Governance organisation and working arrangement of the System Pillar

Contents

Abbreviations and acronyms

Abbreviations and acronyms	Description
AMRT	Architecture Migration and Roadmap Team
ARCT	Architecture and Release Coordination Team
AWC	Architecture Working Circle
CBA	Cost Benefit Analysis
CBO	Common Business Objective
CCM	Change Control Management
CCS	Control-Command and Signalling
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CER	Community of European Railway and Infrastructure Companies
CM	Capacity Management
COM	European Commission
CONEMP	Concept of Employment
CONOPS	Concept of Operations
CONUSE	Concept how to use the system
CR	Change Request
DAC	Digital Automated Coupling
DCM	Digital Capacity Management
DG MOVE	Directorate-General for Mobility and Transport
DG RTD	Directorate-General for Research and Innovation
EDDP	European DAC Delivery Program
ERRAC	European Rail Research Advisory Council
ERTMS	European Rail Traffic Management System
ESA	European Space Agency
ESC	European Securities Committee
EECT	ERA Extended Core Team
EIM	European Rail Infrastructure Managers
ENISA	European Union Agency for cybersecurity
EPF	European Passengers' Federation
ERA	European Union Agency for Railways
ERJU	Europe's Rail Joint Undertaking
ESC	ETCS System Compatibility
ESO	European Standardization Organization
ETF	European Transport Workers' Federation
ETSI	European Telecommunications Standards Institute
EUG	ERTMS Users Group
EUSPA	EU Agency for the Space Programme
FA	Flagship Area
FDFTO	Full Digital Freight Train Operations
FM	Founding Members
FFFIS	Form Fit Function Interface Specification
FIS	Functional Interface Specification
FRS/FIS	/Functional Requirement Specification/Functional Interface Specification
FTE	Full Time Equivalent
FRMCS	Future Railway Mobile Communication System
FRS	Functional Requirements Specification

MBSE	Model based System Engineering
NB-Rail	Notified bodies for interoperability in the railway sector
IEC	International Electrotechnical Commission
IPSE	Innovation Pillar System Experts
ISO	International Organization for Standardization
JU	(Europe's Rail) Joint Undertaking
OHT	Operational Harmonization Team
PMAT	PRAMSS Management & Assurance Team
PMO	Project Management Office
PRAMSS	Performance, reliability, availability, maintainability, safety and security
RASCOP	Rail Standardisation Coordination Platform for Europe
RNE	Rail Net Europe
SPC	System Pillar Coregroup
SPDT	System Pillar Domain Team
SPSG	System Pillar Steering Group
SRS	System Requirements Specification
TAF/TAP	Telematics Applications for Freight/Passenger Services
TC	Technical Comittee
TSI	Technical Specifications for Interoperability
TWG	Topical Working Group
TMS	Traffic Management System
UIC	International union of railways
UIP	Union Interparlementaire
UITP	The International Association of Public Transport
UNIFE	Union des Industries Ferroviaires Européennes
UNISIG	Union Industry of Signalling
UNITEL	Union Industry of Telecommunications

1 Management Summary

This document defines the governance, organizational structure and decision process of the System Pillar. This management summary presents the key principles of the document.

The System Pillar is managed and led by the System Pillar Unit of EU-Rail, under the responsibility of the Executive Director, within the governance established by the SBA.

In order to perform the activities of the System Pillar, the Governing Board of EU-Rail adopted the Work Programme 2022 -2024 into which it is established that the System Pillar activities will performed via three service contracts to cover:

1. The System Pillar Core Group
2. The System Pillar Tasks
3. CCS TSI Maintenance Activities

In this framework, the following management structure is set up under the System Pillar Unit

1. The System Pillar Core Group will lead and coordinate a set of core engineering and administrative services structured around the System Pillar Tasks.

2. The System Pillar Tasks are initially set up, in Task 1 which will specify the Business Process Architecture and Operational Design for the Railway System; Task 2 (CCS), Task 3 (TMS/CM) and Task 4 (DAC/FTDFTO) will deliver detailed design work, i.e. defining detailed operational processes and requirements, functional system analysis and technical architecture. The output of the Tasks to different channels will be planned, validated and delivered according to the Standardization and TSI Input Plan. In order to deliver a coherent output from EU-RAIL the System Pillar and the Innovation pillar will work together as an integrated programme team, i.e. involving Innovation Pillar System Experts in all relevant Tasks.

The System Pillar working method aims at timely, effective and balanced decision making with full sector involvement. Integrated teams within one place - the System Pillar - will work on and propose developed positions for sector consideration. On all hierarchical levels of the decision-making process a balanced sector representation shall ensure that developed and fully considered positions are put forward to the System Pillar Steering Group and finally to the EU-Rail Governing Board. Further the System Pillar is part of the System and Innovation Programme Board for project and programme management of the JU including interaction between the two pillars.

2   Purpose

The purpose of this document is to define the Governance Organisation and working arrangement of the System Pillar, in line with the Single Basic Act [1].

The focus is the structure of the System Pillar, role of the Core Group in relation to both the System Pillar activities and the interaction with the Innovation Pillar, and on the working arrangements with external bodies. The document defines sector organization involvement in the System Pillar activities with the target to achieve broad sector alignment early in the system design process.

The information in the final version of this document will be an input to the ERJU Governance Handbook as a single reference for the governance of the JU. As such processes may be adapted based on the decision-making process to finalise the ERJU Governance Handbook. The document is not restrictive, but the governance is subject to an evolution during the project lifetime if needed.

3 Scope

The scope for this document is the definition of the governance organization of the System Pillar and its working bodies, the System Pillar Domain Teams. The document further summarizes working arrangements between the System Pillar and its steering bodies and the Innovation Pillar and other external bodies.

The following figure illustrates the scope of the document:

- Governance Organisation:
    - o System Pillar Core Group
    - o Task structure with System Pillar Domain Teams
    - o Innovation Pillar System Experts (as decribed in the Europe's Rail Governance Handbook)
- Working Arrangements
    - o with System Pillar Steering Group
    - o with System and Innovation Programme Board
    - o with European Union Agency for Railways
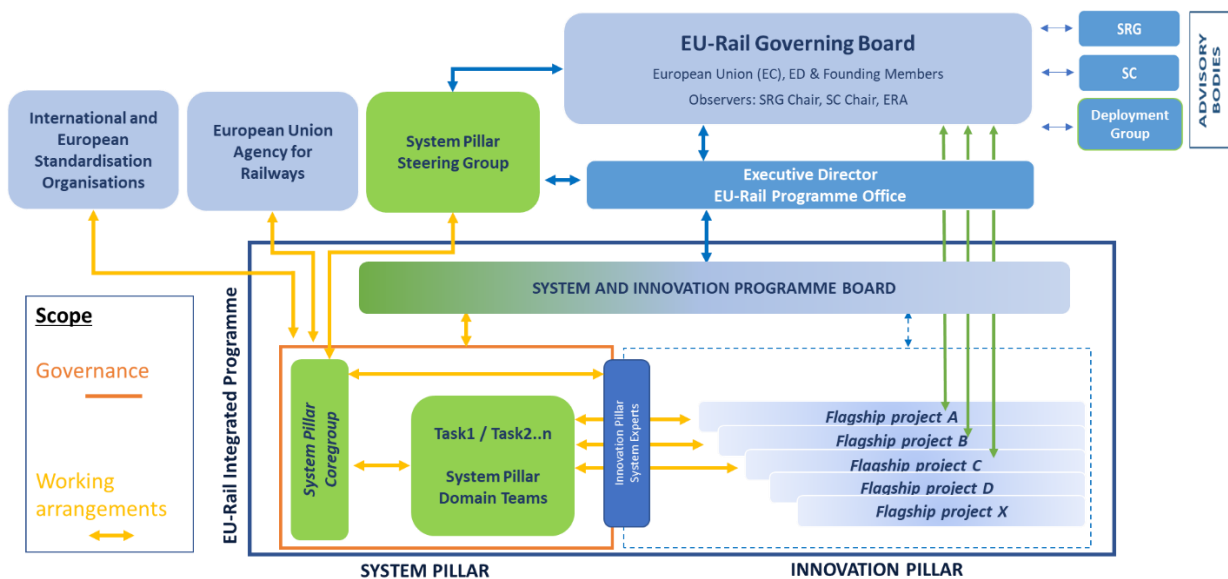   - o with International and European Standardization Organizations

Figure 1 - Scope of the Governance Handbook

In addition to the scope of this main document, further aspects are kept separate to maintain a lean structure:

- Annex A: Working Circles
- Annex B: Procedure descriptions [this is presently being updated]
- Annex C: Background and rationale

For reading of this document it is recommended to have a basic understanding of the principles and content defined in other documents of the System Pillar Ramp-Up project:

- Common Business Objectives [2]
- Operational Concept [3]
- High-Level Architecture [4]

Out-of-scope: This document is not intended to define the detailed engineering process, or the governance for model and tools and the conceptual data model, that will be defined within the scope of the Methods and tools workstream. Nevertheless, in order to give context, Annex C discusses some basic principles of the engineering process, to explain background and rational for the governance organization.

