Deliverable D2.2
Workplan for collaboration with other EU-RAIL Destinations

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2	2023-07-14	Final version for review
3	2023-08-11	Final version after reviewers comments
4	2024-05-09	Including updates after MCP1 (Maturity Checkpoint) and rejection letter with other Destinations

Report contributors		
Name	Beneficiary Short Name	Details of contribution
Marco Ferreira	HACON	Initial draft and revisions consolidation Included MCP1 updates
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1. Executive Summary

The purpose of this document is to present a Workplan for collaboration with other EU-RAIL Destinations for Flagship Project 1: MOTIONAL. The Workplan outlines the objectives, guidelines, collaboration activities, deliverables, outcomes and risk management strategies for the collaboration between Flagship Project 1 and the other participating EU-RAIL Destinations.

The objectives of collaboration include improving knowledge sharing, enhancing collaboration and coordination, and increasing efficiency and effectiveness of technical enablers developed by the Flagship projects. The guidelines for collaboration address communication and coordination mechanisms, roles and responsibilities, data sharing and confidentiality, intellectual property rights, and timelines and milestones.

The activities include identifying potential collaboration, joint planning and implementation of pilots, and documentation exchange.

Overall, this Workplan aims to establish a successful and productive collaboration between Flagship Project 1 and the other EU-RAIL Destinations, with the aim to provide better results in all involved projects.

This document was updated after the first FP1 Maturity Checkpoint, considering comments from EU-Rail and other Destinations.

2. Abbreviations and acronyms

Abbreviation / Acronym	Description
ATO	Automatic train operation
B2B	Business to business
C-DAS	Connected Driver Advisory System
CDM	Common Data Model
DAS	Driver Advisory System
EU-RAIL	Europe's Rail Joint Undertaking
ETA	Estimated Time of Arrival
ETCS	European Train Control System
FP	Flagship project
MaaS	Mobility-as-a-Service
MAWP	Multi Annual Work Plan
PIS	Public Information System
SG	Sub-Group
TMS	Traffic Management System
TRL	Technology readiness level
WP	Work Package

3. Background

The present document constitutes the Deliverable 2.2 “Workplan for collaboration with other EU-RAIL Destinations” in the framework of the Flagship Project 1 – MOTIONAL, as described in the EU-RAIL MAWP[1].
A collaborative approach between the EU-Rail Flagship projects is requested to exchange requirements and developments across project borders and have a more holistic view of the EU-Rail developments.

[1] https://rail-research.europa.eu/wp-content/uploads/2022/03/EURAIL_MAWP_final.pdf

4. Introduction

The MOTIONAL project aims to revolutionize the rail industry by developing innovative solutions that enhance the planning and operational management of rail services. To achieve this objective, it is essential to collaborate with other EU-RAIL Destinations to identify dependencies and preparatory work required between projects. This document outlines the workplan for collaboration between the MOTIONAL project and other EU-RAIL Destinations.

The collaboration workplan includes the establishment of a detailed listing the dependencies and cross-requirements between the MOTIONAL project and other Flagship projects, and the development of a timeline of activities to address them. This plan will be established through an iterative process, and its timeline will be kept up to date and adjusted by the different projects as required.

Effective collaboration is essential to the success of the EU-RAIL programme, and this workplan is a critical step in ensuring that the MOTIONAL project can work effectively with other Flagship projects. By identifying dependencies and risks early on, we can minimize the impact of these factors and ensure that the project results are delivered.

This document was updated after the first FP1 Maturity Checkpoint, considering comments from EU-Rail and other Destinations.

5. Guidelines for Collaboration

5.1. Communication and coordination mechanisms

To ensure effective collaboration between the MOTIONAL project and other EU-RAIL Destinations, the following communication and coordination mechanisms are put in place:

1. Regular meetings are held between the project coordinators, project managers, or technical coordinators, depending on the project phase. These meetings will provide an opportunity to discuss the interactions progress, identify upcoming dependencies and risks.
2. The Flagship Project engineers can establish direct communication for technical collaboration.
3. A shared document repository shall be established, where all project documentation, including plans, schedules, and reports, can be accessed by all parties involved in the collaboration. This repository should be provided by EU-Rail, or in alternative the Polarion Tool from the System Pillar can be used.

5.2. Roles and Responsibilities

To ensure effective collaboration between the MOTIONAL project and other EU-RAIL Destinations, the following roles and responsibilities are established:

1. **Project Coordinator:** The project coordinator is responsible for overseeing the collaboration between the MOTIONAL project and other EU-RAIL Destinations. The Project Coordinator ensures that all communication and coordination mechanisms are in place and that the collaboration is progressing according to plan.
2. **Flagship Project Manager:** The project manager is responsible for ensuring that interaction milestones are met, and that any issues or risks are identified and addressed in a timely manner.
3. **Technical Coordinator:** The technical coordinator is responsible for ensuring that the technical requirements of the collaboration are met. The Technical Coordinator works closely with the Flagship Project engineers of each project to identify dependencies and ensure that all technical requirements are delivered on time.
4. **Flagship Project Engineers:** The engineers, together with the technical coordinator are facilitating the collaboration between the WP leaders and the leaders from other Destinations.
5. **WP leaders:** The WP leaders are responsible for delivering the technical requirements and contents of the collaboration. They work closely with the technical coordinator to ensure that all dependencies are identified and addressed, all technical requirements are met, input and output data and information are provided, technical developments shared, and joint demonstrations are aligned.

5.3. Information sharing

Information sharing is an essential component of collaboration between the MOTIONAL project and other EU-RAIL Destinations. However, it is also critical to ensure that data sharing is done in a manner that protects the interests of all parties involved. To this end, if necessary, confidentiality agreements and intellectual property rights should be established as part of the workplan to ensure that all data shared is used only for the purposes of the collaboration and is not disclosed to third parties without prior consent.

By establishing clear communication and coordination mechanisms, defining clear roles and data sharing agreements, we can ensure that the collaboration between the MOTIONAL project and other EU-RAIL Destinations is effective and productive, leading to the successful delivery of the Flagship Projects results.

6. Collaboration Activities

The collaboration activities with other EU-RAIL destinations have been a key focus of this project since its inception. In the initial months, the project team identified potential topics for collaboration and began exploring opportunities for joint planning and implementation of pilot projects. This process is ongoing and has already identified promising collaborations.

One of the primary forms of collaboration is through the development and exchange of project deliverables, which can take many forms. These may include requirements, specifications, reports, or other resources that provide valuable insights into the challenges and opportunities faced by EU-RAIL destinations. These deliverables can be shared across projects and could also be made available to a wider audience, making them public.

Another important form of collaboration is through integrated, joint demonstrations, which are designed to showcase innovative rail solutions and technologies produced by the collaborating destinations, in some cases in a real-world setting. These demonstrations are often conducted at a specific stage of development, known as the technology readiness level (TRL). For example, a demonstration might be rated as:

- TRL 4: This stage involves testing a prototype technology in laboratory or simulated environment. For example, a demonstration of an automated train control system might be conducted in a test track to evaluate its performance in a controlled setting.
- TRL 7: At this stage, the technology is tested by the end users in a relevant operational environment, such as a rail network or station. For example, a demonstration of a new passenger information system might be conducted in a busy station during peak hours to evaluate its effectiveness in a real-world setting.

These joint demonstrations can be powerful tools for promoting collaboration and sharing knowledge among EU-RAIL destinations.

Finally, the project team is committed to maintaining regular dialogues with other EU-RAIL

destinations on the topics of mutual interest. This collaboration takes the form of ongoing discussions about how to move forward with joint projects and demonstrations, as well as the sharing of ideas, feedback, and lessons learned from previous developments. This type of collaboration is essential for building strong relationships between EU-RAIL destinations and ensuring that the projects continue to make progress toward their goals.

Throughout the collaboration activities, the project management team will be responsible for evaluating and monitoring the progress of the identified interactions. This will involve tracking key metrics, such as the number and quality of deliverables produced, the success of demonstrations, and the level of engagement among EU-RAIL destinations. These evaluations will help to identify areas for improvement and ensure that the collaboration activities are aligned with the overall goals of the project.

Dissemination and communication of collaboration outcomes is also part of the collaboration activities with other EU-RAIL destinations and should be coordinated with WP32 team. The project partners should ensure that the outcomes of joint projects, including deliverables, demonstrations, and regular dialogues, are widely disseminated, and communicated to a variety of stakeholders. This may involve publishing deliverables, presenting at conferences and workshops, and engaging with policymakers and industry stakeholders to promote the adoption of new rail solutions and best practices.

7. FPs Interactions

This section outlines the process for collecting interactions between different research projects. The purpose of this process is to ensure effective communication and collaboration between projects, and to facilitate the exchange of information and resources.

To collect and elaborate the interactions identified on this section the following process was followed:

1. Identification of Interaction Topics:
   - During the grant agreement preparation phase, interaction topics across projects were identified. These interaction topics were then further detailed, resulting in their inclusion in the relevant text of the Grant Agreements.
2. Creation of Interaction Table:
3. An interaction table was created to compile all interaction topics (described below).
4. Review by FP1 Partners:
   - The interaction table was reviewed by FP1 partners, including additional information, responsible entities/persons, comments, and questions.
5. Feedback from Other FPs:
   - The table was shared with other FPs to get feedback on FP1 comments and identify the correct points of contact for each topic.
6. Meetings for Discussion:
   - For topics requiring discussion and clarifications, meetings were conducted between the responsible partners with the support of WP2.
7. Validation by FP1 Partners:
   - The interaction topics were validated by FP1 partners when no additional discussions are needed.
8. Validation by Other FPs:
   - The tables were shared with other FPs to also be validated by their responsible partners.

It is important to note that the interactions with other FPs are a continuous collaboration, meetings and discussions are still being planned between projects to clarify, validate and develop interaction topics as they emerge from the progress of the different projects' activities.
The FP interaction tables will then be a live document, that will be maintained by WP2 and regularly updated and uploaded to the Cooperation Tool.

The following sub-section identifies the interactions required between the different EU-Rail destinations, guaranteeing that we reach the collaboration goals of each project.

The interactions will be described using a template table describing the following interaction details:

- **FP1 Task:** FP1 task of the WP(s) involved on this interaction.
- **FP1 description:** Description of action in FP1.
- **FPx WP:** FPx WP(s) involved on this interaction.
- **FPx description:** Description of action in FPx, provided by this FP
- **FP delivery direction:** The interaction can be from FP1 to FPx (**→FPx**), from FPx to FP1 (**←FPx**), or exchanging information in both directions **(FP1↔FPx)**.
- **Collaboration Type:** This can be a deliverable (**D**), a demonstration (**Xn** where n is the demonstration TRL) or collaboration **(C)** about the topic having regular dialogs on how to go forward.
- **Deliverable or demonstration concerned:** The deliverable id to be exchanged, the demonstration identifier.
- **When available (M):** The month the interaction item will be available.
- **When expected (M):** The month the interaction is expected to be received.
- **Responsible(s) FP1 Partner and Email:** FP1 responsible entity and the contact e-mail.
- **Responsible(s) FPx Partner and Email:** FPx responsible entity and the contact e-mail.
- **Issues/comments:** Additional comment or issues detected on this interaction.

Interaction that has been validated by both responsible involved are written in **black font**, while interaction that are still being discussed the way to collaborate are written in **grey font**.

7.1. FP1 – FP2 Interactions

The FP2 interactions table is a comprehensive tool that tracks the interactions between different research projects within the FP2 program. This table includes a variety of interaction topics, including “New generation braking” (NG brakes), “Data assessment and potential identification”, “ETCS Hybrid L3 deployment strategies”, “develop simulation methods and models for capacity evaluation of ETCS and C-DAS/ATO”, “links between TMS and ATO/DAS”, and “impact simulation and analysis”. The purpose of this table is to facilitate effective communication and collaboration between FP1 MOTIONAL and FP2 R2DATO projects, while also ensuring that all relevant parties are kept informed and up to date on the status of each project. By using this interactions table, we can develop a detailed plan and timeline for collaboration that can ensure the success of the program and achieve our project goals in a timely and efficient manner.

