EXTRACT OF DRAFT WORK PROGRAMME 2024

adopted by the EU-Rail Governing Board on 5 December 2023

This Draft Work-Programme 2024 will be made publicly available after its approval by the Governing Board. Until then, it is a confidential document for internal use only. [text to be deleted once the document is approved]

In accordance with Council Regulation (EU) 2021/2085 and with Article 33 of the Europe's Rail Financial Rules from S2R GB Decision n° 11/2019 adopted by the GB decision n° 02/2021.

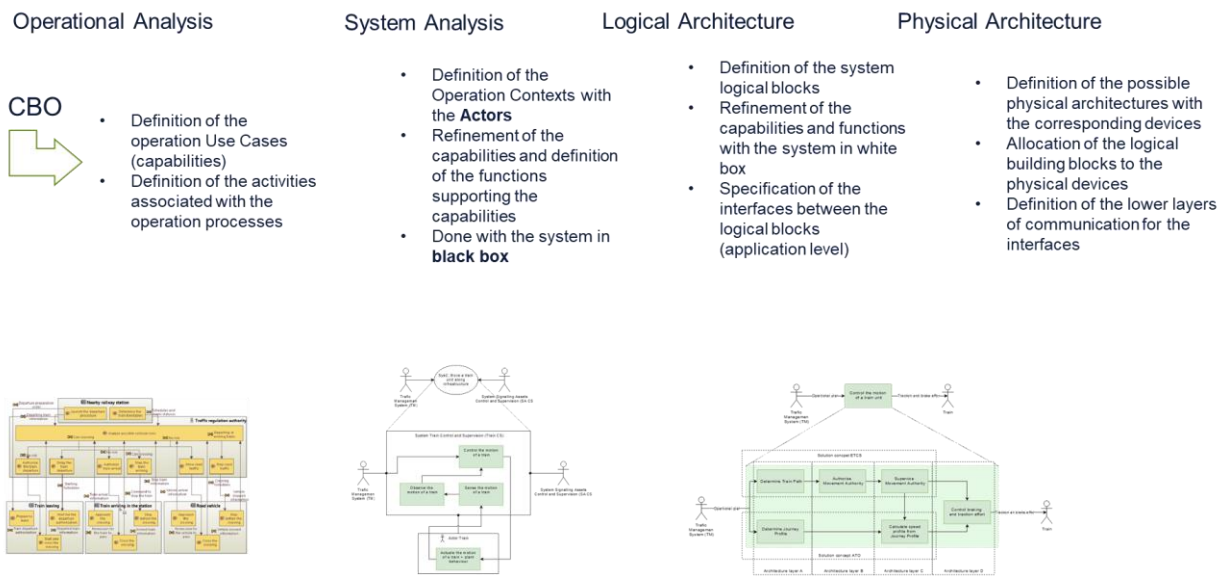
The Work Programme is made publicly available after its adoption by the Governing Board.

NOTICE RELATED TO S2R JU SUCESSOR

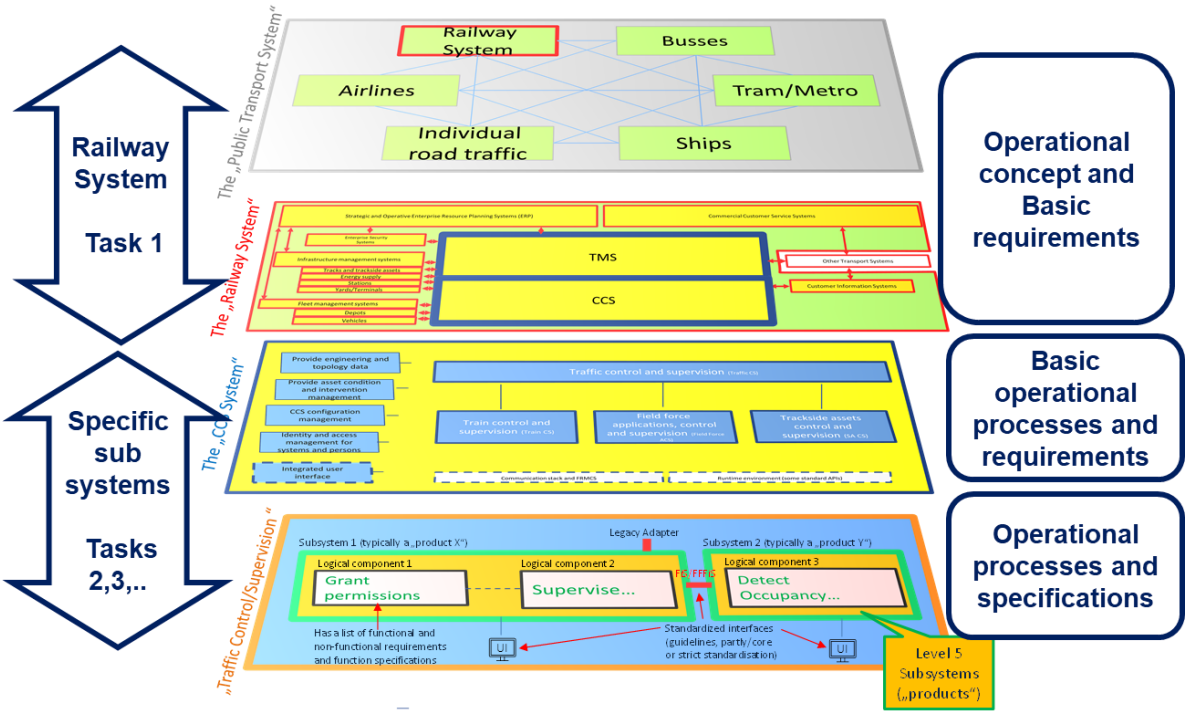
On 30 November 2021, Council Regulation (EU) 2021/2085 of 19 November 2021, establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014, entered into force. In accordance with this Regulation, the Europe's Rail Joint Undertaking (EU-Rail) became the legal and universal successor in respect of all contracts, including employment contracts, procurement contracts and grant agreements, liabilities and acquired property of the Shift2Rail Joint Undertaking (S2R JU). Therefore, if reference is made to S2R JU's contracts/agreements/assets/liabilities in this Work Programme, they should be understood as those of EU-Rail's. In addition, in accordance with Article 174(12), at its first meeting on 21 December 2021, the Governing Board adopted Decision n° 2/2021 listing the decisions adopted by the Governing Board of the S2R JU that shall continue to apply for EU-Rail.

2.3.2 The System Pillar

To achieve an architecture that offers the demanded functional improvements concerning production performance, reliability, quality, and cost as well as the needed architecture quality, the System Pillar (SP) follows the defined process, based on the principles of Model-Based System Engineering (MBSE):



Given that it is necessary to define the whole rail system in order to determine the areas of priority and focus, and in order to ensure consistency of approach, Task 1 of the System Pillar will define the high-level overall railway architecture and operational concept for the EU Rail System, whilst the other tasks, deliver the more detailed view of the systems and their specifications.



Through the Ramp-up phase for the SP a draft high level architecture has been drafted and reviewed with the sector. The full resource for the System Pillar has been in place since October 2022.

During the first year of the System Pillar, the workflows supporting the described model-based system engineering approach for developing the railway system architecture have been launched. The performed work comprises both the top-down system engineering approach, starting from the CBOs and operation use cases, as well as the bottom-up integration of the existing outcomes of previous S2R works or other sector initiatives (as OCORA, EULYNX etc.) The process steps of the implemented model-based system engineering approach have been elaborated in the System Engineering Management Plan (SEMP) and applied to a first set of operational capabilities. The described approach will be pursued in 2024.

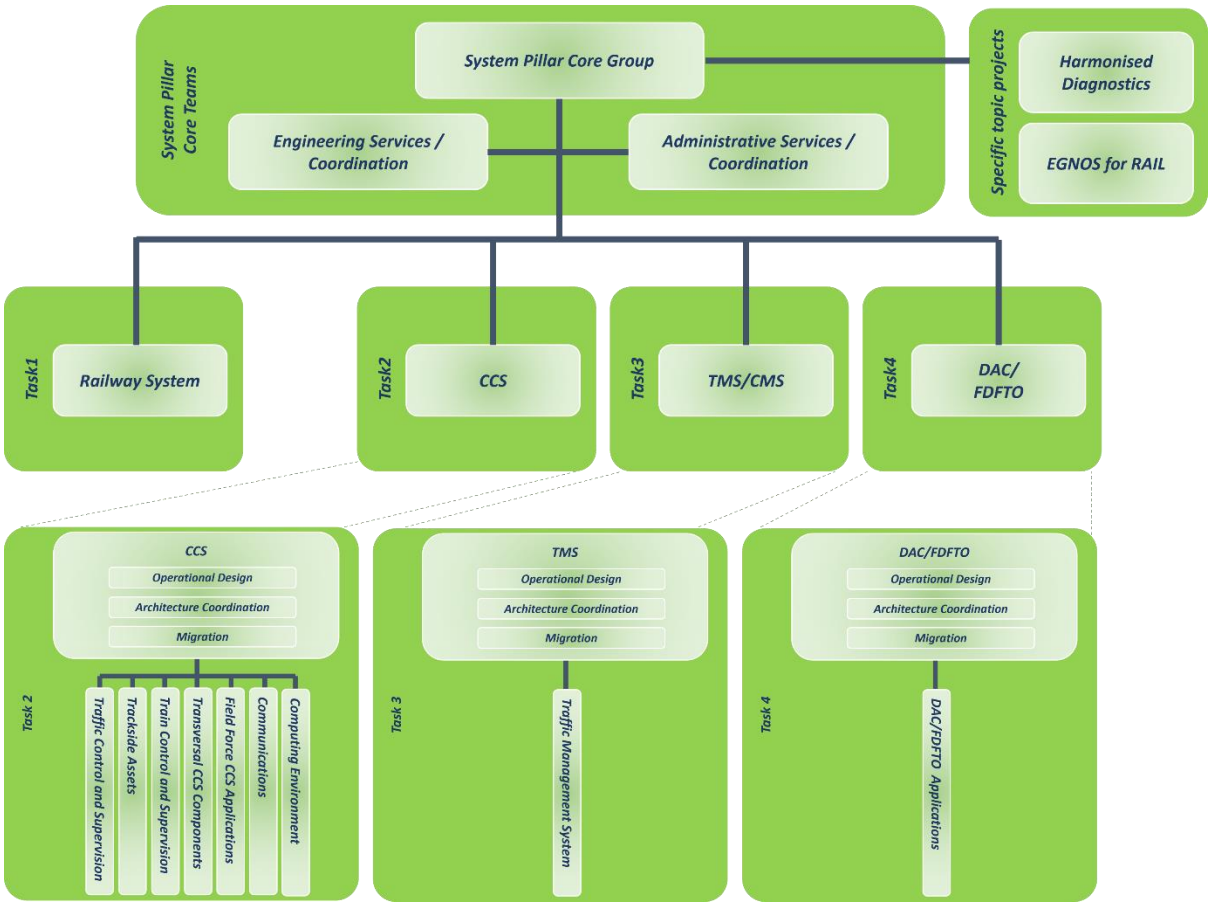
2.3.2.1 SP Organisational Structure of the activities

There are two different structures co-existing within the System Pillar organisation of the activities:

- The content structure: Describes the work items that need to be built in a certain sequence to create the deliverables. Content structures have many levels of details and are connected in all directions by the “flow of requirements”.
- The organisational structure: Defines the team structure and the control flow, aimed to be as simple (top-down), efficient, and effective as possible.