4 Principles

This chapter describes the guiding principles of the System Pillar Governance:

- The **main governance bodies** involved in the System Pillar are:
  - The System Pillar Steering Group
    - is responsible for providing advice to the Executive Director and Governing Board on:
      - the approach to operational harmonisation and the development of system architecture
      - the detailed annual implementation plan for the System Pillar in line with the work programmes adopted by the Governing Board
      - monitoring the progress of the System Pillar.
  - The System Pillar Unit
    - Chairs the System Pillar Core Group
    - Reports to System Pillar Steering Group
    - Coordinates related resources, budget and timescales to the System and Innovation Pillar Programme Board
  - The System Pillar Core Group
    - Provides the competent leadership and expertise of the development of the functional layered railway system architecture, specification models and Operational Concepts that enable safe, secure and efficient delivery of the new systems
    - Manages the common business objectives and deliverables from the Tasks
  - The System and Innovation Programme Board advises the Executive Director on:
    - the coordination of resources, budgets and timescales of the System and Innovation Pillars
    - project and programme management of the JU including interaction between the two pillars as well as change management and conflicts, supported by the System Pillar Core Group.

- The **Standardization and TSI Input Plan** that will be developed by the System Pillar in alignment with the Railway sector organization, will per architecture element
  - Propose a channel
    - **Publication** by System Pillar
    - **Standardisation** (as defined in EU regulation 1025/2021)
    - **Regulation** by TSI (ERA, COM)
  - Propose a "grade of specification"
    - "**Strict**" specification: Full, precise, and mandatory regulation of a process, an interface or system functionality (TSI)
    - "**Core**" specification: Precise and mandatory specification of a part of a process, an interface or part of a system functionality (TSI)
    - "**Market specifications**": Publications that are often used in the market because of agreements in the sector or in a part of the sector
    - "**Guidelines**": Not mandatory, content depth varies depending on the issue and target (ERJU / SP guidelines)

    o Propose the timeline for the specification output

- The System Pillar activities are executed in close relationship with ERA, including supporting ERA as ERTMS system authority on ERTMS and telematics.

5 System Pillar working method

The System Pillar working method aims at fast and balanced decision making with full sector involvement. Integrated teams within one place - the System Pillar - will work on and propose developed positions for sector consideration:

- To ensure best results to the benefit of the sector, the System Pillar design process will ensure clarification and agreement on objectives and requirements early in the process as a basis for the subsequent decisions on operational design and architecture
- The aim is to have developed positions put forward by the tasks and associated domain teams based on concentrated resource and a short interaction flow on system design level within the System Pillar teams, enabling speed of development
- Where appropriate, sector organizations are encouraged to support their representatives in the System Pillar teams and the Core Group with input - consolidated positions, early consideration of issues etc
- Decisions can be made on the lower levels (within the Task cross-cutting or 'Domain teams'), under coordination of the System Pillar Core Group.
- Where required, more detailed sector consultation – working circles - will be organized to critically assess the output of the System Pillar teams. The working circles do not have an explicit role governance, but are established to achieve broad sector alignment.
- On all hierarchical levels of the decision-making process a balanced sector representation shall ensure that developed and fully considered positions are put forward to the System Pillar Steering Group and Governing Board.

6 Governance and Organisational Structure

In this section the overall governance organization within the System Pillar with its Tasks and the operational working teams ('Domain teams') is defined, as well as the interaction principles with the Innovation Pillar System Experts as representatives of the Flagship Areas of the Innovation Pillar. The section also discusses the decision-making process of the System Pillar. The section then concludes with the defined working arrangements with its steering bodies and external bodies.

6.1 The System Pillar

The figures below illustrate the high level structure and system design process of the System Pillar (more details in Annex C):
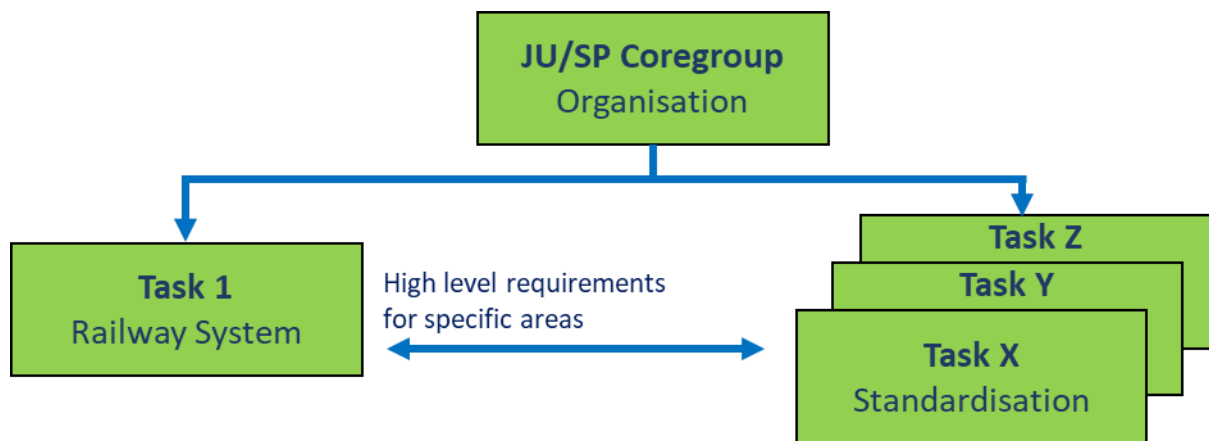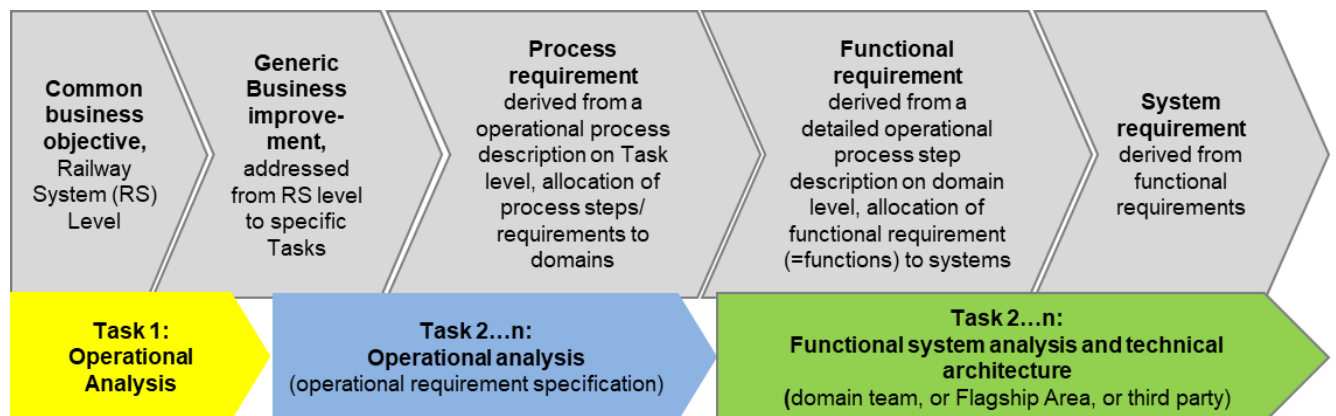

Figure 2 - System Pillar high level structure

Figure 3 - System Pillar High level system design process

Task 1: Railway system defines at high level for the whole Rail System:

- business improvements,
- operational concept, and
- business process architecture

Specific additional Tasks 2…n define for a subsystem/priority area:
- operational processes,
- requirements and
- architecture.