Table 1 - FP1 – FP2 Interactions

ID	FP1 Task	FP1 desc	FP2 WP	FP2 desc	FP1↔FP2 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP2 Partner/Email	Issues/comments
FP1-2-01	3 8.4 9	WP8/WP9 have identified link to FA2 about the need of capacity simulations for calculating the capacity effect of new functionality regarding ETCS HL3, ETCS braking curves and ATO.	32 37	Indeed, and already integrated in joint planning. In some cases, with the same person	**FP1↔FP2**	C				TRV magnus.wahlborg @trafikverket.se per.kohler @trafikverket.se	PR henri.olink @prorail.nl	[BD 2806] The main interface and point of contact is WP32 with Henri Olink

ID	FP1 Task	FP1 desc	FP2 WP	FP2 desc	FP1↔FP2 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP2 Partner/Email	Issues/comments
FP1-2-02	8.4	T8.4.1: (Develop simulation methods and models for capacity evaluation of ETCS): In this subtask simulation methods for capacity evaluation of ETCS level 2 including optimal braking behaviour (by new generation braking coming from FA2) and ETCS Hybrid level 3 are developed	15 16 17 18 37	[information about new generation braking needs to be transferred from FP2 to FP1], is already in progress (planning)	**FP1←FP2**	C				PR henri.olink @prorail.nl	PR henri.olink @prorail.nl KB marcus.fischer @knorr-bremse.com GTSD uwe.klingner @urbanandmainlines.com DB ibtihel.cherif @deutschebahn.com	[BD 2806] The main interface and point of contact is WP32 with Henri Olink.
FP1-2-03	8.4	FA2 WP 32 (DATO Assessment) need insight information on the capacity potential of ATO/C-DAS. FA1 WP8/9 capacity simulation provides this information.	17 18 32	Ongoing work with specification of requirements for capacity simulations between relevant WP:s.		C				PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	Not aligned timing. Needs to be addressed. HO: is mitigated and first steps been taken Minuted this interaction on 20220930 [PK MW 230704] The deliverable months have been moved to row 16 since it is related to demonstration in WP9 (task 9.2). New text suggested in column C and F.
FP1-2-04	9.2	T9.2: (…) The potential capacity impact of the application of new technologies like C-DAS, ATO, optimized braking curves in ETCS L2 (by new generation braking coming from FA2) and Hybrid Level 3 is demonstrated. This is input for FA2. Based on the demonstrator results recommendations for next step for TMS-C-DAS/ATO development are described.	15 16 17 18 32 37	[information about capacity impact of the application of new technologies to be transferred from FP1 to FP2]		C		43	38	PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	[BD 2806] The main interface and point of contact is WP32 with Henri Olink

ID	FP1 Task	FP1 desc	FP2 WP	FP2 desc	FP1↔FP2 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP2 Partner/Email	Issues/comments
FP1-2-05	15.2 15.3 15.4	For modelling ATO driving behaviour specifications of technical parameters have to be transferred to this FP1 WP	9 10	For modelling ATO driving behaviour specifications of technical parameters have to be transferred to this FP1 WP	**FP1←FP2**	C		M36	M20--24	PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	The technical parameters to be transferred to FP1 must be defined by FP1 first and communicated to FP2. In general terms, values cannot be obtained from WP9 and WP10 of FP2 but from the demonstrators. Please note WP9 to WP12 of FP2 will reach TRL4/5 only. Hence, a good approach could be to implement one of the FP2 demos in FP1 simulator. Either if coming from WP9 & WP10 or from the demonstrators of FP2, the values will come too late for FP1. It is suggested to start working with estimated values and then replace them with real ones coming from the demos.
FP1-2-06	15.5	T15.5 ((Together-combined with FA2) Preparations (requirements) for TMS-ATO 2030 demonstrator in real-time live operations, including perturbated situations after 2025): Development of traffic regulation strategies (Operational Concept) for improved global behaviour of the traffic under minor timetable disturbances (delays and unfulfilled headways), based on different criteria and taking into account the global situations of the line through TMS – ATO interaction. It is anticipated that, those developments will be tested in sync by 2030 through the live demonstrator.	39	Alignment and exchange between FP1 T15.5 and FP2	**FP1↔FP2**	C				PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	Expected outputs are defined in R2D2 WP D32.2 and aligned with either FP1 WP8/9 and 15/16 in physical sessions. Demonstrators in FP1 will be developed on basis of this and by iteration refined in the preparation and during the demonstrations.
FP1-2-07	16.1	ST16.1.2: Writing scenarios for operating the Real-world human-in-the-loop demonstrator in close alignment with the FA2 demonstrator on the same topic. Collaborative demonstrator means here that all test requirements of either FA1 or 2 will be executed in sync. ST16.2.1: Testing the in scenarios defined in sub-Task 16.1.2 in close alignment with the FA2 demonstrator on the same topic.	32 39		**FP1↔FP2**	C				PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	More information can be found in D 32.2 of R2DATO and to be determined specifications coming from R2D2 WP37&39, which just started up. Dialogue FP2->FP1 is (WP32) Anke van Haaften to Per Köhler (WP8/9) and Rob Goverde (WP15/16) and Joelle Aoun (WP39/37) to Per Köhler (WP8/9) and Rob Goverde (Wp15/16)

ID	FP1 Task	FP1 desc	FP2 WP	FP2 desc	FP1↔FP2 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP2 Partner/Email	Issues/comments
FP1-2-08	16.2	ST16.2.1: Testing the in scenarios defined in sub-Task 16.1.2 in close alignment with the FA2 demonstrator on the same topic. ST16.2.2: "Live" demonstration for the public (or by video) of future TMS-ATO operations, including human factors: • In alignment with FA2 "Mainline demonstration preparation"- a project of a complex network use case including very short headways, disruption, and conflict resolution where TMS and ATO together show their added value, also indicating how this new kind of operation will impact the involved operational actors (train drivers and signalers HF research) by ProRail/NSR. • Testing HF impact when applying in FA2 developed new optimized braking functionality. (…)	39		**FP1↔FP2**	C				PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	[BD 2806] Additional clarification needed on the link to WP39 and the expectation especially with the timeline to 2023. Our understanding is that the link via the DATO assessment as indicated by Henri Olink (WP32)
FP1-2-09	16.2 16.4	FA2 WP 32 (DATO Assessment) need insight information on the operational potential of the ATO/C-DAS combination, FA1 WP16 simulation provides this information including HF impact. Human-in-the-loop tests in WP 16 also provides insight information for most optimal migration strategies to be developed in FA2's WP33	32 33	FA2 WP 32 (DATO Assessment) need insight information on the operational potential of the ATO/C-DAS combination, FA1 WP16 simulation provides this information including HF impact. Human-in-the-loop tests in WP 16 also provides insight information for most optimal migration strategies to be developed in FA2's WP33	**FP1→FP2**	C		43	38	PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	"Not aligned timing. Needs to be addressed.
FP1-2-10	16.4	ST16.4.3: In alignment with ATO developments in FA2, development of recommendations for a migration strategy for TMS -ATO implementation, based on human factors research towards management of future technology, including practicability, and operational viability.	32 33		**FP1↔FP2**	C				PR henri.olink @prorail.nl	PR henri.olink @prorail.nl	FP2 WP33 starts in month 24, FP1/WP 16 also. Managing the dialogue just before start-up is needed and will be planned
FP1-2-12	17.2	Task 17.2.5 interacts with FA2 ETCS L3 APS System provided by TLSG and Alstom for automatic execution of very short term decision. ("Plan Execution" according RCA architecture	13 14	Task 17.2.5 interacts with FA2 ETCS L3 APS System provided by TLSG and Alstom for automatic execution of very short term decission. ("Plan Execution" according RCA architecture	**FP1↔FP2**	C				GTSD klaus- michael.schuldes @urbanandmainlines .com	GTSD nader.nayeri @urbanandmainlines .com uwe.klingner @urbanandmainlines .com DB gregor.kolokewitzsch @deutschebahn.com ibtihel.cherif @deutschebahn.com	[BD 2806]FP2 WP numbers changed. The alignment has already been started and 2 meetings have been held. In this meeting it was decided that the main person to be contacted is the WP leader of WP17 in order to establish an official communication. This should be reflected in the table.

ID	FP1 Task	FP1 desc	FP2 WP	FP2 desc	FP1↔FP2 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP2 Partner/Email	Issues/comments
FP1-2-13	26.2	It designs, deploys and executes the MOTIONAL project's process to collect use cases from all Destinations, complementing them with System Pillar guidelines, in order to drive development of digital enablers according to the Destinations' actual requirements, constraints and timelines.	all	It designs, deploys and executes the MOTIONAL project's process to collect periodically: • use cases from all Destinations, • architecture specifications from the System Pillar . Following System Engineering Management Plan guidelines delivered by the System Pillar, the process generates specifications to drive incremental development of digital enablers tooling according to the Destinations' actual requirements, constraints and timelines, in compliance with relevant System Pillar architecture specifications. Digital tooling, consisting of CDM digital models and Destination-specific data exchange structures, dataspace Connectors, and Digital Twin development environment, are delivered periodically and incrementally by WP30, WP31 and WP 29, respectively, to the relevant Destinations.	FP1↔FP2	C	D26.1		M08	DRL Christian.Linder @dlr.de		Deliverable D26.1 is a documentation of the process for collecting/updating Use Cases from Destinations and System Pillar architecture specifications. Synchronization with other FPs and System Pillar (concrete checkpoint outcomes) will happen periodically every 6 months, starting at month 6.
FP1-2-14	27	Digital Asset Engineering (Multidisciplinary Process) Digital Planning and Engineering shall enable the data-based planning and engineering of railway assets, starting from CCS+. The result including a set of extracted objects shall be fit for co-simulation, automated testing, and implementation as well as inspection, maintenance, and operations.	7 27 34	Digital Asset Engineering	FP1↔FP2	C D				DB Kehinde-emmanuel. enisan-extern @deutschebahn.com		[BD 2806] We need to check if this point is relevant for FP2 and if WP7 / 27 are the right WPs to be connected The interaction between the WP 27s in FP1 and FP2 involves the exchange of common data format regarding the description of the infrastructure, engineering, and topology. The static data (format/ instance) would be provided by TT - WP27 to R2DATO WP27 Digital Map. In addition, the first alpha version of the toolboc will be used in FP2 moving block demonstrator WP
FP1-2-15	28	Digital Twin Environment Preparation This work package will prepare the design of an environment for building up and using Digital Twins and Digital Twin assemblies, which are defined as virtual representations able to imitate the behaviour of the physical railway system, its multiple heterogeneous subsystems and interactions during their lifetime. This environment is to be designed along Digital Twin use cases provided by the FAs.	34.5 4	These WPs focus on using Digital Twins to support virtual certification and validation in train integration. This WP is relaying on the tool set to be developed by TT.	FP1↔FP2	C D	D28.1	18	18	DLR andreas.heckmann @dlr.de	PR henri.olink @prorail.nl SNCF emilie.cheneau @sncf.fr	[BD 2806] The point of contact have been replaced by the Cluster leader and the WP leader. We do not foresee directly a link to the task laeder of the WP.

One general observation from FP2 R2DATO is that interfaces/communication between the two Flagship Projects from FP2 R2DATO side are handled:

- via WP37 (“logistical dialogue”) - especially for the WP15 & WP16 (and FP1 WP15/16)
- via WP32 (and WP38 – especially for the WP8 & WP9 on the topics of NG break) (and FP1 WP17/18)

7.2. FP1 – FP3 Interactions

The interaction table between FP1 MOTIONAL and FP3 IAM4Rail projects focuses on several key topics related to asset management, maintenance, and traffic monitoring. With a particular emphasis on infrastructure, the table explores the exchange of information between the two projects and the role of TMS in retrieving traffic data and asset usage. These interactions also focus on the use of “federated dataspaces” and “Common Data Model to facilitate asset management” and the “implementation of tools for digital twins”.

