



FP5TRAN54M-R

Transforming
Europe's Rail Freight

D2.2 User Requirement Specification

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1 Executive Summary

This document constitutes deliverable D2.2 “User-Requirements” of EU-Rail Flagship Area 5 project FP5 TRANS4M-R. The project aims to boost innovation for the European rail freight sector, concretely by developing, validating, and demonstrating FP5- TRANS4M-R technical enablers. The reports results from task 2.4: Functional requirements.

The primary objective of this document is to provide the functional User-Requirements that are needed to perform the processes described in deliverable D2.1 “Preliminary Operational Procedures”. These requirements form the foundation for innovation development across WP3-WP12.

To derive the functional requirements from the operational procedures in chapter 6 - Elaboration of Requirements a methodology was developed that ensures the completeness and allows iterations including other WPs and expert groups. Polarion is the tool that is used within FP5 for requirements management in general. Therefore, all User-Requirements are created, developed, evaluated, and approved within this tool. Moreover, experts from various WPs were involved and decisions would be documented transparently and fully traceable. The developed methodology enables system and subsystem requirements that are to be developed in other WPs at different timelines to link to the User-Requirements and form relations.

The scope and delimitations of this document are stated in chapter 7 - General Assumptions & Premises. As the base of the elaborated User-Requirements are the Operational Procedures in D2.1, the restrictions stated there are also valid for this document. Within D2.1 the target Operational Procedures are used as reference to derive the User-Requirements from them.

In addition, further influencing factors were identified in chapter 8 which require the definition of further User-Requirements by other WPs or expert groups. These must be taken into account in a future overall consideration of the functional requirements of the FDFT system. Beyond the task description, non-functional User-Requirements and requirements resulting from other influencing factors are partly included in this deliverable when indicated without claim of completeness.

The results are to be found as User-Requirements and User-Features that are hierarchically and thematically related to each other. Items resulting from the operational procedures are divided into cluster that describe the following topics: System in General, DAC System, Power System, Data System and Brake System. They can be found in chapter 9 - User-Requirements.

The results represent the current state of discussions within FP5 TRANS4M-R based on the Target Operational Procedures. The currently elaborated User-Requirements state a work in progress that still needs to be consolidated and verified within the evaluation and verification/validation process in Polarion. Due to continuous development within the requirements management process in Polarion, future releases of D2.1, or other developments within the project it is intended that these requirements are subject to possible changes in further development and will most likely be adapted in the future. Consequently, this document will then be updated and updated versions will be published.

Keywords: Functional Requirements; User Requirements; Target Operational Procedures; Functional System Architecture; Full Automation; Technical Enabler; Full Digital Freight Train FDFT, FP5 TRANS4M-R

2 Abbreviations & Acronyms

ABT [Automated Brake Test]

APB [Automated Parking Brake]

ATEX [ATmosphères Explosibles]

DAC [Digital Automatic Coupling]

EDDP [European DAC Delivery Programme]

EU-Rail [Europe's Rail Joint Undertaking]

FDFT [Full Digital Freight Train]

FP [Flagship Project]

FPSE [Flagship Project System Engineers]

HMI [Human Machine Interface]

SPE [Single-Pair Ethernet]

TRANS4M-R [Transforming Rail Freight]

TRL [Technology Readiness Level]

WP [Working Package]

YAMS [Yard Automation and Management System]

3 Definitions & Explanations

Authorized Personnel

Designation of the operating Personnel at the HMIs with the indication that these persons must be authorized. Meaning that user authentication and authorization must take place. Each operator can define the scope of rights for their roles, e.g. Yard Manager, Yard Personnel.

Bleeding

Let air out of complete brake system (pipes & cylinders)

Brake Calculation

Calculation of brake force according to national regulations.

Brake Position G/P

Classification term for brake systems in accordance with their brake application and release timings and their braking power as defined in EN 14198.

Brake: Automated Parking Brake

An automatic parking brake secures the wagon(s) against rolling away. Activation of applying and releasing is done via the FDFT link

Brake: Legacy braking means to secure wagons against rolling away

Today existing braking means like drag shoe, manually operated parking brake, etc.

Brake: Service Brake

The service brake is the brake system used today on freight trains (compressed air brake), which slows down the vehicles by lowering the air in the main brake pipe or, depending on national regulations, secure vehicles against rolling away for short periods of parking.

Consist

A Consist is the smallest railway rolling stock entity for operation, containing one DAC Consist controller unit representing one node on DAC network.

It can be a Traction Unit, a single wagon as well as a fixed set of single vehicles (segments) which are not disconnected while operation.

A Consist owns a unique vehicle identification number.

Consist Composition

Consists coupled with DACs.

Consist Data

Consist Data is composed of static (e.g., wagon length, empty wagon weight, master data) and dynamic (e.g., type of load, restrictions, total weight) data.

The Consist is not capable of deriving some of these data by itself, e.g., by use of sensors.

Consist Restrictions

These are restrictions for shunting operations resulting from the type of Consist, the current technical condition or the load of a Consist.

Consist Status Data

Compiled data about the status of a consist, i.e. data the consist can derive by itself (e.g. state of DAC coupler heads, state of brake system, state of hybrid coupler, mileage).