12

This is an analytical work that breaks down process and system requirements and allocates functions. More detailed and precise specifications (FRS, SRS) for its "subsystems" on products may be defined by domain teams in tasks. Detailed specification may be carried out in the System Pillar, or delegated to an Innovation Pillar Flagship Area, or to a third party (to be defined case by case).

The SP Core Group with the support of Engineering and Administrative support services, manages progress of and collaboration between the Tasks.

The following table gives examples for the different specification levels and the related scope of the Tasks as defined above:

	System Level	Area (example)	Level of process details, examples (indicative)
Task 1	Level 1	Transport System for people and goods	The basic requirements, how railways and other transport systems shall interact concerning management connections in a station
	Level 2	Railway System	How shall customer care, ticket sales, customer information, TMS and CCS interact *in general* to manage a deviation (described as basic requirements)
Task 2...n	Level 3	CCS	How shall different actors in the production (trains, field forces, ..) be coordinated to execute a changed plan (requirements, basic process)
	Level 4	Vehicle Control and Supervision	What processes shall happen onboard in general when the movement authorisation changes (requirement, basic process),
	Level 5	Onboard Safety Logic	What is the safety reaction to a change of the movement authorisation

As within the current scope of the System Pillar, the whole railway system cannot be specified in all details to the lowest levels specific elements of the system will be prioritized for deeper analysis. In the first instance, these are proposed to be CCS, TMS/CM, and DAC/FDFTO.

The Tasks and the Domain teams identified and listed below are subject to change during System Pillar lifetime, according to the Task and Domain scope defined through the design process and validated through the governance process.

The figure below illustrates the first level operational breakdown structure of the System Pillar:
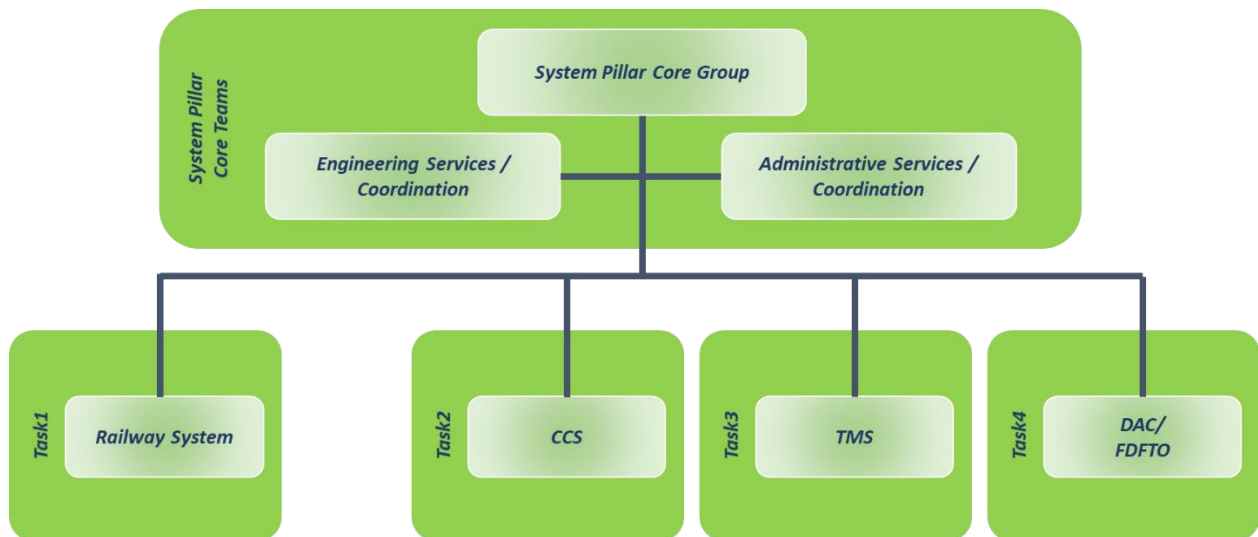
Figure 4 - Operational Breakdown Structure System Pillar

6.1.1 The System Pillar Core Group (SPC)

6.1.1.1 Responsibilities

The System Pillar Core Group, under the supervision of the EU-Rail Executive Director and/or his delegated Head(s) of Units, is leading the day-to-day work of the delivery of the System Pillar through the Tasks. This includes:

- Programme Management of the System Pillar
  - lead the day-to-day work of the delivery of the System Pillar Tasks,
  - provide the necessary elements to the EU-Rail System Pillar Unit for the System Pillar Steering Group decision making process,
  - monitor and manage System Pillar progress,
  - report to the System and Innovation Programme Board (SIPB) on progress and resource allocation, as well as any other matter requested by the SIPB,
  - manage the resources made available within the specific contracts and any other relevant resources that EU-Rail may consider needed to achieve the System Pillar objectives, in line with the governance process established by the JU.
  - proposal for adaptation of Task structure, according to the developing standardization need during project lifetime
- Content and Guidance
  - lead the development of the system architecture and operational concept, ensuring objectives are achieved with outputs of the necessary quality, proposed TSI enhancements and harmonised standards are validated in view of submission to the relevant System Pillar decision-making process,
  - manage and coordinate Task alignment, with specific emphasis on
    - Operational concept
      - Define the strategy to be followed to design the operational concept
      - Ensure and verify consistency between Tasks
    - Architecture
      - Define the strategy to be followed to design the system architecture.
      - Ensure and verify architecture consistency between Tasks

14

- Migration
  - Define the strategy to be followed to design the migration steps
  - Ensure and verify consistency between Tasks
- manage central Engineering Services and Administrative Services into Task 1 and Task 2...n
- manage technical/operational developments within the System Pillar, supporting decision making and progress within the remit set by EU-Rail, including active guidance of Domain teams within the Tasks, in particular through the Railway System (Task 1) and the Operational Design and Architecture and Release Coordination Team (Task 2...n),
- manage and coordinate the Task 2...n Operational Design teams Task 2...n Architecture and Release Coordination domain team for selected interfaceswork together with the JU to ensure sector alignment,
- ensure System Pillar coordination with Innovation Pillar and its Flagship Areas system experts.
- Specific inputs
  - integrate relevant inputs from Innovation Pillar and/or take into account external to EU-Rail Programme,
  - escalate to the SIPB, via the Head of System Pillar Unit any risks, opportunities and issues which may affect the overall EU-Rail R&I Programme, e.g. alignment with the Innovation Pillar or its specific activities, inconsistent national and/or regional programmes.
- Specific outputs
  - prepare and maintain the "Standardisation and TSI input plan" ensuring with the JU alignment at rail stakeholder's level and at European Standardisation Organisations (ESOs), and International Standardization Organisations (ISOs),
  - monitor that the relevant EU-RAIL outputs to the TSI and standardisation process are in line with the overall Operational Concept and System Architecture and associated principles is being delivered on time and in scope and do incorporate the successful R&I outputs of the Innovation Pillar activities (or from S2R Programme),
  - determine with the JU the liaison with ERA including handling of Change requests to TSIs, EECT and working group representation,
  - Handling of standardisation requests

6.1.1.2   General Structure

The composition of the System Pillar Core Group is:

- Chair: ERJU (Head of System Pillar Unit)
- Members:
  - 4 to 8 FTE equivalent representing a balanced input from the railway and supply industry and in any case no more than 8 persons
  - 2 FTE from ERA
- Additional support from EU-Rail as required

6.1.1.3   Meetings

The System Pillar Core Group shall meet indicatively on a weekly basis to manage day-to-day activities. The SPC Chair shall invite by written (e.g. by email) notice five working days prior to a SPC meeting. The invitation shall include an agenda. The members of the SPC shall be prepared for their contributions according to the agenda.

6.1.2   The System Pillar Engineering Services / Coordination

The core services will be managed and lead by the System Pillar Core Group, according to the needs of the System Pillar Tasks. Exceptionally, the PRAMSS Management and Assurance team will be led by a joint leadership team between railways and suppliers, in line with the leadership principle of the Tasks Domain Teams.