Table 2 - FP1 – FP3 Interactions

ID	FP1 Task	FP1 desc	FP3 WP	FP3 desc	FP1↔FP3 ←→	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP3 Partner/Email	Issues/comments
FP1-3-01	3.2	[D3.1 (Use Cases) handover to FP3] D3.1 includes Use cases covering technical enablers 1-7 (Capacity planning)	2 8	[D2.6 "Definition of Use Cases" will describe the use cases addressed by IAM4RAIL]	**FP1↔FP3**	D	FP1 D3.1 FP3 D2.6	FP1 12 FP3 6		TRV magnus.wahlborg @trafikverket.se	STS marco.borinato @hitachirail.com	D3.1 will be published M12. It will describe demonstrator specifications for SG1 planning WP4/WP5, WP6/WP7 and WP8/9. It is good to stay in contact for information/knowledge exchange and to look for if we have connected demonstrations and potential co-operation. FP3 D2.6 "Definition of Use Cases" will describe the use cases addressed by IAM4RAIL and be ready in M6. It can be shared with FP1 to find common UC and improve collaboration.
FP1-3-02	3	Destination 3 link is about Integration of Intelligent Asset Management with capacity planning and TMS	2	Coordination of IAM4RAIL WP2 on the alignment of FP1 and FP3 for the link between IMA and TMS	**FP1↔FP3**	C		1-12		TRV magnus.wahlborg @trafikverket.se	STS marco.borinato @hitachirail.com	Main interests with collaboration are to inform about FP1 and FP3 demonstrations to avoid overlaps and look for mutual benefit.
FP1-3-04	10	[Inputs from FP3 WP2 for specification in FP1 WP10]	2 8 9	[D2.x TMS related inputs from FP3]	**FP1←FP3**	C		12	24	Hacon rolf.goossmann @hacon.de	STS marco.borinato @hitachirail.com	Discussion already started

ID	FP1 Task	FP1 desc	FP3 WP	FP3 desc	FP1↔FP3 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP3 Partner/Email	Issues/comments
FP1-3-05	10	[specifications to be aligned between FP1 WP10 and FP3 WP2]	2 3 4 8 9	[for preparation of D2.x (TMS related inputs from FP3)]	**FP1↔FP3**	C		1-12		Hacon rolf.goossmann @hacon.de	STS marco.borinato @hitachirail.com	
FP1-3-06	11.3	Subtask 11.3.7 HACON develops interfaces for integration of TMS with services such as (…), integration with digital maintenance module as used in Destination 3 WP 8, (…)	2 8	Task 8.4: (…) The primary aim is to align maintenance planning with planned or forecasted traffic as delivered by TMS and to update TMS with any relevant changes of maintenance plans in due time. Activities in this task include: - Development of decision support for integrating dynamic maintenance programs in train plan, maintenance planning system integrated with TMS. (…)	**FP1↔FP3**			30	1-44	Hacon rolf.goossmann @hacon.de	TRV rikard.granstrom @trafikverket.se	Rolf 05.10.2023: I think real provision of what we have developed will happen only after M24. Before, we will just have aligned specifications and separated test capability with example messages. This would be fine for TRL4. I suggest moving this interaction to Month 30.
FP1-3-07	12.2	Subtask 12.2.7 HACON will develop TRL 6 interfaces for integration of TMS with other services such as (…), digital maintenance systems (supporting Destination 3 activities), (…)	8		**FP1↔FP3**	X6	MCP37	14-46	1-44	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	THA	TRL5 delivery to FP3 in M37
FP1-3-08	13	Decision Support Systems (DSS) deals with cooperative real-time detection of incidents/disruptions, in collaboration with FA3 WP 3,4" Wayside Monitoring and TMS link",	3 4	Decision Support Systems (DSS) deals with cooperative real-time detection of incidents/disruptions, in collaboration with FA3 WP 3,4" Wayside Monitoring and TMS link",	**FP1←FP3**	C		3-24	3-24	STS Daniela.Pietranera.ext @hitachirail.com	STS marco.borinato @hitachirail.com	Discussion already started
FP1-3-09	14	Decision Support Systems (DSS) demonstrator deals with cooperative real-time detection of incidents/disruptions, in collaboration with FA3 WP 3,4" Wayside Monitoring and TMS link",	3 4	Decision Support Systems (DSS) demonstrator deals with cooperative real-time detection of incidents/disruptions, in collaboration with FA3 WP 3,4" Wayside Monitoring and TMS link",	**FP1←FP3**	C		3-24	3-24	STS Daniela.Pietranera.ext @hitachirail.com	STS marco.borinato @hitachirail.com	Discussion already started

ID	FP1 Task	FP1 desc	FP3 WP	FP3 desc	FP1↔FP3 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP3 Partner/Email	Issues/comments
FP1-3-10	19.9	Task 19.9 interacts with FA3 WS1 & WS3 enablers to define specifications for information sharing with TMS (by getting asset status predictions and prescriptions and sending back TMS decisions to allow an informed asset management strategy)	2 4	Task 4.2: Integrated demonstration & connection to TMS (Leader: STS; Participants: ADIF, AZD, ENYSE, FS, INDRA, MERMEC, TES) (Duration: 30-48) Task 4.2 will carry out the following steps to guarantee a uniform demonstration at TRL 6/7 of the Use Cases and coherence with the overall ER initiative: • Demonstration of the WP4 results and achievements in line with the guidelines defined in WP3 task 3.1 and on the basis of the identified Use Cases KPIs as defined in Sub-Task 3.2.1 and Sub-Task T3.3.1; • Assessment of the achieved results towards the implementation of the IAMS system in ER; • Identification of remaining gaps and way forward.	**FP1↔FP3**	C		1-12	1-48	STS pietro.calcagno @hitachirail.com	STS marco.borinato @hitachirail.com	Different WPs durations between FA1 & FA3
FP1-3-11	22.1	Providing an access to accessibility information on station.	14 15	Asset management data source (data lake) provides necessary information about operability of accessibility solutions on station.	**FP1↔FP3**	C		24	36	PKP jb@agh.edu.pl	PKP jb@agh.edu.pl	Risk of mismatch in needs. Keep in the loop also WP14-15 Leader (s.casula@italferr.it) and Gilles Gerbe (gilles.gerbe@urbanandmainlines.com)
FP1-3-12	24.5	[needs alignment with WP2 FP3] Task 24.5 – Manage/ Inform Disruptions across modes Calculate planned disruptions and provide mitigation strategies to railway service provider	2	Provide data coming from asset management and monitoring	**FP1↔FP3**	C		5-24	1-48	STS pietro.calcagno @hitachirail.com	STS marco.borinato @hitachirail.com	
FP1-3-13	24.5	[The development of a seamless multimodal management framework able to manage short- and long-term disruptions is linked to the predicted/prescribed information provided by asset management services (FA3)]	3 4	[The development of a seamless multimodal management framework able to manage short- and long-term disruptions is linked to the predicted/prescribed information provided by asset management services (FA3)]	**FP1←FP3**	X5		5-24	5-24	STS pietro.calcagno @hitachirail.com	STS marco.borinato @hitachirail.com	
FP1-3-14	25.1	[Demonstrator for short- and long-term disruptions management able to acquire predicted/prescribed disruption information from asset management services (FA3)]	3 4	[Demonstrator for short- and long-term disruptions management able to acquire predicted/prescribed disruption information from asset management services (FA3)]	**FP1←FP3**	X6/7	MCP37	25-48	25-48	STS pietro.calcagno @hitachirail.com	STS marco.borinato @hitachirail.com	Different WPs durations between FA1 & FA3

ID	FP1 Task	FP1 desc	FP3 WP	FP3 desc	FP1↔FP3 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP3 Partner/Email	Issues/comments
FP1-3-15	26.2	It designs, deploys and executes the MOTIONAL project's process to collect use cases from all Destinations, complementing them with System Pillar guidelines, in order to drive development of digital enablers according to the Destinations' actual requirements, constraints and timelines.	all	It designs, deploys and executes the MOTIONAL project's process to collect periodically: • use cases from all Destinations, • architecture specifications from the System Pillar . Following System Engineering Management Plan guidelines delivered by the System Pillar, the process generates specifications to drive incremental development of digital enablers tooling according to the Destinations' actual requirements, constraints and timelines, in compliance with relevant System Pillar architecture specifications. Digital tooling, consisting of CDM digital models and Destination-specific data exchange structures, dataspace Connectors, and Digital Twin development environment, are delivered periodically and incrementally by WP30, WP31 and WP 29, respectively, to the relevant Destinations.	**FP1↔FP3**	C	D26.1		8	DLR Christian.Linder @dlr.de	STS marco.borinato @hitachirail.com	Deliverable D26.1 is a documentation of the process for collecting/updating Use Cases from Destinations and System Pillar architecture specifications. Synchronization with other FPs and System Pillar (concrete checkpoint outcomes) will happen periodically every 6 months, starting at month 6.
FP1-3-16	27	Digital Asset Engineering	11	Federated data spaces evaluation for usage in Asset Management	**FP1→FP3**					DB Kehinde-emmanuel. enisan-extern @deutschebahn.com	DLR joern.groos @dlr.de Christian.Linder @dlr.de	
FP1-3-17	27	Digital Asset Engineering	9 12 13 15	Digital Twin applications, interested/using Digital Twin	**FP1→FP3**	C D	D28.1			MM pietro.pace @mermecgroup.com	MM, FSI	Collaborate means, we use same method, data format or input/output. We cannot define the technicality right now till we have a detailed deep dive Collaboration with usecase 18.2 is alo agreed, with exchange of topology data via the CCS/TMS Datamodel and the engineering toolbox.
FP1-3-18	28	Digital Twins	3 4	Wayside and Track Monitoring, interested/using Digital Twin	**FP1↔FP3**	C D	D28.1	18	18	DLR andreas.heckmann @dlr.de	STS marco.borinato @hitachirail.com	Deliverable 28.1 due 31.05.24 is dedicated to a summary of other FAs use cases

ID	FP1 Task	FP1 desc	FP3 WP	FP3 desc	FP1↔FP3 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP3 Partner/Email	Issues/comments
FP1-3-20	28	Digital Twins	13	Implementation of tools, interested/using Digital Twin	**FP1↔FP3**	C D	D28.1	18	18	DLR andreas.heckmann @dlr.de	MERMEC vincenzo.scarnera @mermecgroup.com	Deliverable 28.1 due 31.05.24 is dedicated to a summary of other FAs use cases 20240503 a use case subgroup has been founded to elaborate on BIM use cases, lead by Anthony (IFE, an AE of NRD). They have 3 candidates (stations (IFE), bridges (SNCF), facility maintenance monitoring (AGH/PKP) to be selected till June.
FP1-3-21	28	Digital Twins	14 15	Digital Twin applications, interested/using Digital Twin	**FP1↔FP3**	C D	D28.1	18	18	DLR andreas.heckmann @dlr.de	ITALFERR s.casula @italferr.it	Deliverable 28.1 due 31.05.24 is dedicated to a summary of other FAs use cases 20240503 Weak contribution: stations aspects from FP3 WP14/15 into DT requirements (related with FP1-3-20 comment)
FP1-3-22	31	WP31 aims to deliver a trusted, reliable, cybersecure federated data space for the rail ecosystem - the Rail Data Space.	6		**FP1→FP3**	D	D31.1 Sandbox environment	7	7	KB meike.vanthoen @knorr-bremse.com	KB mira.singer @knorr-bremse.com	
FP1-3-23	28	Digital Twins	10,11	Digital Twin applications, interested/using Digital Twin	**FP1↔FP3**	C D	D28.1	20	20	DLR andreas.heckmann @dlr.de	DLR Joern.groos @dlr.de	

7.3. FP1 – FP4 Interactions

The interaction table between FP1 MOTIONAL and FP4 Rail4EARTH projects aims to explore the impact of ATO/C-DAS on the energy consumption of FP4 low carbon trains, with a focus on optimizing energy efficiency. The table will also cover topics like the standardization of data exchange related to energy between FP4 trains and infrastructure and the FP1 traffic management system. Additionally, digital twins will be utilized in energy calculations at the FP1-FP4 macro level, including train consumption at pantograph. These interactions aim to identify ways to promote sustainable practices and reduce energy consumption in the railway industry.