If FDFT Backend is available and the consist can communicate with the FDFT Backend, all changes in Consist Status Data will be automatically sent from the Consist to the FDFT Backend. If other actors need this information, it is actively derived from the Consist.

Coupling Point

Imaginary point of two uncoupled DAC coupler heads, planned for coupling.

Cut List Information

Information about the planned Uncoupling Points for a given Wagon Set.

Based on this information, documents like cut lists can be created.

Demonstrator trains

Demonstrator trains are mobile test instances whose focus is on testing the operational usability of the technologies and vehicles in various infrastructures or operating sites. They consist of several converted vehicles with additional measurement technology to generate results for validation. For use in public infrastructure, test approvals for the vehicles are required in most countries

FDFT Backend

Collection of new FDFT functions on land side.

Receives, supplies, and stores Consist Data (e.g. Wagon Target Track Data, Traction Unit Status Data, Wagon Set Data and Additional Wagon Data).

FDFT Backend provides and receives data to and from other systems (FDFT Yard, Traction Unit, etc.)

FDFT Backend initiates different functions, e.g., uncoupling processes, in Target State.

FDFT function Prevent Coupling

FDFT function Prevent Coupling While the FDFT function Prevent Coupling is activated, the DAC coupler head must not allow coupling.

This function must be activated on both coupler heads of a coupling point. This function can only be activated in FDFT mode Shunting.

Note: The required activation on both coupler heads results from current statements regarding the technical feasibility of the manufactures.

Note: This function is required at all levels of DAC, even if the technical solution may be different.

FDFT Functions

Function that does not exist today and need to be developed to achieve the target state.

FDFT mode Shunting

Allows electrical uncoupling of DAC coupler heads, electrical activation of function prevent coupling and activation of Controllable Brakes (incl. Automated Parking Brake)

When uncoupled, no harmful electrical power on DAC coupler head is present, especially on electrical contacts.

When uncoupling, electrical connections of DAC coupler head must be free of harmful electrical power or current prior to mechanical uncoupling.

When coupling, harmful electrical power and current is only applied after successful mechanical coupling of both DAC coupler heads including electrical coupler.

This mode is required for all consists (wagon and traction unit). All consists of one composition are in the same mode.

FDFT mode Train Run

Coupled DAC coupler heads of Train cannot be commanded to uncouple.

First and last DAC coupler heads of Train must have FDFT function Prevent Coupling deactivated and this function cannot be activated.

Power supply over DAC coupler heads can be enabled by Traction Unit.

Controllable Brakes (incl. Automated Parking Brake) cannot be commanded to brake.

This mode is required for all consists (wagon and traction unit). All consists of one composition are in the same mode.

An operational train run is carried out in FDFT mode Train Run.

This mode is not to be confused with train integrity monitoring.

FDFT System

Systems that do not exist today and need to be developed to achieve the target state.

FDFT Wagon Base System

FDFT Wagon Base System is a system on each wagon, which controls wagon components (e.g., DAC coupler heads, wagon wide power control system, battery management system, brake system).

It can communicate via FDFT Link (network) eg. with the Traction Unit, FDFT Backend (if available), landside systems, with personnel by using a Mobile HMI

FDFT Yard

FDFT Yard is infrastructure based and controls all infrastructure elements in its area. FDFT Yard provides current state of infrastructure to FDFT Backend if available.

The interfaces between FDFT Backend and FDFT Yard will be defined in a later step.

Human Machine Interface

HMI, Part of a system an operator interacts with. The interface is the aggregate of means by which the users interact with a machine, device, and system (the system). The interface provides means for input, allowing the users to control the system and output, allowing the system to inform the users.

Last Consist

The Last Consist ensures all functions which are needed at the end of a train.

It has one uncoupled end. (end of train plate ??)

Leading Consist

The Leading Consist ensures the interface with the means of control and monitoring of the train.

In maximum one single Leading Consist is allowed per train.

Leading Traction Unit

Provide the power, Master of the train network, host of the train wide functionality.

Movement Area

Movement Area describes the space of vehicle boundaries (including cargo load) during the potential vehicle movement, where a person can be hit by parts of the vehicle.

Mobile HMI (HM)

(Locally) (remote) device for personnel to interact with FDFT Systems.

Connection to FDFT Systems can be wireless and physical, even to FDFT Wagon Base System.

For example, personnel can connect the Mobile HMI to a wagon in a wagon set and retrieve Wagon Status Data and Wagon Set Data of the entire Wagon Set.

Operator Traction Unit

Personnel (remotely) controlling Traction Unit(s).

Polarion

Software environment used in TRANS4M-R

Power Supply

The term "Power Supply" is especially used for the high-voltage system, supplied by TU or Stationary Device (e.g. 400V).

Ready for departure

Train preparation is finished and all necessary documents are available.

As long as no ATO service is implemented, the TU Operator reported ready for departure.

Ready for train preparation

A Consist Composition is ready to train preparation when the intended Consist Composition for the following train run is given and the Consist Composition is secured against rolling away.

Ready to couple

A DAC is ready to couple when it is uncoupled and the FDFT Function Prevent Coupling is deactivated. If two DACs are in ready to couple position, they can be coupled error-free.