Regarding the difference between the content structure and the organisational structure, a “design team” for the business architecture of the railway system cannot be the “leading” team for all System Pillar projects. Design work and program management is not the same. The Task 1 analysis and design team contributes important requirements to the SP projects, but the progress management of the SP is done by the SP Coregroup/the JU.

The figure below illustrates the first and second level operational breakdown structure of the System Pillar, reflecting both the organizational structure:



The roles and responsibilities of the following SP groups are depicted in the EU-Rail's Governance and Process Handbook:

- SP Steering Group, Core Group, Engineering Services / Coordination (comprising Engineering Environment Team, Standardisation and TSI input planning, External Architectural support, PRAMMS Management and Assurance), Administrative Services (comprising Programme Office, Economic Analysis),
- Task 1: Railway System,
- Task 2: (Advanced) CCS system design,
    - The cross-cutting domain teams (comprising Operational Design, Architecture and release coordination and Migration and roadmap),
    - The CCS System Design Teams (comprising Traffic control and supervision, Trackside assets control & supervision, Train control and supervision, Transversal CCS component, Field force CCS application, Communication team, Computing environment),
- Task 3: TMS system design,
- Task 4: DAC/FDFTO[1] System design.
- Specific Topic Projects:
    - Harmonised diagnostics
    - EGNOS for Rail

[1] DAC = Digital Automatic Coupler / FDFTO = Full Digital Freight Train Operations (part of FA 5 project)

System Pillar Task 1: EU Rail System

The System Pillar Task 1 will be focussed on the European railway network to which Directive 2016/797 applies.

The vision of the European railway system is:

- Open access to SERA, i.e. no technical and operational boundaries for trains, standardisation (economies of scale), safety (including learning from information sharing) and resilience;
- Performant and competitive;
- Synchronised deployment, and
- Full alignment with the future system

The system architecture used by the System Pillar needs to be structurally and logically consistent, and reflect the structural reality that, currently, there is no single European railway system.

The high-level target architecture(s) will input to the considerations of the optimal level of technical and safety harmonisation building on cutting-edge technologies, making it possible to facilitate, improve and develop railway services within the Union, and with third countries, and to contribute to the completion of the SERA and the progressive achievement of the internal market. Interoperability must be achieved and maintained.

The scope of Task 1 should not be time-bound, and can consider several iterations of development i.e. it should be ambitious and flexible to take into account the impact of new technologies and processes with regards to rail (e.g. from the innovation pillar) which may require a substantial revision of, *inter alia*, safety concepts and the regulatory framework underpinning operations both with the clear goal to harmonise across Europe.

To achieve the overall evolution and target architectures defined in Task 1 will be a complex challenge. Best practice from other industries shows that successful integration of system architecture approaches, especially when moving from current engrained systems like in rail, is to take the opportunity when systems are in any case evolving to put in place the correct system architecture processes and principles.

System Pillar Task 2: CCS

The regulation and implementation of European rail control-command and signalling (CCS) is of central importance in the running of a safe, efficient, interoperable, robust cost-efficient and reliable rail service in Europe. CCS deals with all the on-board and trackside equipment required to ensure safety and to plan, command and control movements of trains authorised to travel on the network as well as the efficient integration of maintenance processes that occupy tracks.

Historically the automatic systems developed over time to monitor drivers' operation (continuous speed monitoring and avoidance of signals passed at red) have been developed to be different and they are still substantially different in each national railway network, and thus a major barrier to operate one European network.

A central focus at European level has been the implementation of ERTMS (European Railway Traffic Management System), a major industrial programme to harmonise the automatic train control and communication system and underpin interoperability throughout the rail system in Europe. Deployment of ERTMS provides the backbone for a digital, connected Single European Rail Area.

The current harmonisation at European level, through the CCS TSI, addresses the safety and interoperability requirements, the on-board functions and the interfaces between trackside and on-board related to train protection, signalling the permission to move the train and radio communication. Hence, not the full CCS system.

For trackside CCS beyond that specified in the CCS TSI, there are currently network or deployment specific approaches of trackside engineering, operational concept, signalling rules and their interfaces.

The current typical CCS on-board configuration includes multiple proprietary TCMS (train control management systems) and Class B driven interfaces between the main train on-board building blocks, which are currently not harmonised.

As a result, even if ERTMS as it stands is implemented in full across the EU, national systems for significant parts of the CCS system would continue, along with national operational rules driving customisation, and a continued overall fragmented CCS market of signalling configurations and rail business models.

This situation significantly increases CCS complexity and reduces the opportunity for more open and competitive markets across Europe. It also creates a system that is not conducive to harmonised evolution and innovation and induces errors and incompatibilities in implementation of the TSI regulated interfaces. Finally, it undermines the performance of the rail system in favour of clients opting for other mobility and transport solutions.

Hence the CCS task is to develop a harmonised operational concept and functional system architecture for a genuine integrated European CCS system, supported by a model-based systems architecting & engineering approach, beyond the current specifications in the CCS TSI, with much greater standardisation and much less variation than at present. Differences in operation are one of the key root causes for complexity as well as product diversity and therefore are a major cost driver. The harmonization of operational principles where economically possible – in particular under cab signalling and radio-based ETCS is key to achieve generic CCS solutions, minimize national requirements, reduce life cycle cost and achieve operational interoperability. This integrated CCS system shall on the one hand deliver unrestricted movement of trains, on the other hand, it shall create a single market for rail components.

CCS – both on-board and trackside - shall be based on a standardised modular system architecture using standardised interfaces. In order to preserve investment made, the System pillar should not only create adequate interface but care about migration feasibility (i.e. clear and affordable transition steps) and find paths for moving beyond the current system with proprietary interfaces and allowing modularity of components.

The need for the CCS task is because digitalisation technologies are ready for use in rail with huge potential to improve passenger and freight services. Digitalisation coupled with automation is one effective way to increase performance and capacity with less new infrastructure investments. Without high quality architecture, adding such new technologies and maintaining compatibility will not be possible.

The purpose of the focus on CCS is therefore to take advantage that as networks and Member States migrate to CCS systems of ERTMS L2 or above – the opportunity is taken to do this in a harmonised manner following functional layered architecture principles: this will set a common baseline that will allow to evolve systems at the technological evolution pace. It will be a major change from “black boxes” to “software solutions” computing environments.

Operational interoperability is an equally important goal of the Single European Rail Area. A further major opportunity is thus to create harmonized operational rules.

On this basis, a converging shared vision on future rail operations based on ERTMS-alone Level 2 and Level 3 networks will set up the baseline for the operational and technological solutions to ensure and continue evolutions of rail.

System Pillar Task 3: TMS/CMS

TM/CM means to create a long-term to short-term operational plan (production plan) that fulfils customer needs in an optimized way, to prepare and let execute the plan, and to predict and react on deviations and events with adapted planning or initiated interventions to solve production problems. The operational plan describes in very detail all types of track usage (train movements, stabling, construction sites, usage restriction areas, etc.).

Task 3 aim for Traffic Management is to reach a high, smart and flexible automation and cooperation levels for its long or short term simulation, planning, forecasting and coordination processes (cross-company, cross-country) in a way that allows to work with an integrated and rolling high-quality plan in near-real-time, based on automated information exchange between all involved planning partners.

The harmonization of operational processes is a key driver towards a deep and seamless integration of the new services and capabilities, with a specific focus on national borders; this is fundamental for the evolution of the Traffic and Capacity Management System to get an effective Single European Railway Area (SERA).

The basic vision will also include a highly digitalized tactical short-term planning with the relevant cost-efficient approach to address risks and opportunities.

This will allow task 3 of SP to achieve the objectives to:

- Strengthen the ability to sustain a given service quality, punctuality, and safe operation, by completeness of planning, adequate level of information, rapid responses to capacity requests and planning changes and reducing the impact of disturbances,
- Leverage on real-time information and data sharing to provide accurate status in order to provide to customer rapid alerts of traffic congestion and in general provide valuable data and information,
- Enable more efficient infrastructure usage and better predict capacity needs of infrastructure.

System Pillar Task 4: DAC/FDFTO

Coupling is done manually by a worker who must climb between wagons to hook and un-hook them, requiring physically exhausting manual operation in a hazardous environment. A more efficient, sustainable and competitive rail freight system is essential to meet the needs of both climate protection and rising transport volumes. Digital automatic coupler is an enabler to create a modern and digital European railway freight transport. It will not only increase efficiency thanks to automation processes, but it will also ensure sufficient energy supply for telematics applications, as well as safe data communication throughout the entire train.

Through the work in task 4, mainly regarding the high level specifications and providing the system view, System Pillar will be supporting the improvement of freight train composition, operation and capacity allocations of paths, stabling tracks (f.e. waiting for terminal slots) and shunting (yard) work.