6.1.2.1   (Central) Modelling service

The Modelling Service includes methods & tools definition for the whole system Pillar, support of the modelling platform, and derives and maintains the CDM catalogues. Specifically, the responsibilities include:

- Provide the central modelling service that converts conceptual inputs or external model fragments into harmonised model aspects in the central model master.
- Design tests and perform model proving for the overall model validation
    - Design and describe the engineering process in the System Pillar (along ISO15288) with roles, working steps and type of artefacts; processes change requests and proposals to the processes and methods
    - Choose, develop and provide the documentation, concept, architecting and modelling handbook (MBSE), the ontology, the architecting framework, and the Railway Dictionary
    - Design, hosts and maintains the central tool platforms and concept/model/CDM databases and edits and consolidates their content as a central service
- Manage relevant licences and technical support for the necessary technical modelling software.
- Requirements management platform and methods and moderation of the creation, negotiation and CCM process for requirements
- Assure the coherence, quality, and completeness of the full requirement implementation (requirements from all sides, like from Task 1 or between other Tasks or domains), as well as for the processes and interfaces between tasks
- Provide document management platform and methods, such as the repository for conceptual documents, coordination of the translation of concepts into formal models and derived views and exports like for CDM

6.1.2.2   Standardisation and TSI Input planning

The "Standardisation and TSI Input planning" service is mainly structured along the catalogue of processes and interfaces/systems. Its responsibilities include:

- Coordination of the Standardisation and TSI Input planning process with the Tasks Domain Teams and the Innovation Pillar System Experts or externally

- Input to the validation and decision process of the Standardisation and TSI Input plan
- Follow-up progress reporting of the Standardisation and TSI Input plan implementation

6.1.2.3   External Architecture Support

System architects are very scarce resources. This central pool of (external) architects will support the SP Coregroup (e.g. architectural issues on top level), the modelling service, the Tasks or single domains on demand. The responsibilities include:

- Provide Expertise on formal system architecture to build upon a systemic and recognized methodology
- Complementing Domain experts of the rail sector, to properly structure the concept of operations and future rail system architecture.
- Support the activities of Task 1 and Task 2…n

6.1.2.4   PRAMSS Management & Assurance Team

In addition to the Modelling Service that is moderating the requirements flow, the PRAMSS requirements (most of the non-functional requirements) are additionally coordinated centrally. This includes top-level design and assurance of the requirement implementation in the System Pillar Tasks.

The responsibilities include:

- Defining strategies (e.g. safety strategy), policies, methods (e.g. concerning security design)
- PRAMSS definitions (From existing to target) on top-level
- Assure requirement implementation in the System Pillar Tasks
- Coordinate and support Tasks and Domain Teams in the break-down process for the PRAMSS requirements:
  - PRAMSS definitions (From existing to target)
  - PRAMSS Target objectives definition per System and components
  - PRAMSS KPIs definition
  - PRAMSS Assurance Processes definition
  - PRAMSS standardisation and PRAMSS breakdown to components
  - Application standardisation, PRAMSS framework, PRAMSS quantitative design
  - PRAMSS assurance, PRAMSS validation of design proposals

6.1.3   The System Pillar Administrative Services

6.1.3.1   Programme Office

The Programme Office will support all the activities of the System Pillar including

- Support to Core Group Day to day management and delivery of System Pillar objectives
- Continuous monitoring and management of progress
- Management of resources and administration
- Quality Management
- Publications and communication, under the supervision and coordination of the Communication and Dissemination structure of the JU

6.1.3.2 Economic Analysis

Economic analysis supporting the activities of the System Pillar for example:

- Support Cost Benefit Analysis of potential changes
- Support economic analysis of specific enhancement change requests
- Analysis of specific business cases as a service

6.1.4 Task 1: Railway System

In the System Pillar Task 1 the Business Process Architecture and Operational Design (Organisational needs, Generic automation needs, …) for the Railway System will be specified, based on and reflecting the Common Business Objectives. More specifically, the main ambition for the Task 1 System Levels is to get a complete list of the needed and important improvements (as-is analysis, pain-points) in selected interaction processes as input in form of a requirement set to the different Tasks 2…n. These improved business process solutions will, to the extend needed, describe the rationale behind the requirements of the to-be target Business Process Architecture and Operational Design. The design work for Task 1 is not intended to describe all process and improvement aspects of the full railway system in full detail, especially when no need for standardization inside of the System Pillar is identified.

Figure 5 - Task 1: Railway System

Task 1 responsibilities include:

- Conduct an as-is analysis of the railway system, considering operational, functional, logical & physical assets
- Identifying the pain points for selected operational interaction processes and derive a requirement set reflecting the Common Business Objectives
- Specification of the Business Process Architecture and Operational Design (Organisational needs, Generic automation needs, …) for the (to-be) Railway System
- Assess migration roadmap of the Tasks 2…n regarding overall Business Process Architecture and Operational Design consistency
- Assign input requirements to lower level tasks

6.1.5 Task 2…n

The Tasks that execute the detailed design work for the lower System Levels 3, 4 and 5 are defining detailed operational processes and requirements, functional system analysis and technical architecture. They are structured in Domain teams for cross-cutting activities and (Sub-)System Design activities that need to be managed and coordinated:
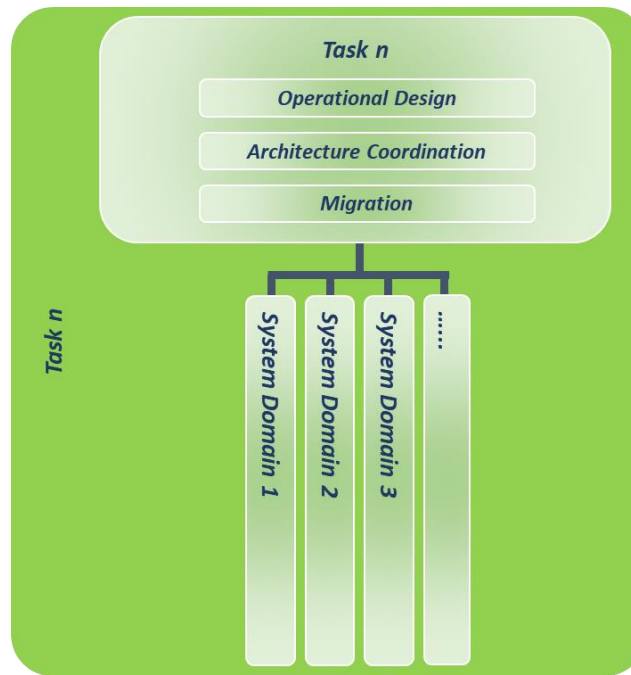
Figure 6 – Task 2..n General Structure

- Cross-Cutting activities:
  - Operational design process
  - Architecture coordination process
  - Migration design and architectural support
- (Sub-)System design activities:
  - Precise specification (FRS, SRS)
  - Coordinate for sub-systems with cross-cutting teams

The activities are carried out by Domain Teams, which are led by joint leadership teams, as pair from railways and suppliers. The team size will be adapted as needed in order to deliver the assigned specification work. The team shall always be staffed in a balanced way between railways and suppliers, if possible. In case there is insufficient resource available or not suitable as deemed, direct resources outside of the sector organisations or their members could be contracted to support the domain team work.

The different Tasks 2…n shall be connected (where appropriate) by simple interfaces/process interactions. These will be defined early and decouple the dependencies in the development work. Depending on size and scope of tasks the roles of Domain Teams above can be shared by a single team, or distributed across multiple teams (e.g. initial teams for Tasks that have lower maturity the cross cutting may be combined with the system design activities). If it exists, work already developed outside the System Pillar may be synthesised and incorporated by the Task (e.g. in the System Pillar ramp up, a large part of the work is to consolidate the already very detailed work from the sector, S2R etc in the CCS subsystem).

6.1.5.1 General Domain Teams Responsibilities

The System Pillar Domain Teams are leading the day-to-day architecture specification and system design work of the delivery of the System Pillar.