Semi-automated State

During Semi-automated State the automated operations are not yet fully possible. Manual intervention on site will take place on a regular basis.

Shunting Composition

Traction Unit(s) coupled by DAC to a wagon (set). Wagons and TU are in FDFT mode Shunting. This composition has no uniquely identifiable attribute, which is only assigned when all conditions for train preparation have to be fulfilled (see Processes).

Stationary Device

Infrastructure-sided device that provides air for (automated) brake test and measurement data (e.g. air pressure).

It can also be mobile in case of limited moveability on site.

For target processes:

Power and data are also supplied and connected. Over this device, a connection between Wagons to FDFT Backend or Legacy Systems is possible.

Traction Unit

- A Traction Unit with DAC coupler heads that supplies traction power and moves itself and coupled vehicles. This also includes multiple traction units moving together.
- The DAC coupler heads can also be hybrid couplers.
- A Traction Unit can also have Distributed Power System functionalities.
- ATO and ASO systems can be applied.
- A Traction Unit can be equipped with FDFT functionalities, e.g., allows retrieving Wagon Status Data or Wagon Set Data and can initiate FDFT Wagon Base System's functions, like secure against rolling away, bleeding, etc.
- An unpowered Traction Unit is considered and behaves like a wagon with FDFT Wagon Base System.
- Traction Units can be main line locomotives, shunting locomotives, shunting devices, two-way vehicles, etc.
- User Interface is available

Traction Unit Status Data

Compiled data about the status of a Traction Unit (e.g., state of DAC coupler heads, state of hybrid coupler, state of brake system).

If FDFT Backend is available and the Traction Unit can communicate with FDFT Backend, all changes in Traction Unit Status Data will be automatically sent from Traction Unit to FDFT Backend. If other actors need this information, it is actively pulled from Traction Unit.

Train

Uniquely identifiable composition of Traction Unit(s) and optionally a Wagon (Set).

Train Composition

The train composition represents a mechanically connected set of consists which is defined in order to execute train functions within this arrangement for the train operation.

Train Run

The Train Run starts and ends in yards and stations.

Operational definition of Train moving or parked.

Before the Train Run starts all conditions for train preparation must be fulfilled.

Transformational State

The transformation state describes the phase between the operational transition state from the actual state to fully automated operation, i.e. towards the target process.

Processes that are only partially automated are referred to as partially automated processes.

In the transformation state, the automated actions are not fully possible and require regular, manual interventions in individual process steps.

Uncoupling Point of Shunting Composition/Wagon Set

Identifies the connection between two DAC coupler heads planned for uncoupling.

Uncoupling Prevention

Prevents Consists from being uncoupled during normal operations. If the coupler is electrically commanded to uncouple, it shall not execute the command.

Wagon

Single physical freight Wagon equipped with DAC coupler head at each end.

Wagons permanently coupled (just one UIC Number) together should behave like a single wagon and cannot be uncoupled.

Wagon Set

Wagons coupled together by DAC coupler heads.

Wagon Set Data

Information derived by Wagon Status Data to reflect orientation and order of each wagon in a wagon set.

Wagon Status Data

Compiled data about the status of a wagon and FDFT Wagon Base System can derive this data by itself (e.g., state of DAC coupler heads, state of brake system).

If FDFT Backend is available and FDFT Wagon Base System can communicate with FDFT Backend, all changes in Wagon Status Data will be automatically sent from FDFT Wagon Base System to FDFT Backend. If other actors need this information, it is actively pulled from FDFT Wagon Base System.

Yard Legacy System (YAMS)

Today's technical systems used in yard operations.

Yard Manager

Personnel responsible for operation of shunting yards.

Yard Personnel

On site personnel needed for manual shunting operations, e.g. for uncoupling / coupling rolling stock, for securing rolling stock and any other activities that require human intervention in shunting operation.

4 Background

The present document constitutes the Deliverable D2.2 “User Requirement Specification” in the framework of the Flagship Project FP5 TRANS4M-R as described in the EU-Rail MAWP.

The project aims to boost innovation for the European rail freight sector, concretely by developing, validating and demonstrating FP5 TRANS4M-R technical enablers. The work to reach this level of TRL is complex and thus divided into several work packages (WP) highly dependent on each other. This WP structure is shown in the following figure.