Specific topic work items

Harmonised diagnostics

The ambitious plans of the European Union and railway undertakings are targeting a significant increase in rail usage. This increase requests a higher availability of railway infrastructure and rolling stock but also shortens the time for maintenance for both infrastructure and rolling stock. Thus, fast, and accurate data sharing among different stakeholders is key for better maintenance.

Previous and on-going projects have already developed approaches and concepts for standardized data exchange. However, a harmonized European approach for exchanging maintenance data has not yet been established and data which is currently produced by different technologies (e.g. checkpoints) cannot be exchanged across Europe, which hinders development of the railway sector and blocks business cases.

The initial remit is to select a limited number of examples to demonstrate "proof of concept" European harmonization on the approach, based on the SP Data Model. The procedure methodology and proposed solution should be worked out using simple, non-critical and useful examples, keeping the complexity of the task within manageable limits. Therefore existing and proven systems should be considered as far as possible, and feasibility demonstrated using a non-critical, useful applications and applying a system wide view.

EGNOS for rail

Current existing EGNOS SoL service has been developed according to aviation requirements. As these requirements are different from railway ones, this service cannot be used in rail safety related applications without additional activities to ensure the compliance with railway standards and to support safety evidence and guarantees.

For the successful adoption of the use of EGNOS within ERTMS framework, it is necessary that both the system/service and the service provision are defined, and where appropriate, properly introduced in the regulations and certified/authorised according to the European Rail regulatory framework.

The resource provided by the SP Consortium will also feed ERA for successive TSI drafting.

2.3.2.2 SP deliverables, milestones and harmonisation planning

The work of the System Pillar is structured along the different tasks described in section 2.3.2.1. In the following section the deliverables and milestones are summarized per task and domain.

Detailed information can be found in Annex VI.

Other outputs, such as the Standardisation and TSI Input Plan are also described, and the work to support the maintenance and update of the CCS TSI are also described.

Task 1 Railway System

Task 1 specifies the Business Process Architecture and the Operational design for the complete railway system up to System Level 2, following the defined Common Business Objectives and the expected future performances. Based on the identified pain points of the current (as-is) railway system, a priority list of operational and system capabilities will be defined, on which the development of an improved to-be architecture should focus. The includes the creation of the as-is operational architecture as well as the operational and system analysis of the proposed to-be architecture.

The deliverables for the period of the Work Programme are:

- *Priority list of capabilities* on which operational analysis and system analysis should focus
- Description of each capability with *operational process and scenarios*, highlighting divergencies between members states
- Identification and mapping of *pain points* in the operational architecture, in order to highlight activities and interactions where there are opportunities for harmonization
- Description of the *performances already reached by the as-is architecture*, identify existing rules, current performance, and process (TSI, EN standards, Operational rules and AMoCs – Accepted Means of Compliance)
- *Operational analysis* of the to-be architecture, based on a set of selected capabilities, including the provision of a draft of performances which could be reached by the To-Be Architecture and derived requirements.

Task 2 CCS

The activity of task 2 on CCS represents the main focus of the System Pillar activities and is divided in several domains.

Task 2 CCS: Domain Operational Harmonisation

This domain task is to integrate the stakeholder needs of RU and IM into the operational design in a way that allows to harmonize CCS procedures in the interoperable interactions and to harmonize CCS products according to the harmonization scope of the System Pillar, including the definition of all performance, safety, and efficiency targets.

The deliverables for the period of the Work Programme are:

- Completed *set of operational requirements*, derived from CBO and operational visions, and from stakeholder input
- Description of *processes and scenarios for the ERTMS capabilities*, including
    - operational outcomes necessary for the system analysis in T2 ARC
    - operational hazards and risk assessements of scenarios.
    - operational concept per scenario describing harmonized processes (concept and modelling level harmonization)

Task 2 CCS: Domain Architecture and Release Coordination

This domain, based on the required operational capabilities, derives the CCS system requirements and translates into system capabilities. The system functions and the overall logical architecture allowing their implementation are defined (System level 3).

The deliverables for the period of the Work Programme are:

- Amendment of system requirements, specification of System Analysis and Logical Architecture on System Level 3, defining the *next iteration of the target architecture model* based on the architecting approaches:
    - top-down: Based on the outcome of Task2 Operational Harmonization domain
    - botton-up: Analisys of existing system architecture from specifications, input initiatives and/or system domains

- Coordinate *overarching architecture processes* like ATO or Absolute Train Positioning specifications (including input to the overall work on EGNOS within the ERJU), analysis and moderation of the technical integration of the bottom up level 4 models and outcomes from system domains
- Identify input from the Domain to the *Standardisation and TSI Input Plan (STIP)* and support the SPCG in the analysis of the STIP draft and updates from architectural point of view
- Performing activities related to the "baseline exercise" of ATPS:
    - Complete the Operational Analysis linked to Common Business Objectives and the first level of the System Analysis according to SP SEMP and MBSE methodology
    - Ensure a coordinated and consistent development of the overall specifications (related to the onboard train positioning and its relevant interfaces) produced by different SP domains and possibly other WGs/tasks (e.g. of IP)

Task 2 CCS: Domain Migration & Roadmap

To support and ensure the migration to the developed CCS target architecture, this domain will develop a list of key migration requirements for the target system.

The deliverables for the period of the Work Programme are:

- Identification of *CCS feature packages that are indivisible* in terms of deployment together with the Architecture, Traffic CS and Train CS domains.
- Assessment and recommendation of a scope for *System Pillar Reference Architecture Baseline 1 Release 1* (SPRA B1R1) and succeeding releases according to STIP.
- Elaboration of a *list of key migration requirements* for the target system, based on CBO and other Railway requirements, that will facilitate migration in terms of architectural structure and automated deployment
- Assessment and recommendation of plateaus for a possible regulation process as input for the harmonization process

The detailed logical and physical architecture of the CCS system components (trackside and onboard subsystems) are designed in the following domains. Starting from a detailed description of the subsystem capabilities and related functions, the logical architecture is described. This work integrates top-down system requirements with existing architectures from specifications and previous/ongoing sector initiatives. The main outcome of the logical architecture design will be the agreement and definition of interfaces between the subsystem components, thus providing the physical architecture of the system components.

Task 2 CCS: Domain Traffic Control and Supervision

This domain is in charge of the management and maintenance of the Traffic Control and Supervision system architecture at the functional, logical and physical level, including system interfaces, data sharing and high level functional specification and requirements. Additionally, ensures alignment and cooperation between the System Pillar and the Innovation Pillar flagship area 2

The deliverables for the period of the Work Programme are:

- Description of the *operational requirements and operational capabilities/processes* for providing, configuring, maintaining, and exchanging the Traffic CS components, including needed System capabilities and their functions.
- Amendment of *system requirements*, *specification of System Analysis and Logical Architecture* on System Level 4

Task 2 CCS: Domain Train Control & Supervision

The Train CS domain is responsible for the onboard CCS system. This includes beside the ETCS vehicle equipment also the additional components and functions like ATO (GoA 2 -4), RTO (Remote train operation), C-DAS and others from the on board perspective. Close alignment with the communication domain (now Lot 3) required to define the interface between FRMCS and the Train CS system.

The deliverables for the period of the Work Programme are:

- The *architectural drawing of the target architecture* and descriptions of the functional building blocks
- Preparation for an update of *Subset-121 and Subset-147*
- Proposals for functional enhancements of the *interface of the on-board CCS subsystem to the train*
- Description of a draft physical architecture with defined subtasks, responsibilities, and schedule
- Consolidated collection of agreed and prioritized functions
- Elaboration of a concept for the *simplification of authorization and integration processes* and the framework conditions for better upgradeability
- *Transition of OCORA technical workstream to the SP*: Agreed input for SP related activites and plan for transition of OCORA technical workstreams to related SP documentation

Task 2 CCS: Domain Computing Environment

The task of the computing environment domain is to find solutions to simplify software installation, hardware configuration and life-cycle processes such as upgrades, updates, or replacements with different software products

The deliverables for the period of the Work Programme are:

- Creation of first *operational standardization specifications* (ORS CONEMP) for computing environment, based on an operational concept based on the Use Case analysis from SC 2.1,. The operational analysis includes the deliverables along SEMP process Group 2 (Annex D) for the CONEMP operations (lifecycle processes for construction, maintenance, replacement, etc.).
- *Identification of system capabilities, functions and external actors* in the System Analysis, based on the operational concept, covering all the interfaces identified
- Drafting of *API specifications* coordinated with Innovation Pillar

Task 2 CCS: Domain Trackside Assets Control & Supervision

The Trackside CS domain is responsible for the specification of the sub systems controlling the trackside objects like points, track vacancy detection, level crossings and others, focusing in this period on the remaining topics of the specification after the release of the first version of the interface specification and the clarification of the needs for a light signal object controller.

The deliverables for the period of the Work Programme are:

- Description of the asset management and life cycle processes (installation, setup, maintenance, exchange) and their operational requirements.

Task 2 CCS: Domain Transversal Systems

The Transversal Systems domain and its four subdomains provide systems, standard protocols, and data structures for functionalities that are needed on network level and for engineering use cases

The deliverables for the period of the Work Programme are:

- Definition of the CCS/TMS Data model, including:
    - Serving the use cases of the System Pillar domains and IP projects
    - Uptake of the ERA vocabulary (semantic data model)
    - Linking semantically the SP Data Model with external models outside SP scope
    - Applying and improving the SP Data Model governance
    - Updating and amending STIP and Definitions and References
- Definition of the CCS/TMS Diagnostic Data, including:
    - Finalization of operational requirements and processes
    - System Analysis, System definition of the specific subsystems
    - System Requirements for the specific CCS component(s) related to technical diagnostics and monitoring purposes
    - Updating and amending STIP and Definitions and References
- Configuration management methods and system definition
- Rules and System definition for Railways system User Interface subsystems Integration

Task 3 TMS & CMS

This task carries out the coordination and execution of the detailed design work for the lower System Levels 3, 4 and 5 for the Traffic Management System/Capacity Management and defines detailed operational processes and requirements, functional system analysis and technical architecture

The deliverables for the period of the Work Programme are:

- Addition to the already existing System Concept document the topics of *system interfaces, legislative and economic issues, and System definition and capabilities*.
- Provision of *processes and the logical architecture* in the existing high-level design of the System Architecture, including addition of system requirements and specification of interfaces
- Submission of the complete specification of the interface between TMS and Traffic Control and Supervision system
- Definition of the internal interfaces of the Traffic Management System, including System definition and capabilities
- Description and analysis of pros and cons of different architecture models of *TMS/CMS for the management fo cross border traffic*

Task 4 DAC/FDFTO

Task 4 is responsible to manage all cross-cutting activities related to DAC/FDFTO (e.g., regarding operational procedures, architecture and interfaces embedding the onboard system, developed by FP51, into the overall railway system), manage the input to the Standardisation and TSI Input Plan (STIP) for DAC/FTDFTO and supports FP5 regarding authorisation strategy. This implies working in close alignment and cooperation with Innovation Pillar Flagship Project 5 (FP5) and EDDPneo@EU-Rail, including participation in mediation of conflicts with other Innovation Flagship Areas and SP Tasks.