Table 3 - FP1 – FP4 Interactions

ID	FP1 Task	FP1 desc	FP4 WP	FP4 desc	FP1↔FP4 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP4 Partner/Email	Issues/comments
FP1-4-01	3.2	ST3.2.1: WP3 will also have exchanges with FA3, FA4 and FA6 if common demonstrator activities are identified.	1	Deliverable will include the contents of tasks of WP1.1 (Pre-Standardization for Trains with Alternative Drives) & WP1.2 (Task 1.2 Smart Energy Management)	FP1↔FP4	C	FP4: D1	Intermediar = 16 & 32 Final = 48	12	TRV magnus.wahlborg @trafikverket.se	SNCF andre.chamaret @sncf.fr	20220928: FA1 WP3, 10 (FA1 panning/TMS experts) and 26 (modelling --> M8!) to be linked with FA4/WP1 (M1-48); need to involve ATO/C-DAS colleagues 2023-07-04 (MW) email sent Andre to get updates information about FP4 D1 progress to check for potential demonstrator acitivities. FP1 D3.1 is M12 30 nov 2023.
FP1-4-02	3	There are also links to Destinations 3 and 4. Destination 3 link is about Integration of Intelligent Asset Management with capacity planning and TMS, and Destination 4 link is about train and energy simulation for one train that gives input to TMS – C-DAS/ATO optimization and simulation (Objective 2 and 3)	1	Reducing energy consumption during service thanks to improve knowledge on driving and timetable / during parking by optimizing the charging and reducing energy consumption while ensuring a train "ready for service" according to the journey profile (WP1.2	FP1↔FP4	C	FP4: D1	Intermediar = 16 & 32 Final = 48	12	TRV magnus.wahlborg @trafikverket.se	SNCF andre.chamaret @sncf.fr	--> relevant for WP8/9, 15/16 20220928: FA1 WP3, 10 (FA1 panning/TMS experts) and 26 (modelling --> M8!) to be linked with FA4/WP1 (M1-48); need to involve ATO/C-DAS colleagues 023-07-04 email sent Andre to get updates information about FP4 D1 progress to look for knowledge exchange and co-operation. FP1 D3.1 is M12 30 nov 2023.

ID	FP1 Task	FP1 desc	FP4 WP	FP4 desc	FP1↔FP4 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP4 Partner/Email	Issues/comments
FP1-4-09	15	• Energy consumption: ATO/C-DAS operation requires a so-called "train path envelope". This envelope provides room (timetable supplements) for timetable robustness, which can be used for energy driving strategies when trains are on time. • The TMS can trade-off between optimized energy consumption and punctuality in disrupted situations.	1	Simulation of different strategies of driving and parking to evaluate the benefits of each strategy on different scenarios of alternative drive railway system (such as: regional BEMU train, suburban EMU with on-board ESS, etc.) (WP1.2) => Simulation of nominal service and degraded service situations	FP1↔FP4	C	FP4: D1	Intermediar = 16 & 32 Final = 48	24	PR r.m.p.goverde @tudelft.nl	SNCF andre.chamaret @sncf.fr	20220928: FA1 WP3, 10 (FA1 panning/TMS experts) and 26 (modelling --> M8!) to be linked with FA4/WP1 (M1-48); need to involve ATO/C-DAS colleagues
FP1-4-10	15.3	Definition and outline of requirements to model TMS-ATO/C-Das operated trains in timetables and simulation. Included here is the identification of types/grades of TMS for optimal linking with ATO/C-DAS and applying algorithms to them. Next, the development of guidelines for train path envelopes TMS – ATO/ C-DAS, including distribution strategies for dynamic and optimized capacity, punctuality, and energy consumption.	1	Simulation of different strategies of driving and parking to evaluate the benefits of each strategy on different scenarios of alternative drive railway system (such as: regional BEMU train, suburban EMU with on-board ESS, etc.) (WP1.2) => Simulation of nominal service and degraded service situations	FP1↔FP4	C	FP4: D1	Intermediar = 16 & 32 Final = 48	24	PR r.m.p.goverde @tudelft.nl	SNCF andre.chamaret @sncf.fr	20220928: FA1 WP3, 10 (FA1 panning/TMS experts) and 26 (modelling --> M8!) to be linked with FA4/WP1 (M1-48); need to involve ATO/C-DAS colleagues

ID	FP1 Task	FP1 desc	FP4 WP	FP4 desc	FP1↔FP4 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP4 Partner/Email	Issues/comments
FP1-4-14	26.2	It designs, deploys and executes the MOTIONAL project's process to collect use cases from all Destinations, complementing them with System Pillar guidelines, in order to drive development of digital enablers according to the Destinations' actual requirements, constraints and timelines.	all	It designs, deploys and executes the MOTIONAL project's process to collect periodically: • use cases from all Destinations, • architecture specifications from the System Pillar . Following System Engineering Management Plan guidelines delivered by the System Pillar, the process generates specifications to drive incremental development of digital enablers tooling according to the Destinations' actual requirements, constraints and timelines, in compliance with relevant System Pillar architecture specifications. Digital tooling, consisting of CDM digital models and Destination-specific data exchange structures, dataspace Connectors, and Digital Twin development environment, are delivered periodically and incrementally by WP30, WP31 and WP 29, respectively, to the relevant Destinations.	FP1↔FP4	C	D26.1		8	DLR Christian.Linder @dlr.de		Deliverable D26.1 is a documentation of the process for collecting/updating Use Cases from Destinations and System Pillar architecture specifications. Synchronization with other FPs and System Pillar (concrete checkpoint outcomes) will happen periodically every 6 months, starting at month 6.20220928: FA1 WP26 (modelling --> M8! ? Ok with Riccardo? Otherwise, re-schedule D26.1(M8)) to interface with FA4/WP1 (M1-48) to define requirements; timing to be agreed. FA4 and FA1 agree to exchange via their respective WP1 and WP26 on 3 technical topics : • Influence of ATO/C-DAS on FA4 low carbon trains energy consumption (mainly BEMU, as I don't know if the H2 locos developed by Talgo are concerned by ATO/C-DAS ?) • Standardisation of data exchange related to energy , between FA4 train & infra and FA1 traffic management system • Digital Twins in energy calculation (at our FA4/FA1 respective macro levels ex: train consumption at pantograph)
FP1-4-15	27.6	Guidelines and standards for acquiring, updating, and developing BIM/AIM data and models for developing and maintaining Digital Twins	11 13 14 15	Development of BIM documents and software components for requirements verification	FP1→FP4	C D	D27.4		43	PKP daria.brun@pkp.pl	PKP daria.brun@pkp.pl	Collaborate means, we use same method, data format or input/output. We cannot define the technicality right now till we have a detailed deep dive
FP1-4-17	31	WP31 aims to deliver a trusted, reliable, cybersecure federated data space for the rail ecosystem - the Rail Data Space.					D31.1 Sandbox environment	7	7	KB meike.vanthoen @knorr-bremse.com		

7.4. FP1 – FP5 Interactions

The interaction table between FP1 MOTIONAL and FP5 TRANS4M-R projects focuses on three key areas: Seamless Planning, Dynamic Dispatching, and Intermodal Prediction. Within these topics, we identified specific challenges, constraints, and requirements related to planning and operation of international train paths including last mile operations in terminals/yards, and crew/rolling stock planning and management systems. The table aims to establish demonstration partners for development and testing of concepts and identify potential synergies including Yard management. This will help us to develop more effective and efficient systems for managing seamless planning, dynamic dispatching, and intermodal prediction in the railway industry.

Table 4 - FP1 – FP5 Interactions

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-01	3	- Main contacts and planned connected demonstrators are with FA5 and FA2 - WP4/WP5 have identified connection to Destination 5 about demonstrators for cross border capacity planning including cross border node Malmö and network - yard/terminal capacity planning	2 25		**FP1↔FP5**	C		Start M13	Continuous	TRV magnus.wahlborg @trafikverket.se	HACON lars.deiterding @hacon.de felix.hildebrandt @hacon.de TRV nicklas.blidberg @trafikverket.se Martin Joborn Markus Brachner	FP1 WP3 alignment with FA5 WP2/25 Seamless about demonstrators for cross border capacity planning including cross border node Malmö and network - yard/terminal capacity planning(WP3, 4, 5, 11, 12)
FP1-5-02	3.2	[specification alignment between FP1 WS1.1 and FP5 WS 5.2] - ST3.2.1: WP3 will support (…)dialogue with FA5 Seamless about objectives 1 and 2 - ST3.2.2: WP4/WP5 have identified link to FA5 and WP11/WP12 about cross border node Malmö.	2 25		**FP1↔FP5**	C		13	13	TRV magnus.wahlborg @trafikverket.se	HACON lars.deiterding @hacon.de felix.hildebrandt @hacon.de	FP1 WP3 alignment with FA5 WP2/25 Seamless about demonstrators for cross border capacity planning including cross border node Malmö and network - yard/terminal capacity planning(WP3, 4, 5, 11, 12)

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-03	3.2	[receipt of requirements for planning] FP1 to receive requirements for planning, high level description, constraints	1 25	-List of challenges and constraints that are specific for planning international train paths and automated allocation, such as the process of pre-alignments of train requests with respect to TCRs - Definition of RU requirements regarding the IT/communication processes about border-crossing for planning of international train paths - Qualitative, high-level description of the general changes in planning of international train paths. Based on input from selected stakeholders, high-level description of requirements towards the transformation process of these developments - Establishment of demonstration partners (within the FP1 and FP5 team) for development and testing of concepts	**FP1←FP5**	C		13	11	TRV magnus.wahlborg @trafikverket.se	HACON lars.deiterding @hacon.de felix.hildebrandt @hacon.de	Partly already delivered in the scope of D25.2
FP1-5-04	4.1	Analyze requirements related to dynamic dispatching for YCS	27	Determine the requirements for Improved dynamic dispatching for the arrival/departure yard in Malmö related to YCS	**FP1←FP5**	C		13+37	13+37	TRV magnus.wahlborg @trafikverket.se martin.joborn@ri.se	TRV nicklas.blidberg @trafikverket.se martin.joborn@ri.se	Instead of FP5 developing requirements, FP1 receiving them, then analysing them, giving feedback to FP5 and FP5 incorporating the feedback (time-intensive process), we should continue the way of joint alignments, where the requirements will be jointly elaborated based on the preparatory work and the expertise in both flagship areas. Consequently, this process shall be concluded in M13. Should more detailed technical requirements be developed/requested during the development phases, the process may be continued
FP1-5-05	4.2	WP4/WP5 have identified link to FA5 and WP11/WP12 about cross border node Malmö.	25 29	[TRV and RISE Identification of possible data sources for yard capacity planning, including data sources for international traffic. Setting up the initial technical components for cooperative yard capacity planning.]	**FP1↔FP5**	C		1-24	13-40	TRV magnus.wahlborg @trafikverket.se	HACON lars.deiterding @hacon.de felix.hildebrandt @hacon.de TRV nicklas.blidberg @trafikverket.se	FP1 T4.2, T5.2 receive input from FP5 regarding data sources for yard capacity planning.