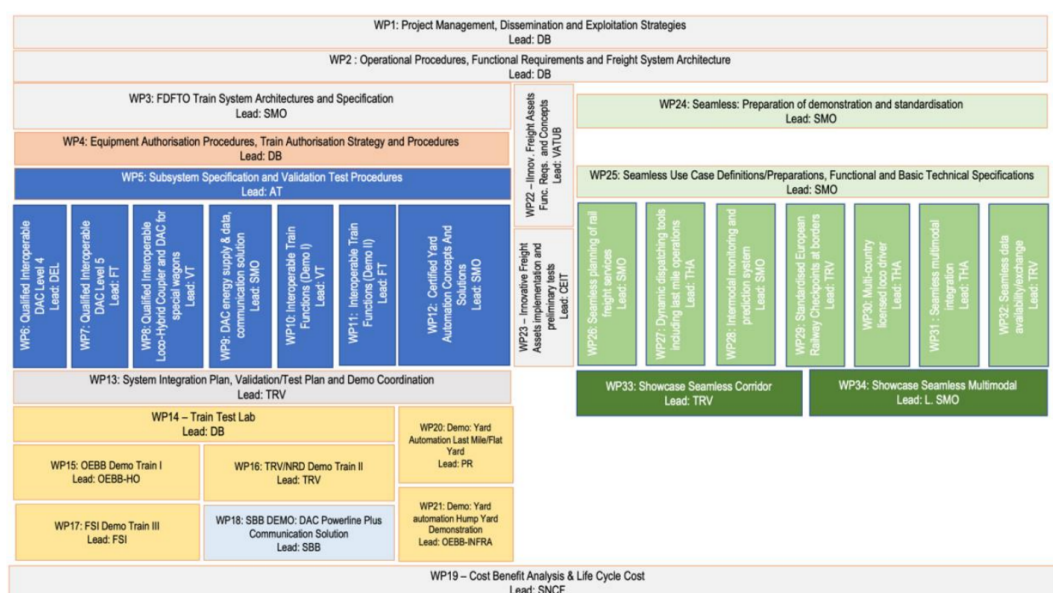


Figure 1: WP structure in FP5 TRANS4M-R.

WP2 is leading, coordinating and developing the User-Requirements within FP5 TRANS4M-R based on the previously published groundwork of the operational procedures, not only for the FDFT, which is the focus, but also including the work of the other innovation workstreams (yard automation, innovative freight assets and seamless).

4.1 TRANS4M-R Deliverable D2.1 v.1.0

The operational procedures were elaborated in detail within the scope of FP5 TRANS4M-R Deliverable D2.1. D2.1 therefore provides the fundamental groundwork for development of the FDFT system for WP2 and the entire project. Deliverable D2.2 also relies thematically on the previous findings from the operational procedures, and consequently D2.1.

The operational processes, which have been specified, contain the operational needs and are therefore the essential foundation for deriving the functional requirements for this deliverable.

4.2 EDDP Migration

The work package “Migration” of the EDDP elaborates the strategies which are needed to introduce a new coupling system (plus digital components) to the existing railway market. The main challenge is given by the fact that for most vehicles – the freight wagons – the new system will not be compatible to the old screw coupling, while retrofitting of all vehicles needs to be stretched over several years (due to e.g. workshop resources) and negative consequences of having to incompatible coupling systems in one railway system during that time need to be absolutely minimized.

Together with DACcelerate WP4 the main migration strategies have been developed and are described in DACcelerate Deliverable D4.2 [1]. Since then, the WP is continuing the work to detail out the strategies and to proof their feasibility step by step. As an open programme, all market participants can register to be a member of the WP to be informed and to contribute. Currently more than 90 participants of about 50 companies/organizations are registered for the WP.

5 Objective/Aim

5.1 Task description

Task 2.4 started in month three and the outputs of these tasks are included in this document. The following table gives the direct match of the task definition from the proposal with the output and a link to the section where more details can be found.

Table 1 : Task Description Matched with Output in Deliverable 2.2

Task definition from proposal (Task 2.4)	Output of WP2
The functional requirements will be defined and collected, based on the results of Task 2.1.	4 - Background , 6.2.4 - Approach on Deriving User-Requirements , 9 - User-Requirements
A common methodology for linking the functional requirements to the functional system architecture considering the actions and results of Task 3.1 will be established.	6.1 - Methodology , 6.2 - Derivation of User Requirements
The methodology will enable consistency and correlation checks on all defined requirements. For each release of the system architecture, the functions will be linked to the corresponding requirements, for the major releases.	6.1 - Methodology , 6.2.5 - Validation and Alignment with other WPs and EGs
Requirements/Architecture fulfillment by clearly defined means of validation will be carried out and for each release.	6.1 - Methodology , 6.2.5 - Validation and Alignment with other WPs and EGs
A permanent alignment with WP3 & WP25 on the functions and the means of validation will be carried out.	6.2.5 - Validation and Alignment with other WPs and EGs

5.2 Outline of deliverable 2.2

The outline of this deliverable is the following:

Section 1-5: Summary, Abbreviations, Background & Objective

Section 6: Elaboration of Requirements

Section 7: General Assumptions & Premises

Section 8: Influencing factors

Section 9: User Requirements

Section 10: Conclusions

6 Elaboration of Requirements

6.1 Methodology

6.1.1 Integrated Approach on User-Requirements within FP5

The User-Requirements are part of correlated results within the product development process of the FDFT system in the FP5 TRANS4M-R project.

The essential foundation for the User-Requirements in the context of D2.2 are the Operational Procedures, which were developed in D2.1. Based on these processes, basic functionalities (User-Features) and the subsequent atomic requirements, the User-Requirements, are defined from the operator's perspective. In addition to the Operational Procedures, other factors can also determine User-Requirements as well as other user groups that also impose requirements on the system.

Subsequently, the User-Requirements provide the base for the System- and Subsystem-Requirements of the FDFT system, enabling a complete list of requirements.

This document is providing User-Requirements only, the further elaboration of System-/Subsystem-Requirements will follow by other WPs.