The deliverables for the period of the Work Programme are:

- *FDFTO Operational Rule Book* based on sector feedback and final mature input from FP5
- Description of ERTMS related use cases (including agreement), interface ATO <-> ASO (if needed) and automated freight shunting and train formation use cases
- Analysis of further interfaces of train-internal DAC/FDFTO to the "outside" world (in cooperation with Task 1)
- Elaboration of a concept how to share the data generated by the DAC system by loco and wagon between the stakeholders taking into account data ownership and confidentiality topics
- Activities related to STIP input maintenance and to “Authorisation Coordination”, with ERA, CEN/CENELEC & others: TSI CR management, EN Standards development, Syst. Pillar documents

Specific Project: Harmonised Diagnostics

It has been identified that the lack of harmonization in regards to exchange of maintenance data between borders across Europe hinders development of the railway sector and blocks business cases To overcome this, this specific project activity is aimed to select a limited number of examples to demonstrate “proof of concept” European harmonization on the approach for exchanging maintenance data, based on the SP Data Model and the associated Diagnostic Data Model.

The deliverables for the period of the Work Programme are:

- Analysis of *existing framework*, definition of *use cases* (incl. KPI), functional requirement for measuring KPI, outlining certification needs, addressing key obstacles (i.e. Data handling, juridical boundary conditions), outline solution, initiate solution process)
- Detailed elaboration/development of the framework/architecture and applying framework to a concrete example of use cases, measuring systems and parameters; output: harmonized measuring methods and parameters.

Engineering Environment Team

The Engineering Environment team includes methods definition (System Engineering Management Plan (SEMP)) and tools provision and training (Polarion, Capella, SysML specification environment) for the whole System Pillar. It monitors the formal quality of the work items, their correct allocation to the tasks and domains, and the consistency, traceability and integrity of the specification. Its role is to actively support where needed and take care that the work of the Tasks and domain can be done in an efficient way and with the needed quality.

The deliverables for the period of the Work Programme are:

- New version of the *System Engineering Management Plan (SEMP)*, including at least: reference management, quality assurance process, verification and validation processes, handbook (MBSE), v1 (on documentation, concept, architecting and modelling), automated traceability check processes (process and tool), revision of all annexes, especially those with open points not addressed in SEMP v2.
- Set up a *requirements management plan* and coordinate the completion of the first complete set of linked requirements (at least on top-level per domain) for the whole system currently in scope
- Creation and publishment of the first complete and consistent *SP Glossary* (incl. terms from European legislation) and creation of a central LiveDoc with all *Reference workitems* in SP-Library, and migration of all decentral references of the projects to it.

- Check all results of the first and second contract (that were finalized on domain level) concerning *formal Quality* (SEMP compliance; results in Polarion and Capella). Deliver optimization report to the domains.
- Capella usage is established in all teams (dedicated modelers) and SysML tool is procured, installed, trained and Trackside Asset specifications (EULYNX) is imported

PRAMS

The PRAMS team is in charge to define the strategy, policies, methods, and principles to be followed by the other Tasks and Domains during the design activities as well as to coach and support implementation. PRAMS team do not produce PRAMS Analysis, Hazard and Risk Analysis, for system components or system parts; these activities are delegated to the related Domain that have to include members with PRAMS skills. The PRAMS Functional team is in place to have a proper coordination and synchronization.

The deliverables for the period of the Work Programme are:

- Performance definition and KPI's part of EU regulatory framework and methodological approach combining Qualitative criteria and results.
- Analysis of RAM Performance needed to reach overall Performance Targets
- Refinement of CBM RAMS rules
- Update System Concept (RAMS Phase 1) and PRAMS Plan (RAMS Phase 2) according to evolving system architecture and mission profiles
- CENELEC changes proposal for harmonisation and modular approaches.
- Coaching of PRAMS experts throughout ERJU SP and IP to follow the Safety Guideline and assure PRAMS requirements implementation.
- Processes for Hazard and Risk Analysis and harmonized hazard lists for Operation and System level
- Contribution to EGNOS project dealing with *certification and authorisation processes*, to be introduced into TSI CCS

Security

The Securtity team is in charge of centrally coordinating the Security requirements, including top-level design and assurance of the requirement implementation in the System Pillar Tasks and the specification of the subsystems for monitoring and the system control access.

The deliverables for the period of the Work Programme are:

- *Secure Product and Secure Communication* specifications (for Innovation Pillar)
- *Secure Product and Secure Communication* specifications, Shared Security Services specifications and Secure Operational processes (for TSI standarization input)

Standardisation and TSI input plan (STIP)

The harmonisation of the European railway system, aiming at interoperability and an uniform European market for railway technology, is a main goal of the System Pillar. For this purpose, all potential topics for harmonisation, including the channels TSI, European Standardisation and SP documents, will be assessed and collected in the Standardisation and TSI Input Plan (STIP).

The input to the STIP is based on all the relevant potential or known harmonisation topics from the System Pillar and Innovation Pillar activities, being the quality of the information checked for completeness and consistency by EU-RAIL, with support of SP where appropiate.

Once approved by the System Pillar Steering Group, the STIP will provide a validated and complete view of the harmonisation outputs linked to EU-RAIL, endorsed by the European Commission, ERA, the European Standardisation bodies and the sector as a whole. This should enable a more strategic alignment of the outputs of EU-RAIL with the TSI revision process and the European standardisation process, and associated Commission request

This deliverable will be therefore instrumental to support the European Commission in its mandate updates to the European Union Agency for railways for TSI development or to the European Standardisation Bodies (CEN/CENELEC/ETSI) for the EN standards development.

CCS TSI Maintenance Activities

The aim of the activities defined in the Lot 3 CCS TSI Maintenance Activities is

- To resolve errors in the current TSI CCS in order to remove ambiguities in the specifications.
- To transfer results of Lot 2 and any other agreed enhancements into the ERA CCM process for the TSI CCS (with possible impact on TSI OPE).
- To facilitate the inclusion of completed versions of FRMCS specifications in future CCS TSIs
- To help infrastructure managers and vehicle owners with the deployment of ERTMS by solving their (potential) technical problems and by putting into place appropriate processes for testing, validation and certification in view to facilitate the authorisation
- To provide and maintain harmonised engineering guidelines

The deliverables for the period of the Work Programme are:

- Maintenance of ETCS and ATO specifications: error Change Requests (CRs) management (up to status ‘analysis completed’), update of Subset 147 version 2,update of safety analysis and other specifications
- CCS 2023 TSI revision: Review of the Subset 153 (ERA CCM process) and update of the application guide of Subsets 077, 078, 079, 080, 081, 088, 118, 129 and 116
- Maintenance of engineering guidelines: Gap analysis of useful guidelines in the future and overall ETCS engineering guideline version 1
- Principles for ATO Testing: Elaboration of Subset 151, including all the test cases covering integration of OB-ATO and OB-TS, traced from the Subset 125
- Maintenance of GSM-R specifications: error CRs management (up to status ‘analysis completed’)
- Evolution of FRMCS specifications: Delivery of drafts UIC FRMCS V2 specifications to ERA and EU-Rail, mapping the functional requirements to the system requirements, FRMCS cybersecurity risk assessment, related reports (meetings between stakeholders, contribution in ECC/CEPT subgroups related to FRMCS spectrum, 3GGP activities), input to UIC FRTMCS Program (CRs or equivalent) and preliminary planning for FRMCS V3 specification
- Contribution to ERA TSI CCS Change Control Management Process: Update of the on-board test specifications (Subset-076 and related documents) based on the CCS TSI 2023, in particular the design of the test specifications for on-board said to support a reduced envelope of system versions up to System Version 2.1 and 2.2.

2.3.2.3 System Pillar and Innovation Pillar interactions

EU-Rail, through the System Pillar will aim to have a coherent approach to the evolution of the EU rail system through a system architecture approach.

The SP has a discrete work scope to set the system architecture of the rail system (Task 1), and in particular the CCS, TMS/CMS and DAC/FDFTO architecture (Task 2, 3 and 4), as well as coordinating the standardisation and TSI outputs of EU-RAIL. While the main focus will be on these Tasks, the System Pillar will have to integrate and duly consider other key elements, such as interfaces to urban mobility and energy systems.

EU-RAIL will develop the operational concept(s) and functional system architecture with much greater standardisation, a wider scope, aiming at no variation compared to presentI.

The Innovation Pillar (IP) will deliver, through research and innovation, advances in, *inter alia*, advanced traffic management, digital and automated train operations, and rail freight.

The description of the interaction is found in the EU-Rail Governance and Programme Handbook.

The interaction between the IP projects and the SP is both-way. For the specification and development of the demonstrators for innovative technologies, the Flagship Projects of the IP will consider the specifications of the railway target architure, developed by the System Pillar. Since the complete specification of all levels of the target architecture (including level 5, physical architecture) will not be available in the coming year, higher-level specifications and realistic assumptions will be used.

In return, the Flagship projects will inform the SP about the technical feasibility and efficiency of different system solutions evaluated in the demonstrators and therefore contribute to the guidance and realignement of the specification of the target railway arechicture.

