

- E4R integrity concept
- Preliminary performance assessment
- Performance qualification strategy
- Engineering tools & means

Next steps

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- **Consolidate the Space & Rail Roadmap**
- **Get feedback of the rail sector** regarding the EGNOS certification approach and **consolidate the approach**
- Get complementary results from the **HE-NAV-024 study** to consolidate different deliverables, notably the **SARPS+ and integrity concept**.
- These documents will then be **used as inputs to consolidate other E4R documents**, such as the Space/Rail dissemination interface or the E4R service concept definition
- Make **demonstrations of performance** in the frame of FP2-R2DATO
- Prepare the **E4R work scope** associated to **FP2-R2DATO wave 2**.

Thank you for your attention!

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