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-06	4.5	The activities will enhance railway network capacity assessment and planning based on the input from yard and station capacity, with relation to Destination 5 activities. A demonstrator cross border node Malmö for network - yard/terminal is planned. Ambition and content will be further specified in WP3, WP 11 and Destination 5. There are possibilities for a demonstrator with connection between FA1 and FA5. (--> FA5/WP26 seamless). - ST 4.5.1 Definition of detailed use cases for integration of network capacity planning with yard and station capacity based on the input from WP 3. (M24).	25 29		**FP1↔FP5**	C		1-24	13-40	HACON rolf.goossmann @hacon.de	HACON lars.deiterding @hacon.de felix.hildebrandt @hacon.de	FP1 T4.5 definition of detailed UCs for integration of network capacity planning with yard and station capacity based to set up demonstrator cross border node Malmö for network- yard /terminal with FA5. Timeline on FP1 side need to be reviewed after Nicklas feedback
FP1-5-07	5.1	Setting up concrete demo cases based on the output of WP4 and in relation with (…) Destination 5. (…)Enabler 6: Integration of planning systems and TMS with a) yard capacity planning and b) station capacity planning [TRL5/6]	25 29		**FP1↔FP5**	C		24-46	13-40	TRV magnus.wahlborg @trafikverket.se	HACON lars.deiterding @hacon.de felix.hildebrandt @hacon.de	Timeline on FP1 side need to be reviewed after Nicklas feedback
FP1-5-08	5.2	Task 5.2 development and demonstration of demonstrators to the target TRL (Leader: HAC; Participants: TRV, HAC, MERMEC, PR) Subtask 5.2.1 Development of demonstrators for Interfaces for interaction with external national or central planning applications (TRL 6/7) Demonstration of cross-border planning including Short Term Timetable Planning and process improvement among actors.	33.1 33.2	'- Planning and preparation of showcases for the Seamless Corridor demonstration - Showcase of the short term- detailed freight-path request, preparation and negotiation process with the IM - Demonstration of technologies which will be developed in FA1 in combination with the developments for the terminals and yards (WP27)	**FP1→FP5**	X6/7	MCP37	38	38	TRV magnus.wahlborg @trafikverket.se HACON rolf.goossmann @hacon.de	TRV jan.bergstrand @trafikverket.se nicklas.blidberg @trafikverket.se	FP1 target TRL for seamless corridor demos in FP5 we need to verify which partner is delivering this demonstration (we expect FP1 WP5 Hacon demonstration with Swedish/Norway data)

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-09	5.2	ST 5.2.4 Development of demonstrators for Integration of network capacity with yard and station capacity planning (TRL 5/6) This demonstrator shows integration of nodes and lines using specified interfaces.	33.2	- Demonstration of technologies which will be developed in FA1 in combination with the developments for the terminals and yards (WP27)	**FP1→FP5**	X5/6	MCP37	38	38	TRV magnus.wahlborg @trafikverket.se martin.joborn@ri.se	TRV jan.bergstrand @trafikverket.se nicklas.blidberg @trafikverket.se	FP1 target TRL for STP and yard/cordor integration demos in FP5 Felix: If possible, there should already be at an earlier date (M32?) a possibility for a feedback loop where the up to then developed technologies can be jointly tested in a shared cloud environment Feedback loop should be established from M34 to M38 FP5 T33.2 Demonstration of technologies which will be developed in FA1 in combination with the developments for the terminals and yards (WP27) M40
FP1-5-11	10.1	[specification alignment between FP1 WS1.2 and FP5 WS 5.1]	2 5	[FP5 to give information on what data is available for or required from WS 1.2 with respect to DAC and Yard Automation]	**FP1↔FP5**	C		13	13	HACON rolf.goossmann @hacon.de	SMO(Yard Automation) ralf.tadje @siemens.com OEBB(Yard Automation) Karl.Zoechmeister @oebb.at KB(Train Functions) Steffen.Jass@knorr-bremse.com	20220928 minuted alignment need between DAC-TMS activities; loco will collect the information; shared with yard management system; data structures will be described; will need to be fed into WP26 aligning with FP5 WP2 (Sys Engineering). Expectation FP5(Manuel): estimated and real train arrival/departure, freight train dispatching capability and information, dependencies, yard disruptions to be considered. FP5 D25.1 (due M13) is aligned with FP1 WP10 (M24)

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-12	10.1	[specification alignment between FP1 WS1.2 and FP5 WS 5.2]	2 25	[FP5 to give information on what data is available for or required from WS 1.2 with respect to seamless, dynamic dispatching and intermodal monitoring]	**FP1↔FP5**	C		13	13	HACON rolf.goossmann @hacon.de	GTSD yves.sterbak @urbanandmainlines.com	20220928 minuted alignment need between DAC-TMS activities; loco will collect the information; shared with yard management system; data structures will be described; will need to be fed into WP26 aligning with FP5 WP2 (Sys Engineering). Expectation FP5 (Manuel): cross border checkpoints, TMS interoperability (need to talk together, esp. handover), energy efficiency. FP5 D25.1 (due M13) is aligned with FP1 WP10 (M24) 20240314: o FP5 seamless and dynamic dispatching interactions **completed** and requirements received
FP1-5-13	10.2	[receipt of requirements for dispatching]	2 25	Specification of dynamic dispatching requirements and constraints that are specific for last mile operations in terminals/yards	**FP1←FP5**	C		13	13	HACON rolf.goossmann @hacon.de	GTSD yves.sterbak @urbanandmainlines.com	Fhi: FP5 content to be updated based on the recent specification of the alignment process? List of dynamic dispatching requirements and constraints that are specific for last mile operations in terminals/yards and related TMS interfacing Definition of requirements and use cases for crew/rolling stock planning and management systems 20240314: o FP5 seamless and dynamic dispatching interactions **completed** and requirements received

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-14	11.3	"Subtask 11.3.8 TRV develops interface of TMS to Yard Coordination System 2.0 in Malmö node. Connected to WP 4."	33.1 33.2 33.3	ETA for yards using TMS	**FP1→FP5**	C		1-24	38	TRV magnus.wahlborg @trafikverket.se	SMO(Yard Automation) ralf.tadje @siemens.com OEBB(Yard Automation) Karl.Zoechmeister @oebb.at KB(Train Functions) Steffen.Jass@knorr-bremse.com	For this, TMS data and modules should be made accessible by FP1. FP5 will provide the machine learning algorithms. This process should happen already during the development phase and not later than M32. 20240506 Requirement: FP 1 will provide a demonstrator to feed ETA for yards. 1. YCS is developed in FP1. 2. Digitalgraf (Trafikverket TMS) includes ETA calculation and the ETA is communicated (fed) via deplide to YCS. 3. Deplide is developed with in FP5. 4. Trafikverket assess that we will fullfill the requirement in FP5 task 28.1.
FP1-5-15	11.3	Subtask 11.3.6 HACON develops Traffic management modules for supporting decision alignment between two neighboring TMS areas and IMs including cross-border traffic operation and required interfaces; The activities feed the related Destination 5 (WP 27) activities.	33.1 33.2	"""- Development of traffic management modules for supporting decision alignment between two neighboring TMS areas and IMs including cross-border traffic operation and required interfaces - Development of TRL 6 interfaces and TRL 5 decision support module for integration and traffic management of two neighboring TMSs and IMs including cross-border operations"" "	**FP1→FP5**	C		1-24	38	HACON rolf.goossmann @hacon.de	GTSD yves.sterbak @urbanandmainlines.com	
FP1-5-16	11.3	"Subtask 11.3.7 HACON develops interfaces for integration of TMS with services such as station and yard management systems (considering requirements of FA5), (…)"	33.1 33.3	"- Development of interfaces for integration of TMS with services such as station and yard management and coordination systems - Definition of detailed use cases for integration of network capacity planning with yard and station capacity"	**FP1←FP5**	C		1-24	38	HACON rolf.goossmann @hacon.de	GTSD yves.sterbak @urbanandmainlines.com	20220928: No interconnection between WS5.1 (here: WP12) and FP1 ? can all be communicated and aligned with via WS5.2? open discussion (train status information, dynamic limitations and route restrictions)
FP1-5-17	12.2	Subtask 12.2.6 HACON develops TRL 6 interfaces and TRL 5 decision support module for integration and traffic management of two neighboring TMSs and IMs including cross-border operations (supporting Destination 5 activities)	33.1 33.3	Planning and preparation of showcases for the Seamless Corridor demonstration Demonstration of the dynamic dispatching developments in FA1, including the connection between TMS and yard systems	**FP1→FP5**	X5/6	MCP37	38	38	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	GTSD yves.sterbak @urbanandmainlines.com	TRL5 sufficient in M37 risk that demonstrator is available only later than M31 (FP5 D29.2 due date) which is later than expected by FA5

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-18	12.2	Subtask 12.2.7 HACON will develop TRL 6 interfaces for integration of TMS with other services such as station and yard management systems (supporting Destination 5 activities),	33.3	Demonstration of the dynamic dispatching developments in FA1, including the connection between TMS and yard systems	**FP1→FP5**	X6	MCP37	38	38	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	GTSD yves.sterbak @urbanandmainlines.com	"TRL5 sufficient in M37 risk that demonstrator is available only in M46 which is later than expected by FA5. 20220928: No interconnection between WS5.1 (here: WP12) and FP1 ? can all be communicated and aligned with via WS5.2? open discussion (train status information, dynamic limitations and route restrictions) Risk that demonstrator is available only later than M31 (FP5 12.2 due date) which is later than expected by FA5"
FP1-5-19	12.2	ST12.2.8: TRV develops interface TRL 5 of TMS to Yard Coordination System 2.0 in Malmö node. Work connects to WP 4.	33.3	Demonstration of the dynamic dispatching developments in FA1, including the connection between TMS and yard systems	**FP1→FP5**	X5	MCP37	38	38	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	GTSD yves.sterbak @urbanandmainlines.com	"YCS demonstrations will be available M37. (TRL5 sufficient in FP1 M37)"

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-20	26.2	It designs, deploys and executes the MOTIONAL project's process to collect use cases from all Destinations, complementing them with System Pillar guidelines, in order to drive development of digital enablers according to the Destinations' actual requirements, constraints and timelines.	all	It designs, deploys and executes the MOTIONAL project's process to collect periodically: • use cases from all Destinations, • architecture specifications from the System Pillar . Following System Engineering Management Plan guidelines delivered by the System Pillar, the process generates specifications to drive incremental development of digital enablers tooling according to the Destinations' actual requirements, constraints and timelines, in compliance with relevant System Pillar architecture specifications. Digital tooling, consisting of CDM digital models and Destination-specific data exchange structures, dataspace Connectors, and Digital Twin development environment, are delivered periodically and incrementally by WP30, WP31 and WP 29, respectively, to the relevant Destinations.	**FP1↔FP5**	C	D26.1		13	DLR Christian.Linder @dlr.de	HACON lars.deiterding @hacon.de felix.hildebrandt @hacon.de	Deliverable D26.1 is a documentation of the process for collecting/updating Use Cases from Destinations and System Pillar architecture specifications. Synchronization with other FPs and System Pillar (concrete checkpoint outcomes) will happen periodically every 6 months, starting at month 6.20220928: FA1 WP26 (modelling --> M8! ? Ok with Riccardo? Otherwise, re-schedule D26.1(M8)) to interface with FA4/WP1 (M1-48) to define requirements; timing to be agreed. FA4 and FA1 agree to exchange via their respective WP1 and WP26 on 3 technical topics : • Influence of ATO/C-DAS on FA4 low carbon trains energy consumption (mainly BEMU, as I don't know if the H2 locos developed by Talgo are concerned by ATO/C-DAS ?) • Standardisation of data exchange related to energy , between FA4 train & infra and FA1 traffic management system • Digital Twins in energy calculation (at our FA4/FA1 respective macro levels ex: train consumption at pantograph)
FP1-5-21	30	CDM	32	CDM, FDS						UIC Tane@uic.org	TRV sneha.gosavi @lindholmen.se	On FP1 side, CDM is Conceptual Data Model. On FP5, it sometimes refers to Conceptual Data Model, sometimes to Collaborative Decision Making. 202404 Collaboration going well, agreed on work progress and data exchanges.

ID	FP1 Task	FP1 desc	FP5 WP	FP5 desc	FP1↔FP5 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP5 Partner/Email	Issues/comments
FP1-5-22	30	CDM	25.6	CDM						UIC Tane@uic.org	TRV, contacts to be confirmed: Sneha Gosavi, possibly Jan Bergstrand, Nicklas Blidberg	From current discussions with FP5-T25.6/32, the situation may have evolved as FP5 and FP1 are exchanging on train digital representations and also on possible TAF/TAP TSI update. The flow is FP5 data requirements for consideration in FP1. 202404 Collaboration going well, agreed on work progress and data exchanges.
FP1-5-23	31	WP31 aims to deliver a trusted, reliable, cybersecure federated data space for the rail ecosystem - the Rail Data Space.	25.6		**FP1←FP5**	C	D31.1 Sandbox environment	7	M13-M18	KB meike.vanthoen @knorr-bremse.com	TRV sneha.gosavi @lindholmen.se	There is only one sandbox environment for all FPs - it does exist and use cases can be onboarded, but need to follow the process described in WP26 of FP1

7.5. FP1 – FP6 Interactions

The interaction table between FP1 MOTIONAL and FP6 FutuRe projects aims to explore the integration of TMS and PIS systems, the integration of DRT services on a MaaS platform using B2B services, the alignment of activities related to demand forecast and other topics.