Therefore, the main objective of the IP-SP interaction are:

- Identify the main technical standardisation areas of collaboration between SP and IP,
- build in the projects the necessary details of the continuous process integration to reach together the EU-Rail outcomes that will achieve target system complying with the CBO,
- include necessary provisions to achieve the Standardisation and TSI input plan together with all the necessary mature standards and regulation proposals,
- revision that the inputs expected by the Flagship projects from the SP are foreseen to be achievable on time

2.3.9 Calls for tenders and other actions (SP extract)

Procurement procedure	Title	Scope	Indicative timetable (Q-quarter)	Indicative budget (EUR)w
Implementation framework contracts for services	Europe's Rail System Pillar	Implementation of a 6-year framework contract (3 lots) following an open call for tenders procedure with a total value (3 lots) of EUR 45 million.	Q1-Q4 2024	Specific contracts 2024 (3 lots) : 10 000 000

Annex VI – System Pillar deliverables and milestones

The remits and related deliverbales and milestones for every task and domain for 2024 can be found in the following tables. They are based on the Specific Contract SC2.3 for Lot2 with the SP consortium.

Engineering Environmental Team

No	Regular tasks / improvement deliverable	Milestone
01	**SEMP**	
01a Regular tasks	**1.** Check SEMP application once in 6 months per domain and create a report and issue list. **2.** Analyse and detect inefficiencies und unused aspects of the SEMP application in the teams and define optimization issues. Check every SEMP process in at least two teams during the contract period. **3.** Collect actively feedback about the SEMP and create optimization issue workitems in Polarion. **4.** Collect and react on user questions about the SEMP application (hotline). Create a FAQ list and provide it to the domains. Create issue workitems of SEMP optimizations and report to the requesting users when they are solved.	List of issues solved every month
01b Improvements / single deliverable	a. <u>Description of Deliverable:</u> Two new SEMP versions are expected (one version per six month) in this contract (V3, V4) V3 shall contain: • Quality assurance process, • Documentation, concept, architecting and modelling handbook (MBSE), v1. • Revision of all annexes, especially those with open points not addressed in SEMP v2. b. <u>Sub-Milestones:</u> • SEMP V3: May 2024 c. <u>Definition of done:</u> • SEMP update is approved by Coregroup, domain and all domains leads d. <u>Interaction with other Domains:</u> **All**	Oct 2024

No	Regular tasks / improvement deliverable	Milestone
02	**Requirements management**	
02a Regular tasks	1. Refine the requirement management process in the SEMP. Check the process application in the domains (at least every 6 months per domain) and give feedback and instructions. Register issues for the process improvements. 2. Check the quality of newly (or externally) created requirements (probes) once per month, and give feedbacks to the domains, e.g., about the following aspects: 1. Textual quality 2. Correct derivation 3. Links and traceability 4. Unassigned requirements **3.** Prepare and coordinate the functional team meetings (every 1-2 month) for requirements: Coordination for the assignment of requirements to the domains, if the assignment is unclear 4. Assure the coherence, quality, and completeness of the full requirement implementation in the specification (requirements from all sides, like from sector, Task 1 or between other Tasks or domains), as well as for the processes and interfaces between tasks. Create two reports per year about the requirement implementation. Manage all points above as a prioritized Issue (with linked tasks) list in Polarion and create monthly work reports out of this list	List of issues solved every month
02b Improvements / single deliverable	a. <u>Description of two deliverables:</u> **I.** Set up a requirements management plan that gathers which requirement areas in all domains will be worked on and completed when. II. Coordinate the completion of the first complete set of linked requirements (at least on top-level per domain) for the whole system currently in scope based on contributions of the tasks and domains. b. <u>Sub-Milestones</u>: none c. <u>Definition of done</u>: **1.** Requirements management plan is defined and agreed d. <u>Interaction with other Domains</u>: All domains	Dec 2023 July 2024
03	<u>SP meta data (Definitions and References)</u>	
03a Regular tasks	1. Refine the glossary and Reference management process in the SEMP. Check the process application in the domains (at least every 6 months per domain) and give feedback and instructions. Register issues for the process improvements. 2. Check the quality of newly (or externally) created Definitions (probes) and references once per month, and give feedbacks or change tasks to the domains about the following aspects a. Preciseness and specificity (e.g. domain specific language only allowed for very generic terms) b. Textual quality c. Links and traceability (correct linked usage in specifications)	List of issues solved every month

No	Regular tasks / improvement deliverable	Milestone
	3. Prepare and coordinate the functional team meetings (every 1-2 month) for Glossaries: Coordination for the assignment of definition work to the domains, if the assignment is unclear Manage all points above as a prioritized Issue (ith linked tasks) list in Polarion and create monthly work reports out of this list for the domain reporting (new issues and solved issues)	
03b Improvements / single deliverables	Create and publish the first complete and consistent SP Glossary (incl. terms from European legislation)	Apr 2024

No	Regular tasks / improvement deliverable	Milestone
04	**Specification and model integration, quality assurance, and result/import integration**	
04a Regular tasks	1. MBSE model administration (creation, model management, import on demand, role assignment, …). Assess SP-external specification and models as the single point of contact, assign it to the domains, and import/link it to the Mastermodel/Specification(Polarion) in collaboration with the domains (main workload in the domains) 2. Prepare and coordinate the functional team for all modelers of the domains 3. Integrate OA, SA & LA models based on the inputs of the tasks and domains according to their milestone structure, integrated in the master model and fulfilling the decide requirements. Create integration assessments together with the responsible domains. Propose model amendments to the modelers in the domain **4.** Prepare and coordinate the functional team meetings (every 1-2 month) for modelling: Coordination for the assignment of modelling tasks if the assignment is unclear Manage all points above as a prioritized Issue (evtl. with linked tasks) list in Polarion and create monthly work reports out of this list (new issues and solved issues).	List of issues solved every month
04b Improvements / single deliverable	**Description of Deliverable:** Check all results of the first and second contract (that were finalized on domain level) concerning formal Quality (SEMP compliance; results in Polarion and Capella). Deliver optimization report to the domains. **Interaction with other Domains:** All	Quarterly

No	Regular tasks / improvement deliverable	Milestone
05	**Tool support for Polarion, Capella, SysML tool, SP sharepoints, Git, publication platform**	
05a Regular tasks	1. Manage relevant licenses and technical support 2. Administer the SP Sharepoint and Git installation 3. Polarion-Capella bridge maintenance and training for EET and other domains / tasks. **4.** Provide Tool hot line for trouble shooting and user support Manage all points above as a prioritized Issue/Task (evtl. With linked tasks) list in Polarion and create monthly work reports out of this list (new issues and solved issues).	List of issues solved every month
05b Improvements	**Description of Deliverable and definition of done:** Capella usage is established in all teams (dedicated modelers) and SysML tool is procured, installed, trained and Trackside Asset specifications (EULYNX) is imported **Interaction with other Domains: All domains**	June 2024

PRAMS

No	Deliverable	Milestone
	Performance and RAM	
01	**Refinement of Performance KPIs and definition of Performance Targets for a modular railway architecture** a. Description of Deliverable: Performance definition and KPI's part of EU regulatory framework Methodological approach combining Qualitative criteria and results b. Sub-Milestones: KPIs and Qualitative methods preliminary release c. Definition of done: Document is in Polarion, reviewed by the mirror groups (if applicable) and ready for SPCG revision. d. Interaction with other Domains: All	Q3/2024 Q1/2024
03	**Refinement of CBM RAMS rules** CBM part of EU regulatory framework a. Description of Deliverable: a. Standardized set of requirements for CBM b. Provide inputs to STIP b. Sub-Milestones: No c. Definition of done: Document is in Polarion, reviewed by the mirror groups (if applicable) and ready for SPCG revision. d. Interaction with other Domains: All	Q3/2024
	Safety	
06	**Update System Concept (RAMS Phase 1) and PRAMS Plan (RAMS Phase 2) according to evolving system architecture and mission profiles** a. Description of Deliverable: Scope of ERJU (boundaries), system architecture and mission profiles (like cargo, mixed traffic, passenger, high speed) are defined more precisely. The existing deliverables of SC 2.1 will be updated, processes for hazard and risk analysis and design rules changed if needed. b. Sub-Milestones: No c. Definition of done: Documents updated are in Polarion, reviewed by the mirror groups (if applicable) and ready for SPCG revision. d. Interaction with other Domains: Mostly with task 1 and ARC-F for input	Q2/2024
07	**CENELEC changes proposal for harmonisation and modular approaches.** a. Description of Deliverable: Proposal of possible changes to CENELEC standards starting with EN 50126, 50128 (or 50716 likely replacing it), 50129 to better support harmonisation and modular approaches. Feedback from CG on the existing PRAMS Plan and the modularization approach for safety assurance therein will be a vital input to decide how to b. Sub-Milestones: Q1/2024: input plan, Q3/2024 proposals for changes to standards c. Definition of done: All standards to be changed by PRAMS identified in TSI input plan, proposals for changes forwarded to the appropriate standardsiation committees. d. Interaction with other Domains: No direct interaction, but experience and feedback of other domains on modular approach to be used	Q3/2024
08	**Coaching of PRAMS experts throughout ERJU SP and IP to follow the Safety Guideline and assure PRAMS requirements implementation**.	Monthly

No	Deliverable	Milestone
	a. Description of Deliverable: No documents b. Sub-Milestones: Ongoing task, regular meetings c. Definition of done: Set-up of Functional Teams for PRAM and Safety d. Interaction with other Domains: All	
10	PRAMS will contribute to EGNOS project dealing with certification and authorisation processes, to be introduced into TSI CCS	Q3 / 2024

Security

No	Deliverable	Milestone
	Security	
01	**Draft security specifications for innovation pillar** CG Feedback for architecture assumption a. Description of Deliverable: - Secure Product Specification - Secure Communication Specification b. Sub-Milestones: None c. Definition of done: Drafts available for Innovation Pillar	Q4/2023
02	**Continue security specification for TSI standardization input:** a. Description of Deliverable: - Secure Product Specification - Secure Communication Specification - Shared Security Services Specification (TIME, PKI, IAM, LOG) - Secure Operational Processes (Application Guide) b. Sub-Milestones: Drafts for Shared Security Services Specification and Secure Operational Processes available for review for CG and other domains c. Definition of done: input for the STIP ready for final review	Q3/2024 Q2/2024