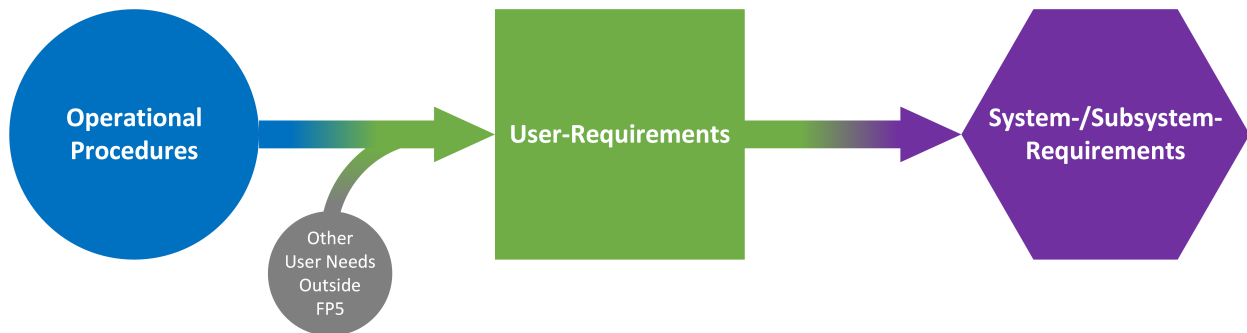


Figure 1 : High-Level Approach on User-Requirements within FP5

6.1.2 Definitions

Feature

A feature is a non-measurable, high-level description that serves as a foundational element for articulating the overall problem and goals of the products. It provides a broad perspective without specifying detailed requirements, allowing for a comprehensive understanding of the project's objectives. Furthermore, a feature establishes a crucial link to both the system architecture and target processes, guiding the development process in alignment with the overarching goals.

Requirements

A requirement is a documented statement that specifies a necessary property the resulting system or product must fulfill. Therefore, defining requirements serves the purpose to ensure a clear understanding for all stakeholders what needs to be achieved with the resulting system or product. Requirements are phrased and defined according to the following characteristics:

Table 2 : Characteristics of Requirements

Properties	Description
Testable	Requirement should be verifiable. If no reasonable test case is possible, the requirement is not adequately well phrased.
Clear, precise	Requirements should not contain unnecessary verbiage or information. They should be stated clearly and simply.
Complete	The requirement must contain all relevant information so that tests can be derived with sufficient precision. The set of requirements must be complete and cover all aspects of the product or system.
Relevant	A requirement must be relevant to stakeholders and directed to the goals and objectives of the project or system. If a requirement can be omitted without influencing the overall project, it is not relevant.
Non-redundant	Each requirement should be expressed only once and should not overlap with another requirement.
Consistent	There should not be any conflicts between the requirements. Conflicts may be direct or indirect.
Unambiguous	Requirement should be explicit with only one way to interpret.
Feasible	The requirement should be doable within existing constraints.
Atomic	The requirement should contain a single traceable element.

Requirements are split up into functional and non functional requirements. Functional requirements describe desired system or component behavior including its interaction with other systems.

Non-functional requirements define criteria related to the quality with which the specified functionality is to be delivered according to the generic RAMS-process, often extended to PRAMSS. These criteria include performance, reliability, availability, maintainability, security and safety. Therefore, non-functional requirements contribute to ensuring that the system meets the user's needs, is suitable for its purpose, is scaleable, secure and reliable, and is easy to operate and maintain.

Dividing requirements in functional and non-functional requirements is common in product development, e.g. software development. For those some norms were defined, e.g. ISO 29148 [2] or IEEE 830 [3]. The above structure is similar to the norms, but adopted to the needs of FP5-TRANS4MR and in consideration of the RAMS-process described in DIN EN 50126 [4].

User-Requirements

User-Requirements are requirements defined from the operator's perspective and represent their interests. In principle, the definition of User-Requirements is based on the generally applicable requirement definition. However, within User-Requirements functionalities are described on a higher level. Therefore, no claim to completeness regarding the characteristics of requirements listed above to be fulfilled is made. Nevertheless, the definition is applied as complete as possible if applicable.

Relations between Features and Requirements in the FP5-TRANS4MR project

With those definitions, each feature (User-Feature) has a set of atomic and precise requirements. Due to the nature of product and system development in general, it is difficult to impossible to define system-/subsystem requirements at the start. Therefore, operators first define User-Requirements and User-Features as a baseline for the development of requirements on a technical level. These (system-/subsystem)-features and requirements have the same definition as written above, except User-Requirements are not the final atomic statement while (system-/subsystem)-requirements are. Consequently, a User-Requirement can be located with a parent relation while a (system-/subsystem)-requirement cannot. This methodology and these relations are crucial for aligning the following work from WP3 and WP5 defining system and subsystem requirements to the work done in this deliverable by WP2. In the following figure this is shown for further clarification.