Table 5 - FP1 – FP6 Interactions

ID	FP1 Task	FP1 desc	FP6 WP	FP6 desc	FP1↔FP6 ←→	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP6 Partner/Email	Issues/comments
FP1-6-01	10.2	[requirements for FP1 WP12 development to be received from FP6]	6	WP6 Regional Rail Services Requirements & Specifications D6.3:Requirements and interface design for TMS-PIS	**FP1←FP6**	D	6.3	20	20	HACON rolf.goossmann @hacon.de	HACON rolf.goossmann @hacon.de	20240314 Still waiting for D6.3 requirements and interface design for TMS PIS expected in M20
FP1-6-02	12.2	Subtask 12.2.7 HACON will develop TRL 6 interfaces for integration of TMS with other services such as (…), **Passenger Information Services (supporting Destination 6)**, (…)	7 11	Receive information regarding interface for PIS?	**FP1→FP6**	X6	MCP37	37	14-49	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	HACON rolf.goossmann @hacon.de	TRL5 delivery to FP6 in M37
FP1-6-03	12.2	[list of functions to be provided by FP6 WP 6, see D6.1] Subtask 12.2.7 HACON will develop TRL 6 interfaces for integration of TMS with other services such as (…), Passenger Information Services (supporting Destination 6), (…)	6	[list of functions to be provided by FP6 WP 6, see D6.1] D6.1 Specification of Multimodal Travel Solution (Alpha Release) > Provision of the scope of collaboration with Destination 1 and a List of functions to be developed in WP 11	**FP1←FP6**	D	T11.9	6	12	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	HACON ira.kataria @hacon.de	
FP1-6-04	12.2	[Provide TMS demonstrator to FP6 Task 11.9] Subtask 12.2.7 HACON will develop TRL 6 interfaces for integration of TMS with other services such as (…), Passenger Information Services (supporting Destination 6), (…)	11	Task 11.9: Testing, demonstration and validation	**FP1→FP6**	D	FP6: D6.1	46	18-48	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	OEBB Amirreza.Tahamtan @oebb.at	
FP1-6-05	12.2	**[provide input for FP6 D11.2** Implementation Report of TMS and PIS development] Subtask 12.2.7 HACON will develop TRL 6 interfaces for integration of TMS with other services such as (…), Passenger Information Services (supporting Destination 6), (…)	11	D11.2 Implementation Report of TMS and PIS development	**FP1→FP6**	D	FP6: D11.2	46	48	TRV jan.bystrom @trafikverket.se magnus.wahlborg @trafikverket.se	HACON rolf.goossmann @hacon.de	prototypes expected to be available earlier than M46 to allow for sufficient time for validation. But probably needs to be aligned better.
FP1-6-06	17.1	[Task 17.1 considers the requirements of other destinations, especially FA2 and FA6 to define the requirements for FA1/WP17.] Involved deliverable: FA1 D17.1 Requirements Specification for Automated Decisions and Decision Support for Traffic Management optimisation	3.3	[Task 17.1 considers the requirements of other destinations, especially FA2 and FA6 to define the requirements for FA1/WP17.] Involved deliverable: FA6 D2.2 Regional lines operational and functional requirements	**FP1↔FP6**	D		6	24	OEBB Amirreza.Tahamtan @oebb.at ENYSE francisco.lozano @enyse.com	CAF jreyes@cafsignalling.com MERMEC francesco.inzirillo @mermecgroup.com ENYSE noelia.medrano@enyse.com	FA6 WP2 milestones (M6, M14, M42) 20240318: **Closed** as there were no requirement received

ID	FP1 Task	FP1 desc	FP6 WP	FP6 desc	FP1↔FP6 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP6 Partner/Email	Issues/comments
FP1-6-07	17	Task 17.2/17.2.2 Requires alignment of FP6 for specification and demonstration Involved deliverable: FA1 D17.1 Requirements Specification for Automated Decisions and Decision Support for Traffic Management optimisation	3	D3.3 Use cases and scenarios for Traffic Management Systems demos on G1 regional lines - Collaborative Deliverables	**FP1←FP6**	C Xn	D3.3	22	24	ENYSE francisco.lozano @enyse.com	ENYSE noelia.medrano @enyse.com CAF jreyes@cafsignalling.com	ENYSE on both sides, to guarantee alignment, regional lines taken into account
FP1-6-08	19.1 19.2 19.6 19.7	[initial requirements for FP1 WP20 development to be received from FP6]	6	WP6 Regional Rail Services Requirements & Specifications D6.1 Specification of Multimodal Travel Solution (Alpha Release)	**FP1←FP6**	D	D6.1	6	24	HACON marco.ferreira.smo @hacon.de	HACON ira.kataria @hacon.de	
FP1-6-09	19.1 19.2 19.6 19.7	[final requirements for FP1 WP20 development to be received from FP6]	6	WP6 Regional Rail Services Requirements & Specifications D6.2 Specification of Multimodal Travel Solution (Final Release)	**FP1←FP6**	D	D6.2	20	24	HACON marco.ferreira.smo @hacon.de	HACON ira.kataria @hacon.de	
FP1-6-10	19.6 19.7 19.8	[Handover of Specification Demand Forecast TE 23 and 24 in D19.1 from FP1 to FP6]	6	MS6.1 – M12– Destination 1/SG3 Specification on short- and long-term travel demands provided to FutuRe	**FP1→FP6**	D	D19.1	12	12	HACON marco.ferreira.smo @hacon.de	HACON marco.ferreira.smo @hacon.de	
FP1-6-11	20.1 20.2	DRT services are expected to be made available by FP6 at M18 which are to be integrated in the MaaS platform. (OJP)	6 11	[HACON integrates DRT services into MaaS platforms. Harmonized interfaces for multimodal uses. Leveraging **existing European standards (OJP?)**. Support B2B collaboration. FA6: Provide DRT services to be integrated in MaaS platform. Provide list of improvements of standard and corresponding demands]	**FP1↔FP6**	X5		5-24	18	HACON marco.ferreira.smo @hacon.de	HACON ira.kataria @hacon.de	TRL5 delivery to FP6 in M37 20230509 Delivery from FP6 compromised as no demonstration partner available to setup the system

ID	FP1 Task	FP1 desc	FP6 WP	FP6 desc	FP1↔FP6 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP6 Partner/Email	Issues/comments
FP1-6-12	24	[WP24 is focused Anticipate demand leading to improved resource utilisation. Synergy with FA 6 could be in passenger congestion monitoring and information]	6.5	GA: **Based on existing specifications and/or guidelines coming from Destination 1**, WP2, and the System Pillar, this task will focus on the specificities of regional lines, on the connections to main lines and associated passenger's flow. The following links are of interest for FP6: - Link between railway subsystems and disruption management system(FP6/T6.5) - Use Case STS [Railway disruption management through optimization processes]; - Interfaces related to the passenger flow data at regional level (FP6/T6.5) - Use Case STS [Railway disruption management through optimization processes]; - Information in real time for users of the transport service (FP6/T6.2) - Use Case Indra [TransportDataHub].	**FP1↔FP6**	C		12	12	ADIF vguryn@renfe.es	GTSP tiago.fonseca @urbanandmainlines.com	FP6 to check D19.1 specifications and define if further interaction needed
FP1-6-13	26	It designs, deploys and executes the MOTIONAL project's process to **collect use cases from all Destinations**, complementing them with System Pillar guidelines, in order to drive development of digital enablers according to the Destinations' actual requirements, constraints and timelines.	all	It designs, deploys and executes the MOTIONAL project's process to collect periodically: • use cases from all Destinations, • architecture specifications from the System Pillar . Following System Engineering Management Plan guidelines delivered by the System Pillar, the process generates specifications to drive incremental development of digital enablers tooling according to the Destinations' actual requirements, constraints and timelines, in compliance with relevant System Pillar architecture specifications. Digital tooling, consisting of CDM digital models and Destination-specific data exchange structures, dataspace Connectors, and Digital Twin development environment, are delivered periodically and incrementally by WP30, WP31 and WP 29, respectively, to the relevant Destinations.	**FP1↔FP6**	C	D26.1		8	DLR Christian.Linder @dlr.de		Deliverable D26.1 is a documentation of the process for collecting/updating Use Cases from Destinations and System Pillar architecture specifications. Synchronization with other FPs and System Pillar (concrete checkpoint outcomes) will happen periodically every 6 months, starting at month 6.20220928: FA1 WP26 (modelling --> M8! ? Ok with Riccardo? **Otherwise re-schedule D26.1(M8)**) to interface with FA4/WP1 (M1-48) to define requirements; timing to be agreed; FA4 and FA1 agree to exchange via their respective WP1 and WP26 on 3 technical topics : • Influence of ATO/C-DAS on FA4 low carbon trains energy consumption (mainly BEMU, as I don't know if the H2 locos developed by Talgo are concerned by ATO/C-DAS ?) • Standardisation of data exchange related to energy , between FA4 train & infra and FA1 traffic management system • Digital Twins in energy calculation (at our FA4/FA1 respective macro levels ex: train consumption at pantograph)

ID	FP1 Task	FP1 desc	FP6 WP	FP6 desc	FP1↔FP6 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP6 Partner/Email	Issues/comments
FP1-6-14	27	Digital Planning and Engineering shall enable the data-based planning and engineering of railway assets, starting from CCS+. The result including a set of extracted objects shall be fit for co-simulation, automated testing, and implementation as well as inspection, maintenance, and operations.	3	Digital Asset Engineering- CCS?	**FP1→FP6**	C Xn				DB Kehinde-emmanuel. enisan-extern @deutschebahn.com	CAF jreyes@cafsignalling.com MERMEC francesco.inzirillo @mermecgroup.com	FP1 will share sample data and tools
FP1-6-15	27	Digital Planning and Engineering shall enable the data-based planning and engineering of railway assets, starting from CCS+. The result including a set of extracted objects shall be fit for co-simulation, automated testing, and implementation as well as inspection, maintenance, and operations.	3	Digital Asset Engineering- CCS? T7.2 "Digital Platforms for CCS validation and TSI certification"	**FP1→FP6**	C Xn				DB Kehinde-emmanuel. enisan-extern @deutschebahn.com	TRV hans.arvidsson@ri.se CEDEX Miguel.Lopez @cedex.es	FP1 will share sample data and tools
FP1-6-16	31	WP31 aims to deliver a trusted, reliable, cybersecure federated data space for the rail ecosystem - the Rail Data Space.	25.6				D31.1 Sandbox environment	7	7	KB meike.vanthoen @knorr-bremse.com		
FP1-6-17	20.2	The objective of this task is to develop standardised interfaces between rail systems and other transport modes	6.7	To provide reliable passenger information across all mobility modes and all involved operators, all partners need to exchange information (e.g. schedule, delay, PRM information) on a standardised (e.g. OJP, NetEx, OSDM, TRIAS, SIRI) basis. ... The corresponding deliverable is written in close collaboration with Destination 1 and forwarded through WP2 to the System Pillar.	**FP1↔FP6**		FP6 D6.8	20	20	HACON marco.ferreira.smo @hacon.de	HACON matthias.wirtz @hacon.de	
FP1-6-18	SG2	Several WP from WP10 to WP18 tackling TMS topics, better to contact SG2 leader	8.4	Requires Input regarding the prototypes/Generic Application for Traffic Management System(s) developed in FP1	**FP1→FP6**			24	-	HACON rolf.goossmann @hacon.de	ENYSE noelia.medrano @enyse.com	

ID	FP1 Task	FP1 desc	FP6 WP	FP6 desc	FP1↔FP6 ↔	Type	Deliverable or demonstration concerned	When available (M)	When expected (M)	Responsible(s) FP1 Partner/Email	Responsible(s) FP6 Partner/Email	Issues/comments
FP1-6-19	15.4 15.5	Provision of the regulation tool with mixed regulation algorithm that is being developed in FP1. Also some use cases will be done to check the functionality.	3 8	Check description of regulation tool development and use the tool on FP6 use cases	**FP1→FP6**	D C	FP1 D15.2	24	24	CAF isabel.meseguer @cafsignalling.com	CAF jreyes @cafsignalling.com	

8. Collaboration Workplan

The collaboration workplan is a critical component of the overall project management strategy for the FP1 MOTIONAL project. The workplan brings together the various related activities in the six Flagship Projects, ensuring that they are aligned and integrated to achieve the Europe's Rail programme overall objectives. To achieve this, we have developed five Gantt charts, each of which outlines the timeline for the collaboration activities between FP1 and the other FPs.