Each team has, within their Domain scope, the following responsibilities:

19

- Ensure sector alignment according to the Common Business Objectives
- Cooperation with FAs Innovation Pillar System Experts (if corresponding FA is available)
- Coordination with other Domain teams
- Managing inputs
  - Integrating relevant inputs from Innovation Pillar and external to JU
- Managing outputs
  - Contributing to system model artefacts of their respective domain
  - Delivering specifications according to the TSI and standardization input plan
- Lead the system design work
  - Refinement of the domain functional architecture
  - Precise breakdown of system requirements
  - Design functional chains inside of the domains
  - Specify functionality and interfaces
  - Validate specification (model proofing)
  - Contribute for preparing and validating Change Requests
  - Align requirements towards Innovation Pillar FAs and external Systems
- Lead the work for writing specifications, where needed as an identified input, to fulfill the Standardization and TSI Input Plan
- Support ERA in its role as ERTMS and Telematics System Authority in their consideration of TSI enhancements

6.1.5.2   Cross-Cutting Domain Teams responsibilities

6.1.5.2.1   The Operational Design Team

The Operational Design Team is responsible for:

- Define the Operational Target Concept as part of the system design process
- Translate business objectives into operational target processes (business re-engineering)
- Analyse operational legacy/diversity/migration trade, operational solution design
- Derive and maintain standardized operational requirements
- Support and guide technical design teams for functional requirements & harmonization according to target operational processes

6.1.5.2.2   The Architecture and Release Coordination Team

The Architecture and Release Coordination Team is responsible for:

- Define the strategy to be followed to design the and release the fully integrated system architecture
- Collect and evaluate all the existing work (research projects, state-of-the-art documents) as input to design the System architecture.
- Coordinate the work and inputs of the Tasks Architecture-linked Domain Teams and cross cutting teams
- Continuous Interaction with IP and SP Core group and SP domains to provide and receive inputs and mediate conflicts

- Design/Develop/Maintain the System Architecture according to the defined principles, the existing work and to the Operational concept into Functional & Logical architecture
- Design architectural roadmap and migration, ensuring "integrity per migration step"
- End2End integration of functional chains, assure architectural quality on Task level
- Ensure and verify architecture consistency on functional and logical level
- Manage the input to the standardization and TSI plan for Task activities and issue the input according to the "TSI and Standardization input plan"
- Coordination with the Cross Cutting Domain Teams of other Tasks to ensure overall consistency regarding architecture and release coordination
- Organize plenary meetings with all Domain leadership teams to share status reports between all teams

6.1.5.2.3   The Migration and Roadmap Team

The Migration and Roadmap Team is responsible for:

- Analyse national situations, product and deployment constraints
- Design standard architectural migration roadmaps, principles and derive system requirements
- Design operational process migration roadmap, principles and process requirements (including initial intermediate scenarios)
- Decide interface forward and backwards compatibility for migration and safe investments
- Continuous interaction with Architecture and Release Coordination Team

6.1.5.3   Task 2: CCS System Design Teams

The figure below illustrates the CCS Task Domain Team structure.
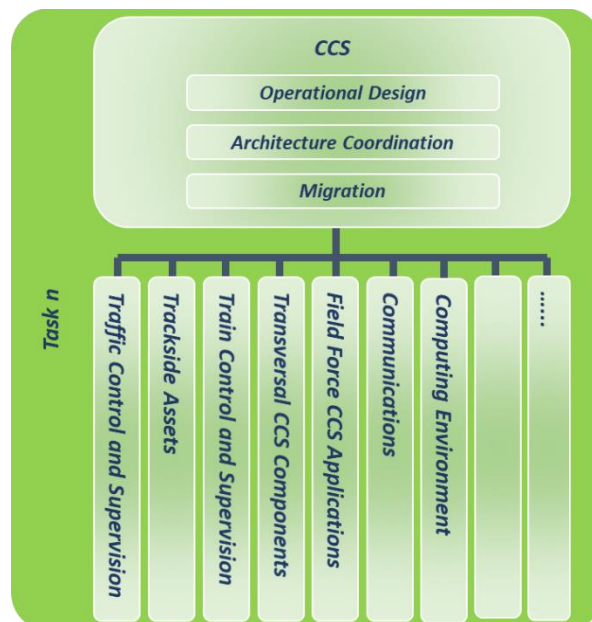

Figure 7 - Task 2: CCS

6.1.5.3.1   The Traffic Control and Supervision Team

The Traffic Control and Supervision Team is responsible for:

- Traffic Control System Interfaces standardization Management/Maintenance (Internal-External interfaces)
- Traffic Control System Functional Architecture and requirements Management/Maintenance
- Traffic Control System Logical Architecture and requirements Management/Maintenance
- Traffic Control System Physical Architecture and requirements Management/Maintenance
- Traffic Control System Data sharing Management/Maintenance
- Ensure alignment and close cooperation with Innovation Pillar Flagship Area 2
- Covers Yard/Depot/Terminals Team
    - Yard/Depot/Terminals System Interfaces standardisation Management/Maintenance (Internal-External interfaces)
    - Yard/Depot/Terminals System Data sharing Management/Maintenance
    - Proposal of Yard/Depot/Terminals System TSI input.
- Covers Station CCS Systems Team
    - Station CCS System Interfaces standardisation Management/Maintenance (Internal-External interfaces)
    - Station CCS System Data sharing Management/Maintenance
    - Proposal of Station CCS System TSI input.

6.1.5.3.2   The Trackside Assets Control & Supervision Team

The Trackside Assets Control & Supervision Team is responsible for:

- The Trackside Assets Interfaces standardization Management/Maintenance (Internal-External interfaces)
- The Trackside Assets Data sharing Management/Maintenance
- Ensure alignment and close cooperation with Innovation Pillar Flagship Area 2

6.1.5.3.3   The Train Control and Supervision Team

The Train CS Team is responsible for:

- Train CS System Interfaces standardization Management/Maintenance (Internal-External interfaces)
- Train CS System Functional Architecture and requirements Management/Maintenance
- Train CS System Logical Architecture and requirements Management/Maintenance
- Train CS System Physical Architecture and requirements Management/Maintenance
- Train CS System Data sharing Management/Maintenance
- Ensure alignment and close cooperation with Innovation Pillar Flagship Area 2

6.1.5.3.4   The Transversal CCS Components Team
- Engineering & Data Topology (map)
    - Define in cooperation with the other SP Domains and IP the standardized set of data;
    - Define methods and tools to prepare and share the data between systems and stakeholders;
- Provide Asset Condition data and technical intervention management

- Specify the minimal standard functionality, interfaces and protocols to collect asset condition data from CCS-external asset management systems and provide them as a service for the CCS systems.
- Provide a system specification for an integrated technical diagnostic system on CCS level

- CCS Configuration Management
  - Define methods/protocol/data to be shared by the system components;
  - Define the configuration management set of functions to be provided as a basis for a standardized management process on network level for CCS systems
- Security systems for systems and persons
  - Specify the standard functionality, interfaces and protocols for security systems like identity and access management, security monitoring, etc.
  - Requirements (Security, roles) definition to access the system;
  - Define methods and tools to interact with the whole Railways system;
- Provide integrated user interface [1]
  - Specify a workbench system that integrates different user interfaces services from different CCS systems
  - Define a user interface framework to include all the components user interfaces;
  - Define methods and tools to be integrated in the framework.

6.1.5.3.5   The Field Force CCS Applications Control and Supervision Team

The Field Force CCS Applications (like for trackworker safety, production information/TMS input for field forces - but not track bound applications) Control and Supervision Team is responsible for:

- Field Force CCS Applications CS System Interfaces standardization Management/Maintenance (Internal-External interfaces)
- Field Force CCS Applications CS System Functional Architecture and requirements Management/Maintenance
- Field Force CCS Applications CS System Logical Architecture and requirements Management/Maintenance
- Field Force CCS Applications CS System Physical Architecture and requirements Management/Maintenance
- Field Force CCS Applications CS System Data sharing Management/Maintenance

6.1.5.3.6   The Communications Team

The Communications Team is responsible for:

- Identify together with all other SP domains, as well as relevant Innovation Pillar FAs, all the Railways system interfaces
- Define/propose communication solutions (Media, protocols,..)