Task 1 Railway systems

No	Deliverable	Milestone
01	**Task management and reporting** a. Description of Deliverable: Collaboration and sector endorsement (Polarion) b. Description of Deliverable: Teams' setup/role and deliverables responsible Architecture explicitation and Modelling support (Polarion/Capella) c. Sub-Milestones: Create mirror group for task 1 and organise sector commitment process (In coordination with SPCG). d. Definition of done: minutes of meeting, presentations, internal process, planning documents e. Interaction with other Domains: Planning of interaction with other domains and FPs. Regular coordination with the Core group on project management and associated reporting.	Continously Q1/2024 (mirror group)
02	**Capability prioritization based on identified pain points (agreement in first step: Q1).** a. Description of Deliverable: Define a priority list of capabilities on which operational analysis and system analysis should focus on the main issue addressing in ERJU (with SPCG). Any potential additional requests such as energy management, military mobility, multimodality should be discussed separately. b. Sub-Milestones: none c. Definition of done: Prioritized capability document approved by SP-STG The (2 to 3) identified capabilities (harmonisation areas), which are then further investigated. d. Interaction with other Domains: Depend on different domain maturity, interaction should be organized in coordination with the SPCG	Q1/2024
03	**As is (AI) Operational Architecture on the prioritized capabilities reflecting the differences between the countries: Continue and consolidated the operational analysis to provide a basis for the diagnosis of the possibilities of harmonization. Setup the sectorial discussion in polarion (Mirror group and sector alignment)** a. Description of Deliverable: a. For each selected capability describe activities, involved entities and activities interactions. b. Provide operational architecture diagrams, and map on it the identified pain point to highlight activities and interactions where we can have opportunities for harmonization. Describe the performances already reached by the as-is architecture, identify existing rules, current performance, and process (TSI, EN standards, Operational rules and AMoCs – Accepted Means of Compliance) b. Sub-Milestones: 1. Diagnosis of the pain points for selected capabilities and process and identity performance target 2. Handling sector commitment and alignment	Q1-Q2/2024

04	**Operational analysis of to be (TB) architecture. Setup the sectorial discussion in polarion (Mirror group and sector alignment)** a. Description of Deliverable: Selected capabilities based on expected performances of the railway system, related improvements, pain points and CBO. The introduction of game changers (ATO, DAC, FRMCS) will be considered (Benchmarking). Provide a draft of performances which could be reached by the To-Be Architecture and derived requirements. Define the performances which could be reached for to-be architecture. Derive a requirement set reflecting the Common Business Objectives.	Q2-Q3/2024

Task 2 CCS: Operational Harmonisation domain

No	Deliverable	Milestone
01	**Collected operational requirements from the sector (RU, IM)** a. Description of Deliverable: Completed set of operational requirements, derived from CBO and operational visions, and from stakeholder input of the Mirror group or other RU an IM b. Sub-Milestones: Intermediate results for SPCG on Dec. 2023 c. Definition of done: The requirements describe the full stakeholder needs concerning the operational production (CONUSE) and are agreed in domain and mirror group d. Interaction with other Domains: T2 ARC, T2 MIG	03/2024
02	**Harmonised processes of 80% of the capabilities and their scenarios (according to the focus of first specification iteration)** a. Description of Deliverable: Processes and scenarios, including the operational outcomes necessary in SEMP for the system analysis in T2 ARC. Operational concept per scenario describing harmonized processes including the description of parametrisation, incl. OA model described in Capella b. Sub-Milestones: 7% of the scenarios are described per monthly sprint and approved on domain level. c. Definition of done: The differences of the countries are identified and analysed, and the harmonized process version is designed and agreed on domain level d. Interaction with other Domains: output to T2 ARC	09/2024
03	**Preliminary operational risk analysis based on deliverable 2** a. Description of Deliverable: Operational hazards and risks as Polarion work items for the scenarios described in 2. b. Sub-Milestones: 7% of the scenarios are assessed per monthly sprint and the assessment approved on domain level. c. Definition of done: The PRAMSS team checked the completeness of the risk assessment against known hazard list d. Interaction with other Domains: Deliverable reviewed by PRAMSS	09/2024

04	**Contribute to the clarification Task of the T2MIG team concerning the need of special lineside signals** a. Description of Deliverable: Concept contribution with an operational analysis that assesses the feasibility of a production completely without lineside signals, also for shunting, stations, at the border of supervised areas, and for degraded modes with vehicles having no working ETCS onboard. b. Sub-Milestones: No c. Definition of done: Concept agreed with the domain, the T2MIG and SPCG d. Interaction with other Domains: all T2 domains	02/2024

Task 2 CCS: Architecture and release coordination domain

No	Deliverable	Milestone
01	**Amend system requirements, specify System Analysis and Logical Architecture in Polarion/Capella on System Level 3** e. Description of Deliverable: Next iteration target architecture model and its conversion to text and requirements in Capella, 2 revisions are expected. Architecture guidelines (design Rule workitems) are amended where needed. Top-down architecting based on the outcome of T2 OD • Described system actors • List of described system capabilities • Functional chains with description of functions, perhaps specific versions for single configuration variants. • Logical architecture of CCS (basic model as a draft in Q4 2023) • Allocation of functions to logical components • Logical functional exchanges Bottom-up architecting by: • Analysing the existing system architectures from the specifications, input initiatives, and/or the system domains Interaction with other Domains: Dependency from T2 OD input. Output for the other T2 System domains.	Q3 2024
02	**Moderation and Coordination** Coordinate overarching architecture processes for a. Description of deliverable: • Coordinate ATO specifications (compare/synchronize R2DATO specification work with current SP specification iteration 1 which is done without ATO GoA3/4) • Coordinate specifications about absolute Train Positioning, and responsibility for SP work in joint activity (EU-Rail, ERA, EUSPA, ESA) to support EGNOS (in SP, synced with R2DATO) • Interaction and input to FP2, and linked maturity checkpoints • Analysis of the technical integration of the bottom up level 4 models and outcomes from system domains, moderation for resolution: a. identification of functional and technical misalignments, b. Revision of the granularity criteria in each of the systems from the domains c. Revision of the evolvability of the systems through the requirements received from the system domains b. Sub-Milestones: • **ATO action** plan for 2023/24 defined and work allocated: Oct 2023, separate monthly status reporting started • **Absolute Train Positioning** action plan for 2023/24 defined and work allocated: Nov 2023, separate monthly status reporting started. c. Definition of done: The coordination tasks are successful if • All necessary tasks are listed and allocated, • a clear understanding of the results was agreed, • the progress is monitored on a monthly basis **d.** Interaction with other Domains: All T2 domains	Monthly

No	Deliverable	Milestone
03	**Standardization and TSI Input Plan V1 (STIP)** a. Description of Deliverable: • Identify input from the Domain to the STIP • Support to the SPCG in the analysis of the STIP draft and updates from architectural point of view, by analyzing the proposals against the target architecture, the architecture roadmap, the granularity principles and the architecture guidelines. b. Sub-Milestones: STIP V1 end of 2023, update in 2024 c. Interaction with other Domains: All Task 2 domains	Q4 2023

Task 2 CCS Migration & Roadmap domain

No	Deliverable	Milestone
01	**CCS features packages indivisible for deployment** a. Sub-Milestones: Quarterly intermediate results for SPCG b. Interaction with other Domains: Architecture, Traffic CS, Train CS	03/2024
02	**Scope for System Pillar Reference Architecture Baseline 1 Release 1(SPRA B1R1)** a. Sub-Milestones**:** Quarterly intermediate results for SPCG b. Definition of done**:** The criteria, assessment and scope of the B1R1 recommendation is approved in domain and mirror group c. Interaction with other domains**:** All Task 2 domains	06/2024
03	**Migration Requirements for Target System** a. Sub-milestones**:** Quarterly intermediate result for SPCG. b. Interaction with other Domains**:** Task 2 Architecture domain, to implement in target system.	09/2024
04	**Input for STIP** a. Description of Deliverable**:** Assess and recommend plateaus for a possible regulation process as input for the harmonization process b. Sub-Milestones**:** Quarterly intermediate result for SPCG. c. Definition of done**:** The plateau(s) recommendation are accepted and approved on domain level incl. mirror group d. Interaction with other Domains**:** Task 2 Architecture domain and Operational Design domain	09/2024

Task 2 CCS Traffic Control and supervision domain

No	Deliverable	Milestone
01	**Traffic CS Operational analysis (CONEMP) - Operational Analysis (ORS)** a. Description of deliverable: The operational requirements and operational capabilities/processes for providing, configuring, maintaining, and exchanging the Traffic CS components are described according to SEMP. Needed System capabilities and their functions are listed. b. Sub Milestones: No c. Definition of done: Documents described in a. in Polarion. Formal quality checked by EET, content approved by the advisor group and the mirror group and ready for SPCG revision d. Interaction with other Domains: T2 OD, T2 ARC, T2 Train CS, T2 TCCS	Q4 2023

No	Deliverable	Milestone
02	**Traffic CS System capabilities, functions and system requirements - System Analysis (FRS)** **Amend system requirements, specify System Analysis and Logical Architecture in Polarion/Capella on System Level 4** f. Description of Deliverable: • System requirements Traffic CS • Described system actors • List of described system capabilities • Functional chains with description of functions • Logical architecture of Traffic CS on System Level 4 (subsystems) • Allocation of functions to logical components • Logical functional exchanges, especially to TMS, Trackside Assets, Train and TCCS SD1,2,3; station (ATO process); FRMCS application services; yard/depot standard interfaces Bottom up architecting by: • Analysing the existing system architectures from the specifications, input initiatives, and/or the system domains g. Sub-Milestones: List of functional chains until Nov 2023, afterwards [10%] of the functional chains allocated to the logical architecture of System Level 4 per month and approved in the domain/mirror group. h. Definition of done: Documents described in a. and b. in Polarion/Capella. Formal quality checked by EET, content approved by the advisor group and the mirror group and ready for SPCG revision. i. Interaction with other Domains: T2 OD, T2 ARC, T2 Train CS	Q3 2024