These Gantt charts are essential for tracking the progress of each FP's collaboration activities, ensuring that they are completed on time. They provide a clear visual representation of each activity. By having a single view of all Gantt charts, we can easily identify any conflicts or overlaps between activities, allowing us to adjust the schedule accordingly.

To track the activities outlined in the Gantt charts, we will use a combination of the FP collaboration activities Gantts to consolidate sub-group activities (SGs) and perform regular periodic checks with each Sub-group team. This will allow us to monitor progress, identify any issues, and make adjustments where necessary to ensure that the overall goals are on track.

The Gantt diagrams presented in the following sections are related to the interactions described on Section 7.

8.1. FP1-FP2 interactions timeline

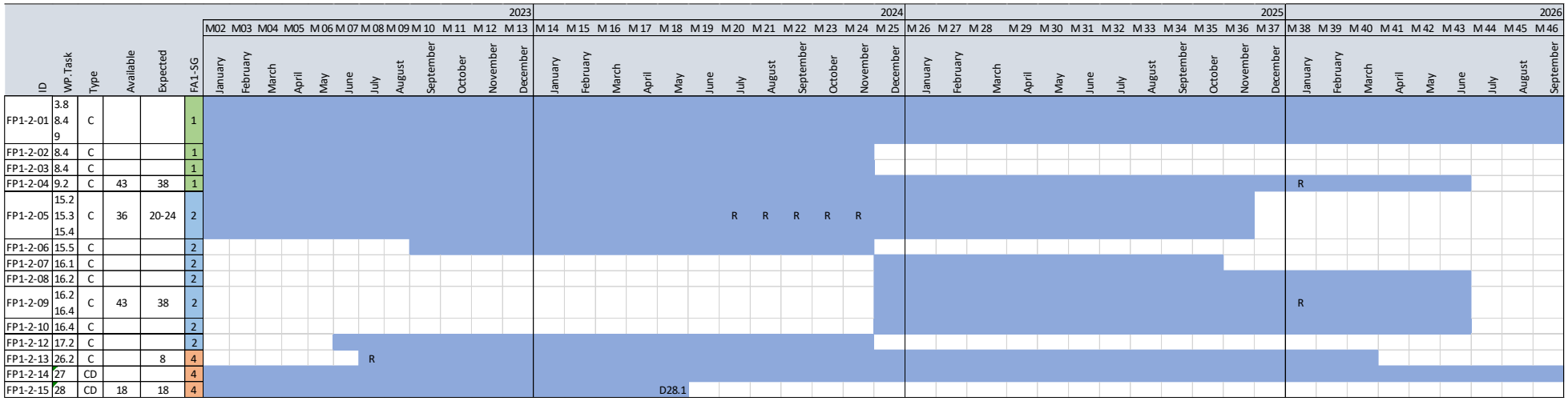
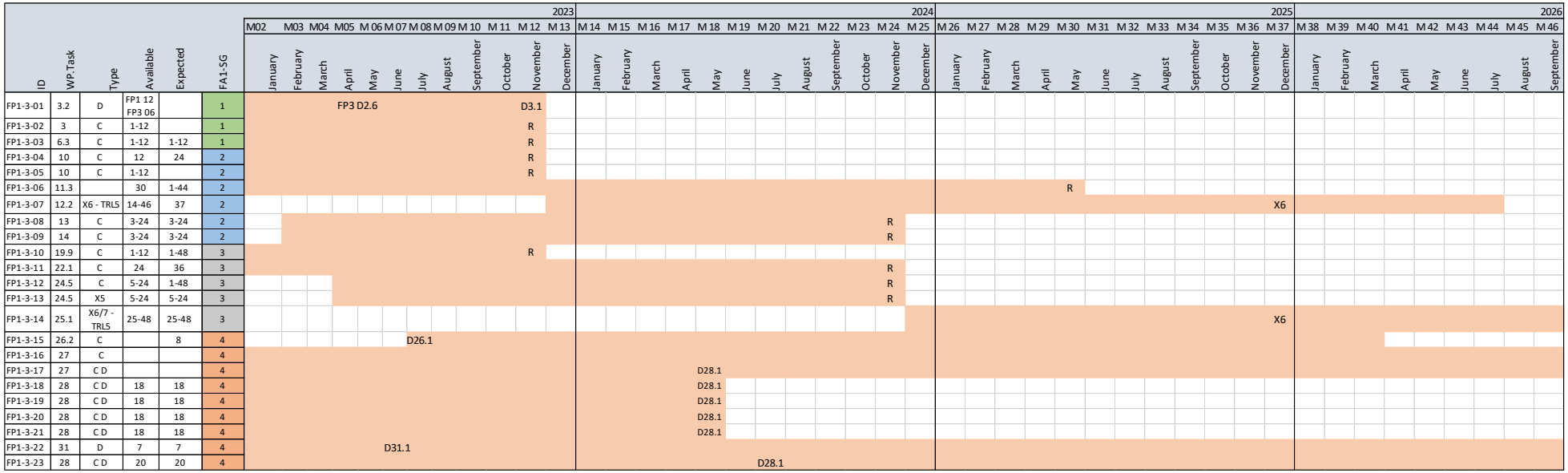


Figure 1 – FP1-FP2 interactions timeline

8.2. FP1-FP3 interactions timeline



ID	WP Task	Type	Available	Expected	FA1-SG	2023												2024												2025												2026									
						M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42	M43	M44	M45	M46
						January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September
FP1-3-01	3.2	D	FP1 12 FP3 06		1				FP3 D2.6							D3.1																																		
FP1-3-02	3	C	1-12		1											R																																		
FP1-3-03	6.3	C	1-12	1-12	1											R																																		
FP1-3-04	10	C	12	24	2											R																																		
FP1-3-05	10	C	1-12		2											R																																		
FP1-3-06	11.3		30	1-44	2																												R																	
FP1-3-07	12.2	X6 - TRL5	14-46	37	2																																			X6											
FP1-3-08	13	C	3-24	3-24	2																						R																							
FP1-3-09	14	C	3-24	3-24	2																						R																							
FP1-3-10	19.9	C	1-12	1-48	3											R																																		
FP1-3-11	22.1	C	24	36	3																						R																							
FP1-3-12	24.5	C	5-24	1-48	3																						R																							
FP1-3-13	24.5	X5	5-24	5-24	3																						R																							
FP1-3-14	25.1	X6/7 - TRL5	25-48	25-48	3																																			X6											
FP1-3-15	26.2	C		8	4						D26.1																																								
FP1-3-16	27	C			4																																														
FP1-3-17	27	C D			4																	D28.1																												
FP1-3-18	28	C D	18	18	4																	D28.1																												
FP1-3-19	28	C D	18	18	4																	D28.1																												
FP1-3-20	28	C D	18	18	4																	D28.1																												
FP1-3-21	28	C D	18	18	4																	D28.1																												
FP1-3-22	31	D	7	7	4						D31.1																																								
FP1-3-23	28	C D	20	20	4																			D28.1																										

Figure 2 – FP1-FP3 interactions timeline

8.3. FP1-FP4 interactions timeline

ID	WP Task	Type	Available	Expected	FA1-SG	2023												2024												2025												2026									
						M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42	M43	M44	M45	M46
						January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September
FP1-4-01	3.2	C	16,32,48	12	1															R																R														
FP1-4-02	3	C	16,32,48	12	1															R																R														
FP1-4-03	6.2	C	16,32,48	24	1											D8.1				R																R														
FP1-4-04	10	C	16,32,48	24	2															R								R								R														
FP1-4-05	11.3	C	16,32,48	24	2															R								R								R														
FP1-4-06	11.3	C	16,32,48	24	2															R								R								R														
FP1-4-07	12.2	C	16,32,48	46	2															R																R														
FP1-4-08	12.2	C	16,32,48	46	2															R																R														
FP1-4-09	15	C	16,32,48	24	2															R								R								R														
FP1-4-10	15.3	C	16,32,48	24	2															R								R								R														
FP1-4-14	26.2	C		8	4							D26.1																																							
FP1-4-15	27.6	C D		43	4																																										D27.4				
FP1-4-16	30.4	C	16,32,48	24	4															R								R								R														
FP1-4-17	31		7	7	4						D31.1																																							