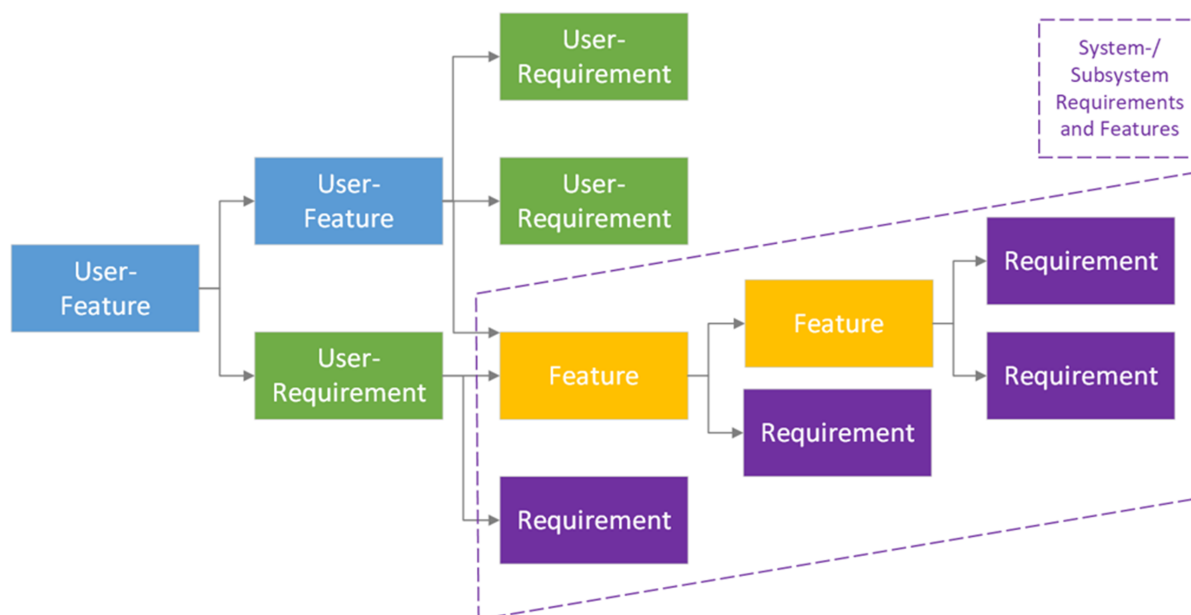


Figure 2 Relations between Requirements and Features for user-, system- and subsystem level

6.1.3 Requirements Management in FP5

In order to develop a coordinated list of requirements within the FP5 project, a methodology was developed by a working group within the project including operators and industry partners of various WPs. It is ensured that this methodology of requirements management is compatible with the product development process according to the V-model. Therefore, work steps were identified in which all relevant project members are involved.

The high-level workflow shown in the following figure describes the main steps that include and interact with requirements management.

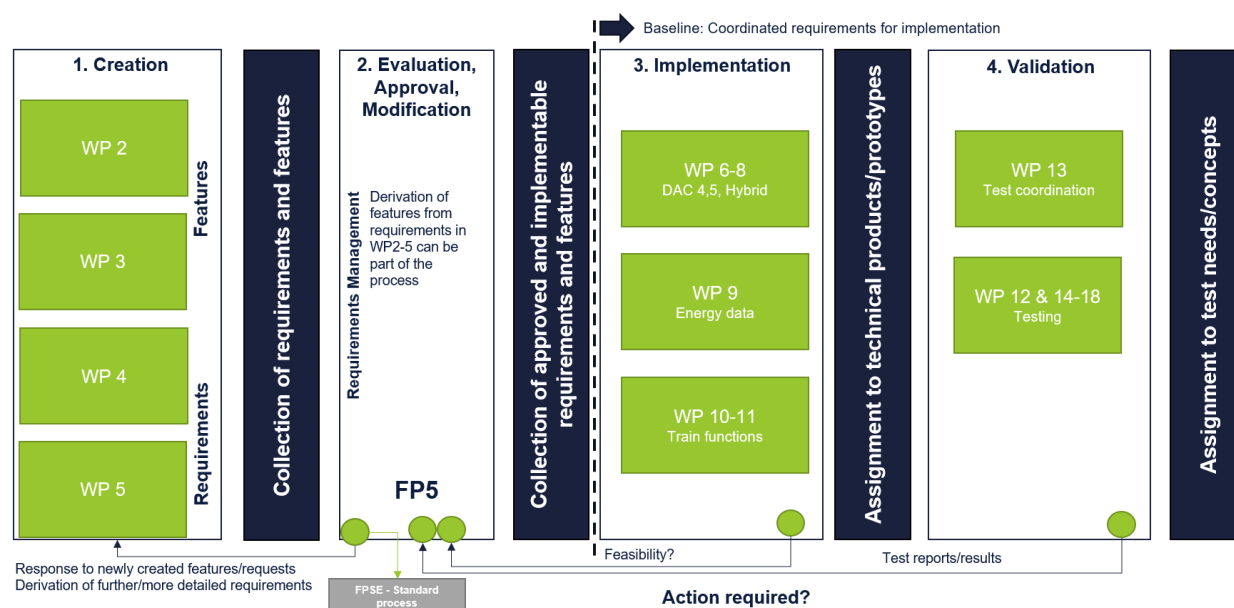


Figure 3 : High-Level Workflow for Requirements Management

Within FP5, various WPs are responsible for creating, reviewing and modifying the requirements (steps 1 and 2). The result of this work is a coordinated list of requirements that is agreed within the project. Following on from this,

implementation and validation (steps 3 and 4) are carried out by the relevant WPs. The workflow developed between these work steps is designed to ensure that all necessary interactions and information paths are taken into account and that iterations are possible.