Task 2 CCS Train Control and Supervision domain

No	Deliverable	Milestones
01	**Train CS logical architecture** a. Requirements and interfaces, taken into account: ATO, RTO, Advanced Positioning System, Event recognition, Virtual coupling, C-DAS, Voice communication" and "future communication strategy, Absolute Safe Train Positioning Diagnosis, monitoring, configuration and maintenance and evolvabilityDescription of Deliverable: document with the description and the requirements (up to the defined percentage of detailing) of the target logical architecture to be able to define the large building blocks including b. Update, refine and extension Specification of communication layer SS147. c. Update and refine Specification of application layer e.g. SS119/139/… d. Sub-Milestones: e. B.1 Analysis by the domain of the percentage of requirement description progress that will be reached by logical module – End 2023Definition of done: Documents described as B.1 and the final deliverables itself are in Polarion, reviewed by the Train CS mirror group and ready for SPCG revision. f. Interaction with other Domains: dependency from T2OD and T2 ARC input. Deliverable reviewed by ARC and the domains with which the module has interface.	Q3/2024

No	Deliverable	Milestones
02	**Agreement and definition of Interfaces (Deliverable: Physical architecture)** A physical architecture will be defined based on the result of point 01.	Q3/2024
03	**Update and more precisely specify Train CS System capabilities** Prioritization of functions derived from T2OD operational scenarios and apportionment to short-term and long-term architectures for new functionalities. a. Description of Deliverable: List of agreed and prioritized functions a. Definition of done: Document described in point a is in Polarion, reviewed by the Train CS mirror group and ready for SPCG revision. b. Interaction with other Domains: dependency to T2 ARC and OD.	Q3/2024
04	**Specification for Authorization, Integration and Upgradability of modular train CS system including train interface** The proposals for this deliverable from a deployment, technical and economical point of view. a. Description of Deliverable: TSI requirement updates for the authorisation of train CS systems including the necessary analysis for the justification of the change. b. Sub-Milestones: No c. Definition of done: Document including proposal for TSI updates and the justification of changes is available in Polarion and ready for SPCG approval. d. Interaction with other Domains: PRAMSS	Q3/2024
05	**CCS Onboard Definition (Replacement of CCS Onboard relevant OCORA Topics)** It is expected that Train CS domain take over the publication of relevant information and documents under the system pillar. a. Description of Deliverable: B.2 revision of the identified OCORA documents that will be incorporated to SP if identified for 2024. b. Sub-Milestones: 1. B.1 Identification of the documents from OCORA that will be taken over as SP document and identification of expected publication in 2024. c. Definition of done: Reviewed OCORA document that will be incorporated to SP are in Polarion, reviewed by the Train CS mirror group, OCORA and ready for SPCG revision. d. Interaction with other Domains: To be confirm once the action is done	Q3/2024
06	**Update of Standardisation & TSI Input plan for train CS topics** This deliverable will be based on the work and first draft delivered within SC2.1 a. Description of Deliverable: input of topics to the plan. For the topics that will be ready in 2024 the input to the pre- assessment template. b. Sub-Milestones: STIP draft Q4/2023Definition of done: STIP content of train CS delivered, consolidation by SPCG achieved with answers where necessary from domain. Successful preassessment achieved for the 2024 TSI elements in STIP c. Interaction with other Domains: no	Ongoing

Task 2 CCS Computing environment domain

No	Deliverable	Milestone
	Regular coordination with the Core group on project management and associated reporting.	Continuous
01	**Computing Environment Operation concept - Operational Analysis (=ORS CONEMP, Operational Requirement Specification)-** a. Description of Deliverable: First operational standardization specifications (ORS CONEMP, as defined in the SEMP) for computing environment. The CE Domain will create an operational concept based on the Use Case analysis from SC 2.1, considering the decided specification granularity. The operational analysis includes the deliverables along SEMP process Group 2 (Annex D) for the CONEMP operations (lifecycle processes for construction, maintenance, replacement, etc.). b. Sub-Milestones: No c. Definition of done: Documents described in a. are in Polarion, reviewed by the mirror group (if applicable) and ready for SPCG revision. d. Interaction with other Domains: T2OPE	03/2024

Task 2 Trackside assets control and supervision domain

No	Deliverable	Milestone
01	**Maintaining the specifications** a. Description of Deliverable: Update BL4 Release 2 specifications with integrated priority backlog topics, with the following tasks: o Import of the relevant specifications into the System Pillar engineering environment. Assumption: EULYNX tools and methods are used for all System Level 5 specs in SP, so for the model import the effort is small. But explanation and requirements documents need to be imported to Polarion, linked and integrated. o Complete priority backlog topics on specifications (SMI, SDI, SCI-P) o Publish a release update with integrated priority backlog topics. b. Sub-Milestones: 1. Import of the relevant specifications into the System Pillar engineering environment. - Dec 2023 2. Model import and explanation and requirements documents imported in Polarion. – June 2024 3. Documents with priority backlog topics on specifications are completed, resulting in new release BL4 Release 3 – By June 2024 c. Definition of done: Documents described in a. and b. are in Polarion, reviewed by the mirror group (if applicable) and ready for SPCG revision. In addition, model is import into SP engineering environment. d. Interaction with other Domains: 1. Imports coordinated with Engineering Environment Team. 2. Deliverables to be reviewed by the domains with which an interface is described.	Q3 2024

No	Deliverable	Milestone
02	**Need of Light Signals (Lead T2 MIG, TACS supports)** a. Description of Deliverable: Report of the impact on the specification and requirements for light signals within the SERA system based on: o The envisaged system is specified without light signals. Discussions within the Operational Process and in the Migration Domain indicating also the possible need for optical wayside indicators (light signals). Possible examples are shunting signals, fallback signals and border signals between existing and new lines. On the other hand, a trackside design with light signals creates more complex functionalities and operational processes. o The TACS domain should clarify the impact on the specification and requirements for light signals within the SERA system, if really needed. b. Sub-Milestones: No c. Definition of done: Documents described in a. are/is in Polarion are approved by T2 MIG and TACS domain and no further support is requested by Migration Domain. d. Interaction with other Domains: Dependency from Migration and Operational design.	Q2 2024
03	**Add basic Operational Analysis (CONEMP) and System Analysis according to SEMP** a. Description of Deliverable: Description of the asset management and life cycle processes (installation, setup, maintenance, exchange) and their operational requirements. b. Sub-Milestones: No c. Definition of done: Document described in a. is in Polarion, approved by the domain and mirror group and ready for SPCG revision. d. Interaction with other Domains: T2 Traffic CS and T2 TCCS, PRAMSS	Q4 2024

Task 2 Transversal systems domain

No	Deliverable	Milestone
SD1	**Digital Engineering, CCS/TMS exchange data** j. Description of Deliverable: CCS/TMS Data Model definition. k. Sub-Milestones: 1. SD11 Data Model schema extensions following the Domain Model contracts, I.e. serving the use cases of the System Pillar domains and IP projects by modelling and integrating the requested data model objects 2. SD12 Uptake of the ERA vocabulary (semantic data model) by static references and increasing the common ground for standardisation on SP and ERA side 3. SD13 Linking semantically the SP Data Model with external models beyond scope and control of the SP 4. SD15 Applying and improving the SP Data Model governance, including the application of Data Model Domain contracts 5. SD16 Updating and amending STIP 6. SD17 Updating and amending Definitions and References l. Definition of done: Documents described in a. and b. are in Polarion, reviewed by mirror group and ready for SPCG revision. m. Interaction with other Domains: All	Q3/24
SD2	**CCS Diagnostics** a. Description of Deliverable: CCS/TMS Diagnostic Data and system component interfaces definition b. Sub-Milestones: 1. SD21 Finalization of operational requirements and processes (according to SEMP) 2. SD22 System Analysis, System definition of the specific subsystems (logical architecture according to SEMP) 3. SD3 System Requirements for the specific CCS component(s), the component(s) being introduced in the architecture for technical diagnostic and monitoring purposes 4. SD25 Updating and amending STIP 5. SD26 Updating and amending definitions and references c. Definition of done: Documents described in a. and b. are in Polarion, reviewed by mirror group and ready for SPCG revision. d. Interaction with other Domains: All	Q3/24

No	Deliverable	Milestone
SD3	**Configuration, CMDB** a. Description of Deliverable: Configuration management methods and system definition b. Sub-Milestones: 1. SD31 Finalization of operational requirements and processes (according to SEMP) 2. SD32 System Analysis, System definition of the specific subsystems (logical architecture according to SEMP) 3. SD33 System Requirements for the specific CCS component(s), the component(s) being introduced in the architecture for technical diagnostic and monitoring purposes 4. SD35 Updating and amending STIP 5. SD36 Updating and amending definitions and references c. Definition of done: Documents described in a. and b. are in Polarion, reviewed by mirror group and ready for SPCG revision. d. Interaction with other Domains: All	Q3/24
SD4	**User interface** a. Description of Deliverable: Rules and System definition for Railways system User Interface subsystems Integration b. Sub-Milestones: 1. SD41 Definition of User Interface Framework 2. SD43 Updating and amending STIP 3. SD44 Updating and amending Definitions c. Definition of done: Documents described in a. and b. are in Polarion, reviewed by mirror group and ready for SPCG revision. d. Interaction with other Domains: All	Q3/24

Task 3 TMS & CMS

No	Deliverable	Date
01	**Task management, regular exchange with other tasks and IP** a. Description of Deliverable: 1. Task management includes detailed backlog of activities to reach objectives and management of the team including training where necessary 2. Regular exchange with tasks and IP includes the necessary meetings and email exchange with other tasks, IP, and PMO 3. Involvement of SPCG by invitation to Task 3 plenary b. Sub-Milestones: No c. Definition of done: minutes of meeting, presentations and planning documents d. Interaction with other Domains: Yes, coordination Task. Regular coordination with the Core group on project management and associated reporting.	Ongoing
02	**System Concept document:** a. Description of Deliverable: With respect to the release submitted as part of SC2.1, the following topics shall be added: • system interfaces (Topology, Incident Mngt., TAP/TAF) • legislative and economic issues • System Definition • System capabilities b. Sub-Milestones: No c. Definition of done: System concept document in Polarion and ready for SPCG revision. Including the above-mentioned topics d. Interaction with other Domains: Task 2	Q2/2024
06	**Interface between TMS and Traffic Control and Supervision system**: a. Description of Deliverable: The complete specification of this interface shall be submitted. Task 3 should take the lead and align with Traffic CS domain b. Sub-Milestones: As a basis the SCI- CC (SCI-OP in RCA terms) interface specification from EUlynx should be taken c. Definition of done: Interface requirement document (FIS) with the basis of the updated SCI-CC (and other EUlynx documents related to this interface) to be outcome as per STIP and approved in Polarion d. Interaction with other Domains: Traffic CS for coordination of the technical aspect and to ensure that the specification of the interface is complete comparing with other defined interfaces to CCS. Trackside Assets domain to be contacted to learn from the experience for the object controller interfaces	Q3/2024