- Coordinate FRMCS related aspects
- Ensure alignment and close cooperation with Innovation Pillar Flagship Area 2

6.1.5.3.7   The Computing Environment Team

The Computing Environment Team is responsible for:

- Input Business Analysis to support the decision if to setup a standardization Domain Team and propose standardization scope of the Computing Environment

6.1.5.4   *Task 3: TMS/CM System Design Teams*

The figure below illustrates the TMS/CM Task Domain Team structure.
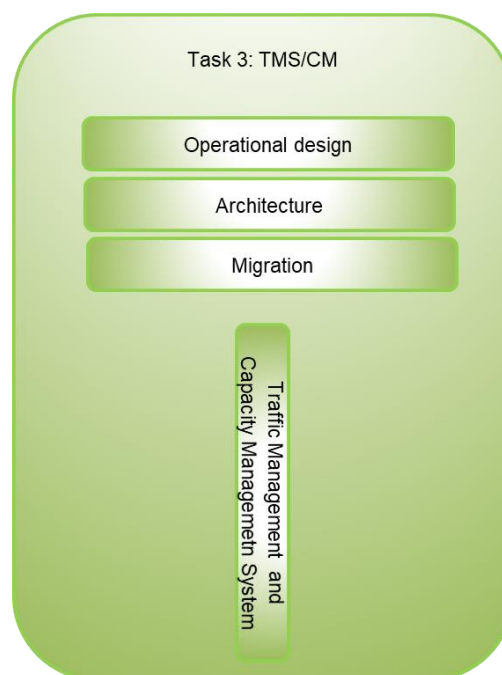

Figure 8 - Task 3: TMS/CM

6.1.5.4.1   The Traffic and Capacity Management Team

The Traffic and Capacity Management Team is responsible for:

- Manage cross-cutting activities for Task 3
  - Conduct an as-is analysis of the railway system, considering operational, functional, logical & physical assets and identifying the pain points
  - Assign prioritized pain points to existing domain teams or propose new domain teams
  - Propose a to-be (target) Functional System Architecture of the railway system
  - Propose a railway system architecture migration roadmap
- Manage the input to the standardization and TSI plan for Task 3 activities
- TMS/DCM Interfaces standardization Management/Maintenance (Internal-External interfaces)

- TMS/DCM Functional Architecture and requirements Management/Maintenance (Allocated to TMS/DCM)
- TMS/DCM Logical Architecture and requirements Management/Maintenance
- TMS/DCM Physical Architecture and requirements Management/Maintenance
- TMS/DCM Data sharing Management/Maintenance
- Ensure alignment and close cooperation with Innovation Pillar Flagship Area 1

6.1.5.5   Task 4: DAC/FTDFTO System Design Teams

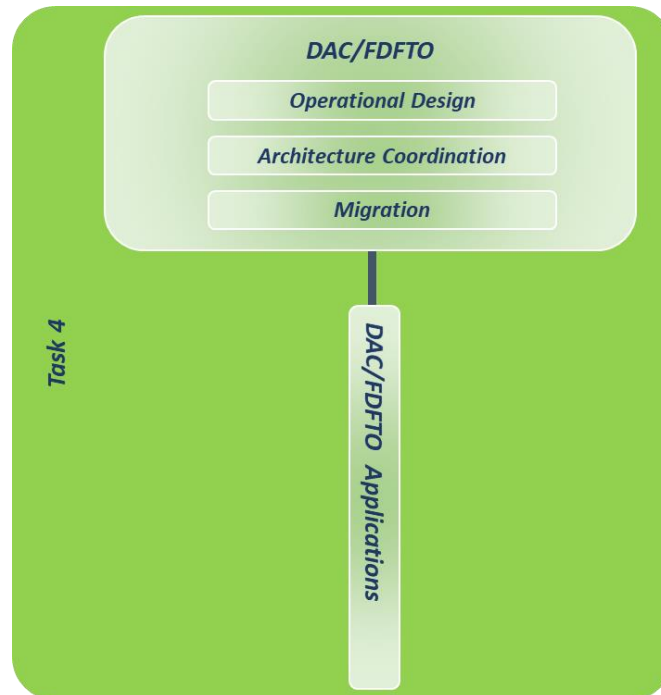The figure below illustrates the DAC/FTDFTO Task Domain Team structure.

Figure 9 - Task 4: DAC/FDFTO

6.1.5.5.1   The DAC/FDFTO Applications Team

The DAC/FDFTO Applications Team is responsible for

- Manage cross-cutting activities for Task 4 (only if necessary for level 3/4/5)
    - Conduct an as-is analysis of the railway system, considering operational, functional, logical & physical assets and identifying the pain points
    - Assign prioritized pain points to existing domain teams or propose new domain teams
    - Propose a to-be (target) Functional System Architecture of the railway system
    - Propose a railway system architecture migration roadmap
- Manage the input to the Standardization and TSI Input Plan for Task 4 activities
- Review input from EDDP (European DAC Delivery Program) on Operational Concept, check with consistency and include in overall Operational Concept, including for CCS-related processes in collaboration with Task 2 coordinated by the System Pillar Core Group
- Provide Design/Develop/Maintain of the System Architecture elements (interfaces and key functions) regarding FDFTO (Full Digital Freight Train Operations) and seamless rail freight according to the defined principles
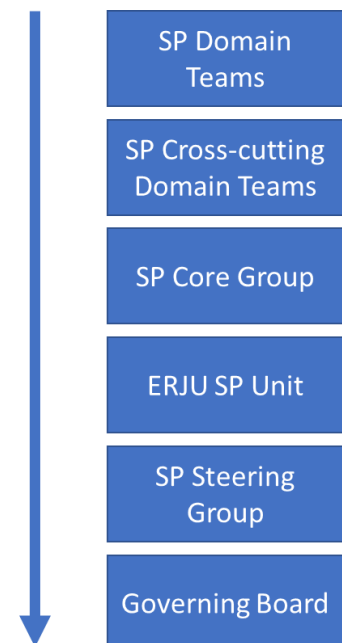
- 'Translate' the Operational concept into Functional architecture, design and maintain the Logical Architecture (Apportionment of the functional blocks) and design and maintain the Physical Architecture regarding FDFTO and seamless rail freight
- Ensure close alignment and cooperation with Innovation Pillar Flagship Area 5 and EDDP@EU-RAIL, including mediation of conflicts
- Support FA5 and EDDP regarding authorisation strategy
- Check CBA provided by EDDP for consistency with CBO

6.1.6   The System Pillar Decision Making Process

Decision making is a hierarchical process during the system design, from the lowest (technical) level (Domain Teams) to the highest level (Governing Board)

Decision preparation in the System Pillar Domain Teams and the Core Group

- Domain Teams and Core Group are preparing decisions to be validated on System Pillar Steering Group and Governing Board level
- **Decision-making** in the **Domain Teams** is taken by **unanimous consent of the domain leads (based on exhaustive discussion in the Domain Team).**
     - o Where no consensus is reached, the Domain Team lead team follows the mediation process via the SPC team (see Annex B)
- **Decision-making** power for the **System Pillar Core Group** is based on the **views of the Chair and Members**.
- [The recommendations of the System Pillar Core Group shall be adopted by consensus of the Chair and Members
     - o Where no consensus is reached, the Head of System Pillar Unit shall prepare a report for the System Pillar Steering Group, outlining the key common points and diverging views (see Annex B)]
     - o The ED will avail itself of the ED-SIPB in the process of preparation of the Decision for the SP-STG and finally of the GB

| SP Domain Teams |
| SP Cross-cutting Domain Teams |
| SP Core Group |
| ERJU SP Unit |
| SP Steering Group |
| Governing Board |

Decision making in the System Pillar Steering Group and the Governing Board

- **Decision-making** power for the **System Pillar Steering Group** is based on the **views of the Chair and Members**
- The recommendations of the System Pillar Steering Group shall be adopted by consensus of the Chair and Members

- o **Where no consensus is reached**, the Executive Director of the Europe's Rail Joint Undertaking shall prepare a **report for the Governing Board**, outlining the key common points and diverging views.
- At the **Governing Board**, a decision shall be deemed **adopted by a majority of at least 55% of the votes** including the votes of representatives who are absent in accordance with Article 8 of the SBA.

6.2 The System Pillar Innovation Pillar Interaction

The System Pillar and Innovation Pillar of EU-RAIL will work together to deliver a coherent output from EU-RAIL.