In particular, the evaluation and approval process shown in step 2 is particularly relevant to ensure the quality the requirements created and is explained in detail in the following figure.

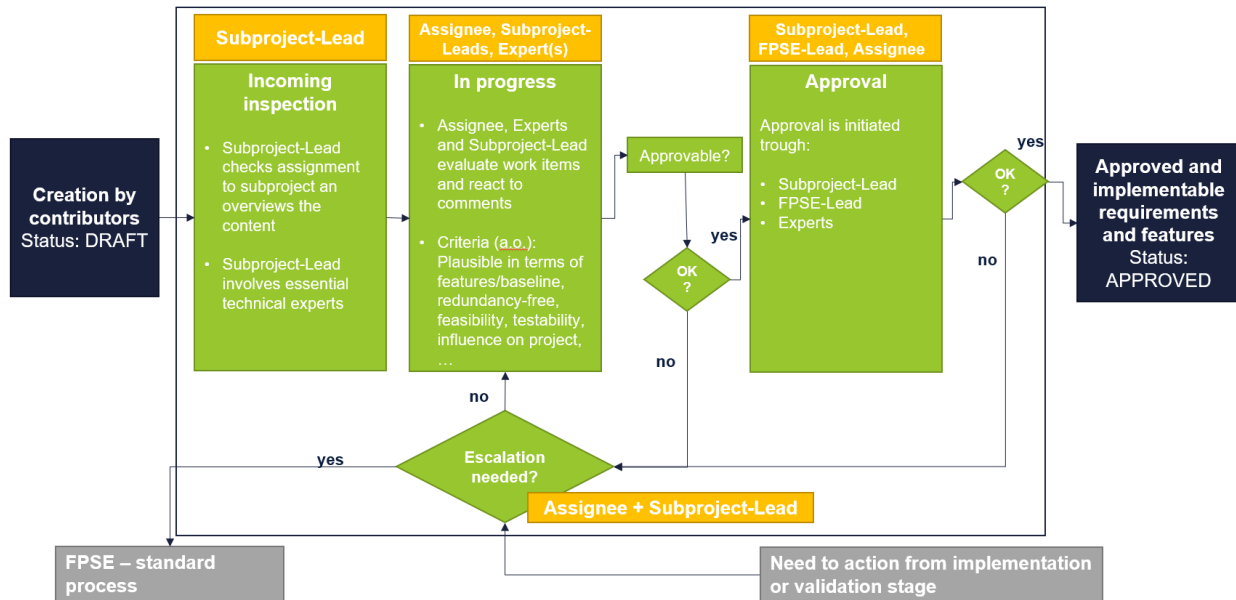


Figure 4 : Evaluation and Approval Process for Requirements

The evaluation and approval process for requirements of all kinds within FP5 is standardized to ensure quality and transparency when creating and modifying them.

For this purpose, roles including responsibilities were defined and included in the process. The Subproject-Leads from the existing project structure were adopted in order to monitor and approve the requirements in their main topics within the evaluation and approval process. Additionally, a clearly assigned project member must be assigned to each requirement, responsible for forwarding the requirements through the process and representing and adapting the content of the requirement. Additional technical experts can also be assigned to requirements to support them with their expertise. The FPSE-Lead responsible in FP5 is also consulted for the final approval and in case of escalation.

The evaluation and approval process for requirements can be divided into three main steps, in which the respective roles have specific responsibilities. After creation, the Subproject-Lead first performs an incoming inspection, during which an initial review of the content takes place and experts are integrated as required. In the second step, "in progress", the requirements can then be reviewed and commented on by all project members in order to clarify content and make adjustments. If a consent is found, requirements are approved in the final step, where all experts and the FPSE-Lead as well as the Subproject-Lead have to approve each requirement before it is included in the coordinated list of requirements. The process also provides for fallback levels and the option of iteration loops to ensure quality.

6.2 Derivation of User Requirements

6.2.1 Tooling: Polarion Environment

Polarion is a software platform specialized in product life cycle management. This tool enables the product life cycle to be managed in all stages, from the development of products and applications through to implementation and maintenance. Polarion offers a wide range of functions for developing, improving, verifying and validating requirements, particularly during the design and development phase.

Advantages such as transparent and collaborative working, detailed version control and numerous customization options for the project environment and workflow within large teams are crucial for the development of highly complex products such as the Full Digital Freight Train (FDFT). Polarion is used within the EU-Rail FP5 TRANS4M-R in requirements management, as the industry expressly requested it as a tool due to its wide range of functionalities. In addition, it is already being used successfully in the EU-Rail System Pillar.

In order to use Polarion in FP5 for requirements management, individual types of so-called work items were defined and customized for User-Requirements, User-Feature as well as system- and subsystem-requirements and -features to enable them to be precisely described and categorized. Each requirement and feature gets a unique and unchangeable identifier. In addition, a workflow for requirements and features has been defined that maps the process described in chapter [6.1.3 - Requirements Management in FP5](#), and ensures the participation of all necessary roles. Furthermore, changes throughout the entire process in Polarion are traceable and transparent for all Polarion users involved in the project.