No	Deliverable	Date
07	**System Analysis (=FRS, Functional Requirement Specification)** a. Description of Deliverable: • Traffic Management – internal interfaces (Capacity Planning (CM), Conflict Resolution, and Incidence Impact Management) o System Definition o System capabilities b. Sub-Milestones: No c. Definition of done: Interface description document, including above mentioned content and proposing the clear next steps to achieve FRS and FIS for the decided necessary modules and interfaces in the coming years in Polarion and reviewed by the Task 3 mirror group and ready for SPCG revision d. Interaction with other Domains: TBD	Q3/2024
09	**Cross border TMS & CMS** a. Description of Deliverable: To improve the management of the European Railway system especially for cross border traffic, there are different architecture models possible. Starting from a decentralized system where each Infrastructure manager operates an own TMS /CMS up to a fully centralized European TMS / CMS system there are several solutions possible. The domain should describe and analyse the pros and cons of 5 options. b. Sub-Milestones: No c. Definition of done: document in Polarion reviewed by the Task 3 mirror group and ready for SPCG revision. Including: a. Description of the variants b. Analysis of the variants against CBO c. Analysis on advantages and disadvantages d. Description of the impact for each variant (technical, economic, governance, regulation, time for migration, etc) d. Interaction with other Domains: No	Q4/2023

Task 4 DAC/FDFTO

No	Deliverable	Milestone
01	**Onboarding of new team members** (team setup, information and training, Polarion, …) [WP0] a. Description of Deliverable: All new (and old!) members are onboarded (see SharePoint "OpenShare", folder "22-10-10 Onboarding Information for domains" and Task 4 related documents) and trained especially in Polarion (at least basic training) b. Sub-Milestones: 1. Onboarding regarding working procedures, documents and results of ramp-up and period 1 2. Polarion training c. Definition of done: Confirmation of document onboarding and Polarion training from Task Leads **d.**	11/2023
02	Continuation of **Sector alignment & Elaboration Scheme for EU Harmonised Operation Procedures: second set of Ops Concepts** [WP1] a. Description of Deliverable: Execution of very well-prepared remaining webinar(s) and collection and evaluation of feedback b. Sub-Milestones: 1. Webinar (depending on progress within SC2.1) – 10/2023 2. Report on collected feedback (incl. evaluation) to hand-over to FP5 – 12/2023 c. Definition of done: Report on collected feedback (incl. evaluation), approved in Polarion and ready for SPCG revision to finally hand-over to FP5. d. Interaction with other Domains: OD	10/2023 12/2023
03	**Finalization of Operations Architecture related to FDFTO interfaces: ERTMS use cases, ASO/ATO** [WP3.2, WP3.3] a. Description of Deliverable: ➢ Description and agreement of ERTMS related use cases (e.g., cab anywhere, supervised manoeuvres) ➢ Description of interface ATO <-> ASO (if needed) ➢ Description of automated freight shunting and train formation use cases ➢ Alignment with Task 2 ATO functional team b. Sub-Milestones: 1. Description and agreement of ERTMS related use cases (e.g., cap anywhere, supervised manoeuvres) - 12/2023 2. Description of automated freight shunting and train formation use cases - 03/2024 3. Alignment with Task 2 ATO functional team / Description of interface ATO <-> ASO (if needed) / Alignment with FP5 (and FP2) - 06/2024 c. Definition of done: Documents described in item b. are in Polarion, reviewed by mirror groups (at least in coordination with ERA TWG Freight@DAC) and ready for SPCG revision. d. Interaction with other Domains: dependency from Task 2 TrainCS and TrafficCS. Alignment must be ensured.	12/2023 03/2024 06/2024

No	Deliverable	Milestone
04	**Analysis of further interfaces of train-internal DAC/FDFTO to the "outside" world in cooperation with Task 1** [WP3.4] a. Description of Deliverable: Based on FDFTO related use cases identification of further interfaces to be considered by FP5. Report incl. a complete diagram showing all interfaces to the train internal DAC/FDFTO system and showing the place in the overall railway system (System of Systems picture down to level 5) b. Sub-Milestones: 1. Report incl. a complete diagram showing all interfaces to the train internal DAC/FDFTO system and showing the place in the overall railway system (System of Systems picture down to level 5) - 03/2024 d. Definition of done: Document described in item b. is in Polarion, reviewed by mirror groups (at least in coordination with ERA TWG Freight@DAC) and ready for SPCG revision. e. Interaction with other Tasks/Domains: Dependency from Task 1. Deliverable reviewed by Task 1, 2 and 3.	03/2024
05	**Central Instance Management of data & software (updates) – final proposal incl. requirements for FP5, with the potential support of a POC** [WP4] a. Description of Deliverable: The SW versions and updates of the DAC system needs stringent control to avoid incompatibilities between wagons and loco. Also the access to the DAC data needs regulation wayside. The WP should analyse the existing solutions in the field of freight wagon management about suitability to be extended for such additional tasks. Based on the results from WP 3.4 elaboration of a concept how to share the data generated by the DAC system by loco and wagon between the stakeholders taking into account data ownership and confidentiality topics. b. Sub-Milestones: 1. Analysis of existing freight wagon SW platforms (to be concluded in SC2.1) – 09/2023 2. Concept for DAC SW version management – 09/2024 3. Concept for architecture for wayside exchange of DAC on board data between the stakeholders- 09/2024 4. Proposal for the organisation (incl. data classification and management policy and authorization process)- 09/2024 c. Definition of done: Documents described in item b. are in Polarion, reviewed by mirror groups (at least in coordination with ERA TWG Freight@DAC) and ready for SPCG revision. d. Interaction with other Domains: Task 2 TrainCS	09/2024

No	Deliverable	Milestone
06	**STIP & "Authorisation Coordination", with ERA, CEN/CENELEC & others:** TSI CR management, EN Standards development, Syst. Pillar documents [WP5] a. Description of Deliverable: Continuous maintenance of STIP input in close cooperation with SPCG, liasion with standardisation body, having a complete overview on activities, following the activities by Task 4 members actively, developing reports on the progress, being present, managing and steering b. Sub-Milestones: 1. Report on the performed activities, representation in harmonasition/standardisation groups, developing a plan in advance, overview, etc. - Continuous c. Definition of done: Reports described in item b. are in Polarion, regularly maintenance of STIP inputs in Polarion, submitted to SPCG for revision when stable status is available. d. Interaction with other Tasks/Domains: Any Task/Domain that can be affected by each of the harmonisation issues. Regarding TSI input liasion is necessary with ERA, i.e.TWG Freight@DAC.	Continuous

Specific work item on Harmonsied Diagnsotics

No	Deliverable	Milestone
01	**Analyzing existing framework, definition of use cases (incl. KPI), functional requirement for measuring KPI); outlining certification needs.Address key obstacles (i.e. Data handling, juridical boundary conditions), outline solution, initiate solution process)** o SD31 Use Cases & Framework ▪ Analysis of existing frameworks and standards for data and asset information exchange; description of gap analysis, what's missing ▪ Description of the approach including a first proposal for detailed use cases (with a focus on quick wins); incl. definition of the relevant KPI to be measured for the respective use cases ▪ Description of homologated methods and subsequently harmonized parameters ▪ Listed key obstacles (i.e. Data handling, juridical boundary conditions), outline solution, initiate solution process o SD32 Certification needs & stakeholder involvement ▪ Outlining certification needs for acceptance ▪ Proposal for anchoring the European Rail Diagnostic approach in European conventions (i.e. TSI, CEN, GCU, …) ▪ Proposal for sensitizing IM/RU for gaining benefit o SD33 Data Exchange ▪ Leverage developments of European dataspace solutions, including in the FP1, that provide digital enforcement of data ownership, distribution and usage policies in the federation of existing frameworks and standards for cybersecure, reliable, scalable and interoperable data and asset information exchange. Definition of Done Deliverable D1: document finished and ready for assessment. **At the end of the feasibility work, an assessment will be made and put to EU-Rail on the continuation of the work on detailed use cases**	Q1/2024

No	Deliverable	Milestone
02	Detailed elaboration/development of the framework/architecture and applying framework to a concrete example of use cases, measuring systems and parameters; output: harmonized measuring methods and parameters. .Detailed elaboration of the framework/architecture ○ SD34 Concrete Use Cases and Framework application ▪ Apply framework to a concrete example/set of use cases, measuring systems and parameters ▪ finalize use cases incl. concrete requirements for methods, measuring systems and harmonized parameters and finalize relevant KPI ▪ Propose solutions for key obstacles (i.e. Data handling, juridical boundary conditions) ▪ Clear definition of harmonized methods and parameters for harmonized diagnostics ○ SD35 Certification needs & stakeholder involvement ▪ Propose a concrete anchoring of the European Rail Diagnostic approach in European conventions (i.e. TSI, CEN, GCU, …) ▪ Defining if there are certification needs for acceptance and which ▪ Recommendation of specific standardization and regulation output ○ SD36 Data Exchange ▪ Final description of which data can be shared through which systems <u>Definition of Deliverable D2: Definition of done: Documents are in Polarion;</u> harmonized measuring methods and parameters. Detailed elaboration/development of the framework/architecture and applying framework to a concrete example of use cases, measuring systems and parameters; output: harmonized measuring methods and parameters ready for take-up by TSI/standard etc. .	Q3 2024

Specific work item on EGNOS for Rail

No	Deliverable	Milestone
01	Support to produce the document "Overview of Aviation & ETCS Railways regulations and processes" Review and comment of the output of the work of EUSPA	December 2023
02	Support to produce the document "Overall certification and authorisation approach for introduction of EGNOS"	July 2024