Figure 3 – FP1-FP4 interactions timeline

8.4. FP1-FP5 interactions timeline

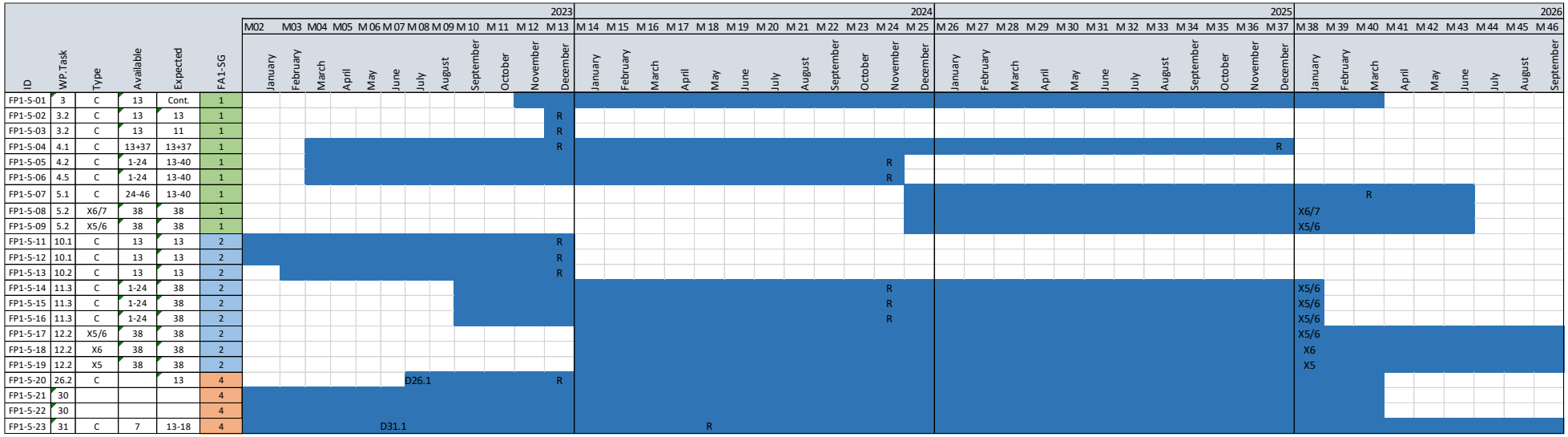


Figure 4 – FP1-FP5 interactions timeline

8.5. FP1-FP6 interactions timeline

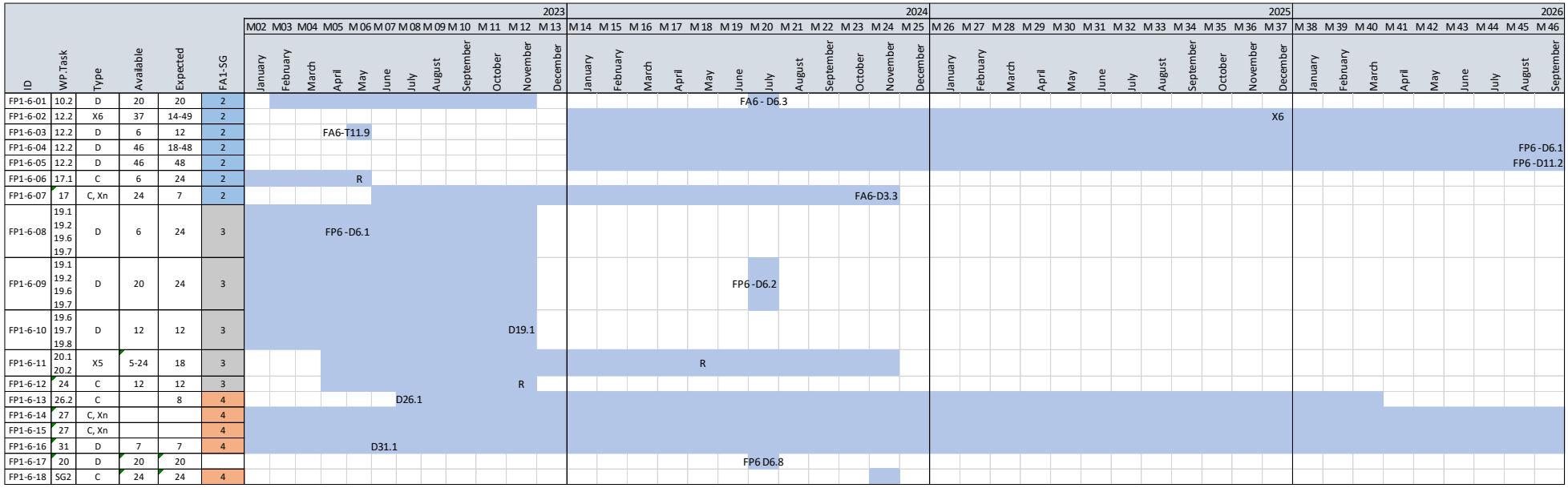


Figure 5 – FP1-FP6 interactions timeline

9. CDM acronym conflict

Due to the use of the CDM acronyms in different contexts, there was the need to align on different acronyms and definitions of the scope of each acronym.
This alignment resulted on the definitions of the following table.

Table 6 - CDM definitions

Acronym	Name	FP1 involved WP	Definition of scope
CDM	Conceptual Data Model	WP30	The conceptual data model is a structured business view of the data required to support business processes, record business events, and track related performance measures, using the ontological engineering and semantic glossary.
CaDM	Canonical Data Model	-	A canonical model is a design pattern communicate between applications that use different data formats.
COLL-DM	Collaborative Decision Making	WP13/14	The process of collaborative decision making is aimed at combining the input from all stakeholders and therefore at making the best choice from the standpoint of the objectivity. It is typical that decisions made by groups differ from those made by individuals. However, there is no clear indication that the group decisions are consistently better (or worse) than individual decisions. Also, collaborative decisions are apparently linked to group behaviours, interactions between members, role distribution, and psychological factors that can affect people's thinking.
TCCS SD1	System Pillar: Transversal CCS Sub-Domain 1 CCS/TMS Data Model	WP10	A common data model that contains a uniform set of metadata, allowing data and its meaning to be shared across applications. This model is the result of the work done in SP to unify all the different standardised data models in the railway sector.

Acronym	Name	FP1 involved WP	Definition of scope
Railway CDM	Railway Collaborative Decision Making	FP1 WP11/12 and FP5	Railway Collaborative Decision Making is used to share operational information between actors. RailwayCDM is a concept for digital collaboration based on data exchange of timestamps on planned, estimated and actual times for arrivals/departures to/from locations and progress of operations within the railway system. Digital collaboration according to RailwayCDM is the basis for a common situational awareness constituting the basis for coordinated decision-making by the railway system's actors. The objective is to increase the attractiveness of trains as a mode of transport, for both travelers and transport buyers. RailwayCDM is a consolidation of two concepts, StationCDM (focusing on passenger travels at Stockholm Central and Depot Hagalund) and YardCDM (focusing on Cargo Transport at MGB (Malmö Marshalling Yard). The initial concept was developed by Hacon and To70 on behalf of the Railfreight Corridor 1 funded by the European Commission, clarifying the general feasibility and the concept elements which can be transfered from other modes. The concept has been inspired by CDM concepts that were developed and implemented in aviation (A-CDM) and by concepts from the maritime sector (PortCDM), but was/is adapted to the challenges in the railway system. The concept idea is used as basis for some EU-Rail activities like the Malmö demonstration on yard capacity planning in FP1 SG1/SG2 and connected with information from FP5 (e.g. predictions in FP5 WP28). FP1/FP5 focus is not to develop a complete Railway CDM, but to develop functions/components which can be used for Railway CDMs. E.g. it is planned to use Railway CDM timestamps from freight RUs active in the Malmö Use-Case. This demonstration is having co-operation and knowledge exchange with the RNE Railway CDM pilot Luxemburg - Lyon. FP1/FP5 will also align with RNE on their current work with developing a Railway CDM handbook based also on the original study from RFC1.

10. SG4 Transversal Topics Communication strategy

Due to the emerging risk detected during interaction meetings with other Flagship Projects. Regarding the lack of knowledge of the Transversal Topics activities, led to the creation of a better plan of communication of these activities. Transversal Topics as the name suggests, should be used transversally by the FPs and SP, which cannot be achieve with the current knowledge of the Europe's Rail community.

TT is responsible for the provision of digital enablers to support the demonstrations and the use cases of other FPs. The following enablers will be currently developed by TT in the first wave.

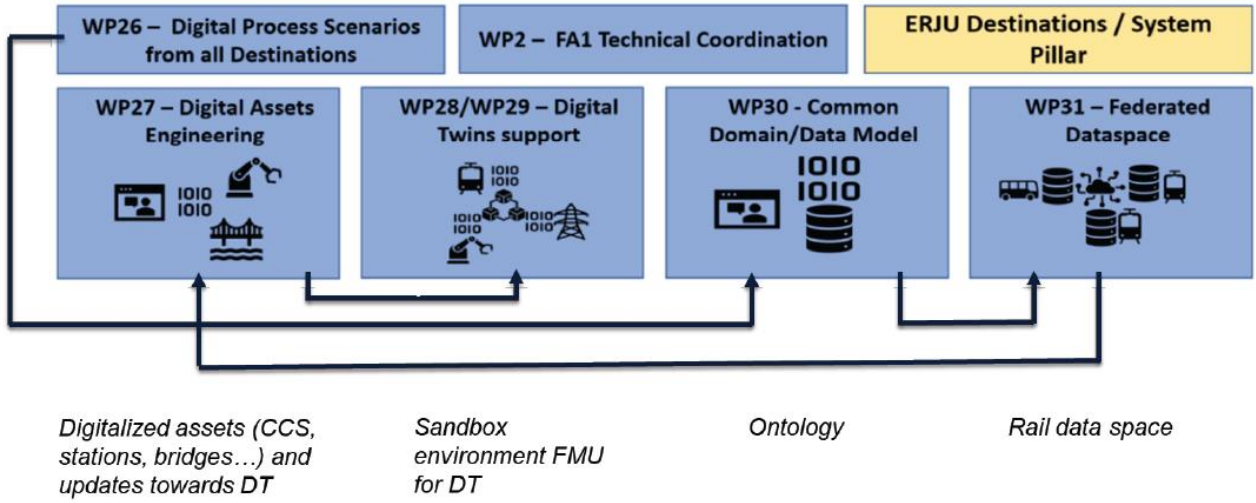


Figure 6 – Transversal Topics activities

WP26 acts as an interface for TT to other FPs and SP. This will help facilitate the process described below (part of D26.1):

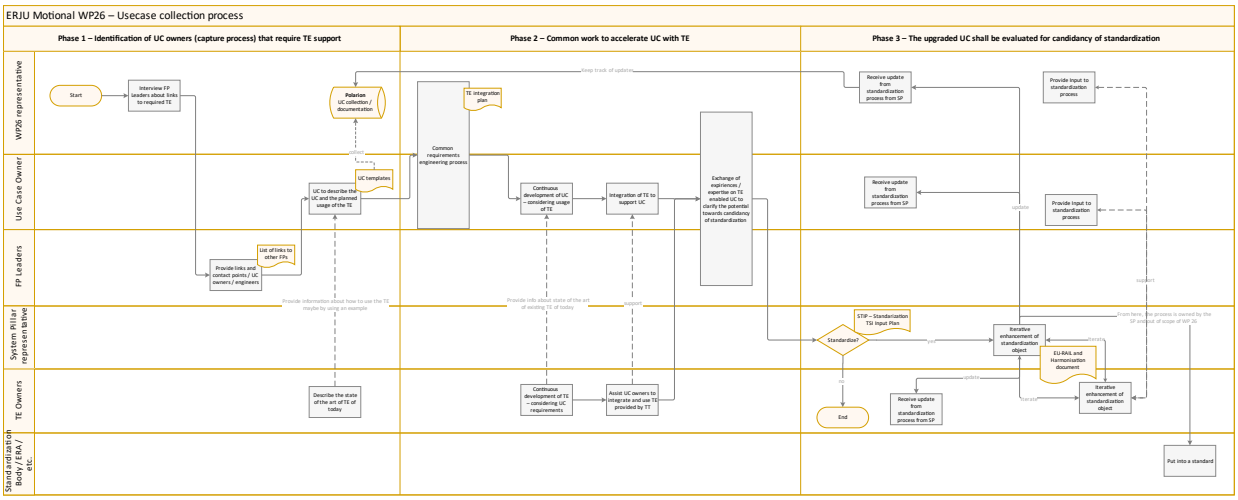


Figure 7 – TT Use Case collection process

WP26 has executed the use case collection process and now has over 950 use cases in its repository. This comprises the use cases from all FPs and are currently under analysis by TT enabler owners. Following this analysis, TT will run a series of Town halls to disseminate to the stakeholders current development of the enablers.

WP27 is currently developing a digital toolbox as enabler 30 with a focus on ERTMS and Infrastructure assets.

WP28/29 are responsible for developing the digital twin environment as enabler 29 for digitized railway assets.

WP 30 focuses on the use of Ontology as a federation mechanism for various use cases and is specified as enabler 31

WP 31 is set up to develop the rail data space for data sharing mechanisms specified as enabler 28.

These enablers are currently under development and are considering the use cases from FPs as input.

10.1. TT Townhall Meetings to organize transversality

Date	Subject
08.12.23	Rail Data Space
26.01.24	Digital Twin
21.03.24	Digital Assets Engineering
early June	Conceptual Data Model
ca. August	Rail Dataspace
ca. October	Digital Twin
ca. December	Digital Assets Engineering
	…

1 to 2 hours meetings, > 150 invited persons throughout ERJU, Records publicly available: https://projects.rail-research.europa.eu/eurail-fp1/other-documents/

11. Risk Management and Contingency Plans

The main collaboration risk identified in this project is the possibility of delays related to other projects' results. This medium-risk scenario could impact all work packages which depend on results from the collaboration activity that may be delayed.
To mitigate this risk, the project team has dedicated Task 2.6 to monitor and manage risks generated by cross-Flagship project dependencies and interactions. Close collaboration and communications with other Flagship projects will be implemented, and specific periodic 'maturity checkpoint' milestones are planned to ensure the exchange of outcomes. The first maturity checkpoint happened in December 2023, the following maturity checkpoints will be scheduled by the EU-Rail.

In the event that delays do occur, change management requests may be generated and processed according to the EU-Rail Governance and Project Management handbook [2]to systematically re-arrange planning and timelines at the EU-Rail level. By proactively managing this risk, the project team aims to ensure that collaboration activities stay on track and that the project continues to make progress toward its goals.

[2] https://rail-research.europa.eu/wp-content/uploads/2022/10/EU-Rail-Governance-and-Process-Handbook.pdf

12. Conclusions

In conclusion, the collaboration with other EU-Rail destinations is a critical component of the flagship projects aimed at enhancing the interoperability, safety, and efficiency of the rail system across Europe.

The collaboration activities identified in this work plan, including joint planning and implementation of demonstrations, development and exchange of project deliverables, regular dialogues, and demonstrations of innovative solutions and technologies, will facilitate knowledge sharing and collaboration among EU-Rail destinations. By proactively managing collaboration risks and leveraging change management requests, the project team aims to ensure that collaboration activities stay on track.

End-of-document