The System Pillar aims to, when relevant, guide, support and secure the work of the Innovation Pillar (i.e. to ensure that research is targeted on commonly agreed and shared customer requirements and operational needs, compatible and aligned to the system architecture), and the Innovation Pillar will impact the scope of the System Pillar where new technologies or processes mean that innovations can drive a change in approach, as well as delivering detailed specifications and requirements. Accordingly, the SP considers results to be expected from the IP in its architectural works.

The high-level principles of the working arrangements and the relationship between the pillars are set out in the following diagram:
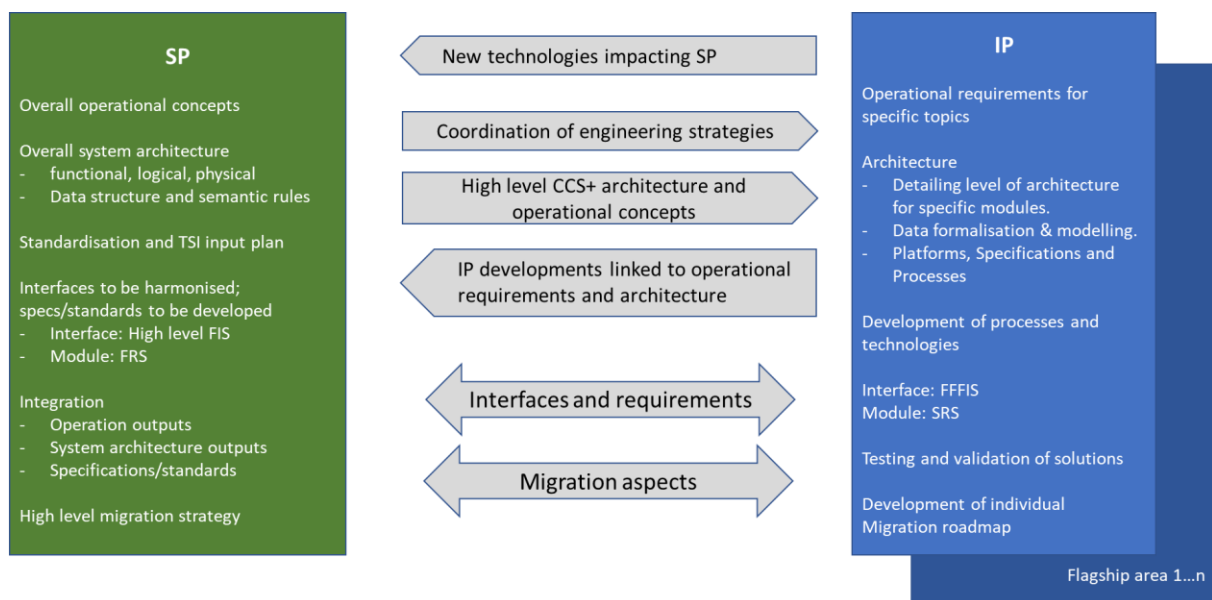

Figure 10 - Relationship between the Innovation Pillar and the System Pillar

The principle of interaction is that the System Pillar proposes the architecture and operational concept. The System Pillar will coordinate specification work of the architecture (including FFFIS and SRS), according to the specification needs. Thus, the Innovation Pillar will develop the technologies and innovation solutions including, when relevant and aligned with IP objectives and scope, the more detailed FFFIS&SRS of the specific systems. The detailed specifications will be verified by the System

Pillar to ensure consistency with the overall architecture and operational concept. The responsibility for consolidating and proposing technical documents according to the Standardization and TSI Input Plan is with the System Pillar. This will enable integration of the flagship projects both together and within the overall proposed system architecture.

From the results of this joint work, the SP will update the Standardization and TSI input plan with those draft specifications e.g. FRS, SRS, FIS, FFFIS that will allow the next iteration of the future rail system through the ERA CCM process to achieve the ambition of EU-Rail.

6.2.1 The Innovation Pillar System Experts (IPSE)

In order to deliver a coherent output from EU-RAIL the System Pillar and the Innovation pillar will work together as an integrated programme team. The following figure illustrates the principles of exchange between both pillars:
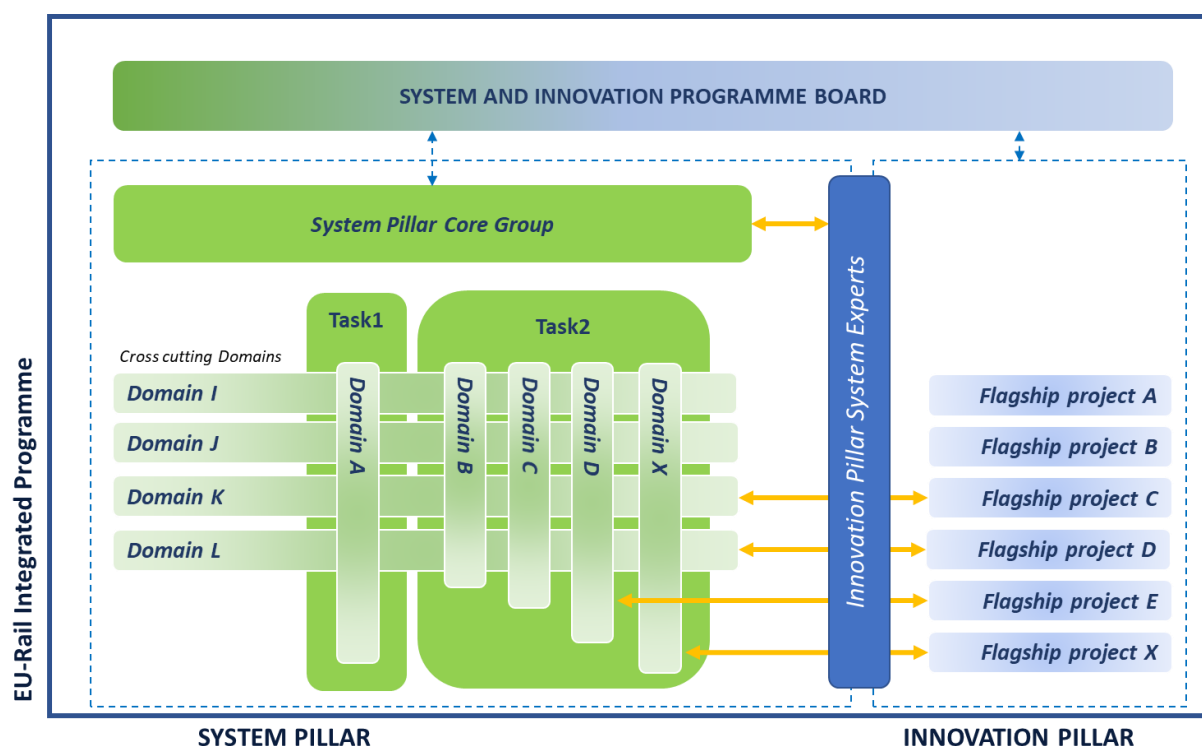

Figure 11 - Role of Innovation Pillar System Experts

The Innovation Pillar Flagship Projects will nominate one System Expert (and one alternate) as contact point for the System Pillar. These System Experts will be mandated to discuss system level topics of their Flagship project with the System Pillar Core Group, or the Domain teams. It is the responsibility of the System Pillar Core Group to extend the relevant meetings to the relevant Innovation Pillar System Experts as required. In case there is an Innovation Pillar internal alignment between Flagship projects required, the Innovation Pillar System Experts will manage the alignment together with their Flagship Project Programme Manager and serve as single point of contact towards the system pillar for their Flagship Project

6.3 Working arrangements

6.3.1 System Pillar Steering Group

Article 96 of the Single Basic Act sets out the following in relation of the System Pillar Steering Group:

- The System Pillar steering group shall be an advisory body of the Europe's Rail Joint Undertaking in charge of providing advice on System Pillar issues.
- The System Pillar steering group shall be composed of representatives of the Commission, representatives of the rail and mobility sector and of relevant organisations, the Executive Director of the Europe's Rail Joint Undertaking, the chairperson of the states' representatives group and representatives of the European Union Agency for Railways and of the ERRAC. The Commission shall take the final decision on the composition of the Group. When justified, the Commission may invite additional relevant experts and stakeholders to attend the meetings of the System Pillar steering group as observers. The System Pillar steering group shall regularly report to the states' representatives group on its activities.
- The System Pillar Steering group shall be chaired by the Commission.
- The recommendations of the System Pillar steering group shall be adopted by consensus. Where no consensus is reached, the Executive Director of the Europe's Rail Joint Undertaking shall prepare a report for the Governing Board, in consultation with the European Union Agency for Railways and the Commission, outlining the key common points and diverging views. In this case, the states' representatives group shall also prepare an opinion for the Governing Board.
- The System Pillar steering group shall adopt its own rules of procedure.
- The System Pillar steering group shall be responsible for providing advice to the Executive Director and Governing Board on any of the following:
  - The approach to operational harmonisation and the development of system architecture, including on the relevant part of the Master Plan;
  - delivering on the specific objective set out in point (c) of Article 85(2), namely:
    - develop through its System Pillar a unified operational concept and a functional, safe and secure system architecture, with due consideration of cyber-security aspects, focused on the European railway network to which Directive (EU) 2016/797 of the European Parliament and of the Council applies, for integrated European rail traffic management, command, control and signalling systems, including automated train operation which shall ensure that research and innovation is targeted on commonly agreed and shared customer requirements and operational needs and is open to evolution
  - carrying out the tasks set out in point (a) of Article 86(5), namely:
    - develop in its System Pillar a system view that reflects the needs of the rail manufacturing industry, the rail operating community, Member States and other rail private and public stakeholders, including bodies representing customers, such as passengers and freight and staff, as well as relevant actors outside the traditional rail sector. The 'system view' shall encompass:
      - the development of the operational concept and system architecture, including the definition of the services, functional blocks, and interfaces which form the basis of rail system operations;
      - the development of associated specifications including interfaces, functional requirement specifications and system requirement specifications to feed into Technical Specifications for Interoperability (TSI) established pursuant to Directive (EU) 2016/797 or

standardisation processes to lead to higher levels of digitalisation and automation;

- ensuring the system is maintained, error-corrected and able to adapt over time and ensure migration considerations from current architectures;

- ensuring that the necessary interfaces with other modes, as well as with metro and trams or light rail systems, are assessed and demonstrated, in particular for freight and passenger flows

  o the detailed annual implementation plan for the System Pillar in line with the work programmes adopted by the Governing Board in accordance with point (b) of Article 94.

  o Monitoring the progress of the System Pillar.

In effect it is the decision-making body for the System Pillar, ratifying the deliverables of the System Pillar, and providing a mechanism to deliver consensus, or a decision/recommendation where this is not possible

The Composition of the System Pillar Steering Group will be:

- Chair: DG MOVE

- Members: Commission (DG MOVE and DG RTD), EU-Rail, Chairperson of the States' Representative Group, ERA, ERRAC, AllRail, CER, EIM, UNIFE, UITP, UIP

- Observers (technical bodies responsible for providing advice to members): EUG, UIC, UNISIG, UNITEL

- Observers (other): ERTMS Coordinator, EPF, EUSPA, ETF, NB-Rail, RNE

The composition of the System Pillar Steering Group may change over time. Additional participants may be invited on ad hoc basis depending on the subject of matter to be discussed.

Meeting inputs shall be provided primarily by the System Pillar Core Group, via the Executive Director of the JU.

6.3.2 ERA in the System Pillar

ERA as System Authority for ERTMS and Telematics Applications will assess, in its full independence and autonomy, that the output of the System Pillar meets the criteria of interoperability, safety and security (via ENISA) established by the legislator, by:

- formulating requests and clarifications to the System Pillar Steering Group on progress and output

- raising to the European Commission concerns where developments may run counter to the objectives of interoperability, security and safety

- recommendations to the European Commission as result of its assessment, proposing the relevant amendment to the existing TSIs, expanding their scope or proposing the introduction of any new relevant regulation that would underpin the implementation of the aforementioned output

Once agreed and positively assessed, or mandated by the European Commission , ERA manages the outputs from the System Pillar into the TSI according to their internal working arrangements (e.g. of the ERA Extended Core Team), and the recommendation to the European Commission.

Such recommendations and proposals in no manner can be considered to construe a position of ERA with regard to its specific roles of authorisation of vehicles, issuer of safety certificates, in the collection of the ESC, and in the ERTMS Trackside Approval.

ERA will assist the European Commission in developing a common approach to safety and via ENISA to security on the Union rail system, avoiding fragmentation through a consistent set of TSIs ensuring and enhancing the interoperability in the Single European Railway Area.

- ERA will contribute to the work as advisor to the JU, while safeguarding its independence, contributing to identify:

- the detailed scope of the work and its possible structure

- its end users needs

- the strategic view of the major functionalities/changes to be introduced on the basis of the target operational concept and system architecture

- relationship and impact on relevant TSIs

- standardisation, studies, etc. needs to achieve the System Pillar objective

- the management of compatibility of systems over time, maintaining acceptable level of performance

In this context ERA will contribute to the development of the operational concept, system architecture and development of the "Standardisation and TSI input plan"

Where there is a need to ensure adaptation of the TSI, a Topical Working Group (TWG) may be set up – chaired by ERA; the System Pillar Core Group is responsible for organising the input of the JU to the TWG.

In the context of maintenance of specifications, ERA, with the support of the JU, shall explore and recommend, possible tools and techniques to further improve the quality of the specifications, ease the validation of their modifications, speed up the definition and update of the related test specifications.

The System Pillar will support ERA

- in their consideration of TSI enhancements in the scope of the JU
- in its role as ERTMS and Telematics System Authority,
    - Validating and checking enhancement change requests in the scope of TAP/TAF, CCS enhancements external to the JU. Such enhancements will be passed to the System Pillar from ERA to asses against the overall system architecture and operational concept, and inform ERA in its further consideration of such enhancements.
    - validating and assessing CCS associated error corrections

- providing input to a TWG

6.3.3 Working arrangements with International and European Standardization Organizations (ISO, IEC and ESO)

The System Pillar will manage Standardization activities from the JU towards European and International Standardization Organizations. Principles for activity are

- Ensure a coordinated approach for the JU, System Pillar and Innovation Pillar
- Ensure early uptake of new findings in Innovation process to standardization activities
- Prevent overlapping and contradictory or conflicting standardization activities within and outside the project
- Enable smooth standardisation process through early identification of blocking points with standardisation bodies
- Ensure the development of the right standard at the right place on the right time, with close cooperation with European and International standardisation bodies

The System Pillar will therefore coordinate standardization activities from the JU with the following bodies:

- European Standardization Organisations
  - The Railway Technical Committee of the European Committee for Standardization: CEN TC 256
  - The Railway Technical Committee of the European Committee for Electrotechnical Standardization: CENELEC TC 9X
  - The Railway Technical Committee of the European Telecommunication Standard Institute: ETSI TC RT
- International Standard Organisations
  - The Railway technical committee of the International Organisation for Standardisation: ISO TC 269
  - The Railway technical committee of the International Electronical Commission: IEC TC9
  - The International Telecommunication Union (ITU)

Responsibilities of the System Pillar are

- Collecting standardization proposals from System Pillar Domain Teams system design activities or external enhancement proposals, as well as collecting standardization proposal from the Innovation Pillars Flagship Areas
- Analysis and assessment of standardization proposals and maintaining the Standardization and TSI Input Plan
- Validation of standardization Input Plan with the System Pillar Steering Group
- Providing relevant input to the different standardization bodies

7 References

[1]   Single Basic Act, 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 (OJ L 472, 30.11.2021, p. 17).

[2]   Common Business Objectives, System Pillar Core Group, Document link: https://eeigertms.sharepoint.com/:f:/s/SC5CoreGroup/ErIsmm5BpJJCqR8rjphR2KcBRVyMZrvFdjawaoJ4IM02Vw?e=IL1HJR

[3]   Operational Concept, System Pillar Core Group, Document link: https://eeigertms.sharepoint.com/:f:/s/SC5CoreGroup/ErIsmm5BpJJCqR8rjphR2KcBRVyMZrvFdjawaoJ4IM02Vw?e=IL1HJR

[4]   High-Level Architecture, System Pillar Core Group, Document link: https://eeigertms.sharepoint.com/:f:/s/SC5CoreGroup/ErIsmm5BpJJCqR8rjphR2KcBRVyMZrvFdjawaoJ4IM02Vw?e=IL1HJR