6.2.2 Workflow in Polarion

To ensure a formal quality of requirements and features for each type several, partly mandatory, fields have to be filled out to describe each item. The following figure shows an example of a user requirement in Polarion.

The atomic character of the requirement is considered in the description that doubles as a title. All relevant information is to be found there. Furthermore, additional content can be included within rational and objective. To ensure the traceability, a source e.g. D2.1, can be added. When creating feature in Polarion, the title and description differ from requirements. The description for features is utilized differently as it is the main field of information. It contains a detailed description of the functionality it represents. When features and requirements are described their relation to each other can be added via the linking functionality in Polarion.

To ensure the participation of all relevant project members, users from different roles need to be included and added to each item. At first, every item needs an assignee who is responsible for the items and processing it throughout the workflow according to the workflow ([6.1.3 - Requirements Management in FP5](#)). Furthermore, experts need to be added that support and approve once the content is set.

Once work items such as (user) requirements and features are created in Polarion they are visible and commendable for all users to start the workflow of the evaluation and approval process in Polarion.

6.2.3 WP2 Team Composition

WP2 composed a international team of European operational and project experts from several companies to develop the operational procedures in D2.1. These experts are best suited to continue with the subsequent task of deriving functional requirements on the basis of these processes. The formal project work took place in regular work sequences and workshops and consisted of theoretical and practical parts.

The main part of the work was in responsibility of the international WP2 Core-Team, consisting of SBB, RCA, SNCF and DB Cargo AG. In addition, experts for product development especially within the field of requirements were supporting the Core-Team deriving User-Requirements. The consideration of various expert groups such as EG5 (brakes), EG6 (occupational safety) and EG7 (hazardous goods) was once more improving the quality of the results.

6.2.4 Approach on Deriving User-Requirements

The process of deriving functional requirements out of the operational procedures involves a step-by-step analysis to formulate them accurately, aligning with the processes described in section 6.1.3 - Requirements Management in FP5.

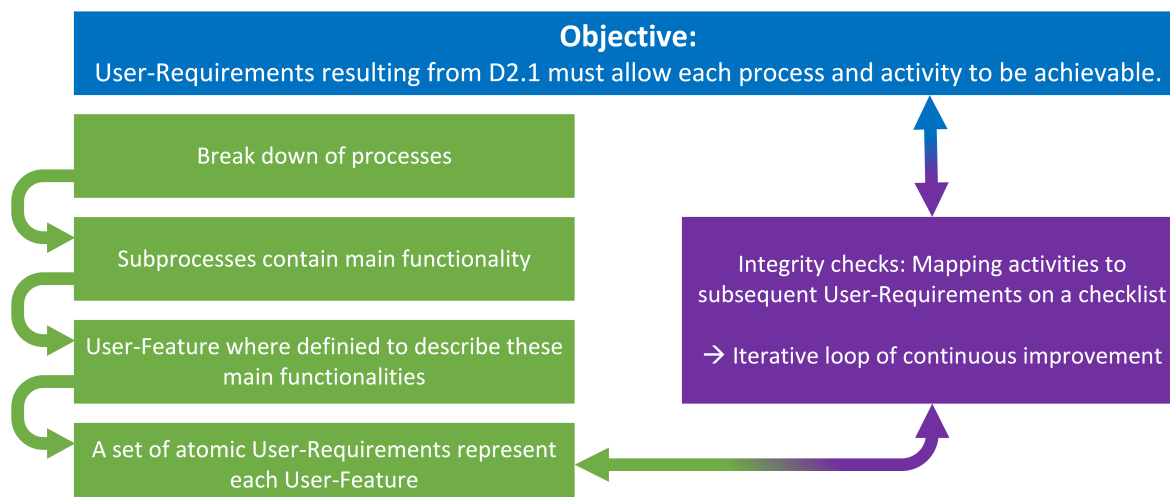


Figure 5 : Approach on Deriving User-Requirements from Operational Procedures

First of all, the overall objective was defined that the requirements resulting from D2.1 must allow each process and activity to be performed and achievable. Attention was paid regarding the scope to ensure that only the requirements of the FDFT system are included. For example, no operational requirements can be set for personnel, even if this is partly shown in the processes. This scope was specified and defined within the Core-Team in regular exchanges.

Following this, the processes were broken down starting with the subprocesses. These subprocesses are very suitable as they are self-contained functions that are used at various stages in the main processes. As a result, the main functionality of the FDFT system can be found in the subprocesses, with the main processes being assessed following to the subprocesses. The derivation of the features and sub-features and consequently the requirements depends on their functional coherence. A series of atomic requirements has to be defined in order to represent the functionality of the system. The collection of all requirements for describing a particular functionality can therefore be found in the parent feature. Where possible and necessary, sub-features are created to provide a further level of organization.

However, the requirements derived are not limited to the processes or subprocesses where they were originating from (i.e. the scope they are addressing is broader than the process they are derived from, unless stated otherwise).

An iterative loop of continuous improvement is applied throughout the entire process. This is necessary as requirements are valid on their own, but only represent the correct functionality as a set of requirements. A functional specification always leaves room for variation in the design of the resulting requirements. Therefore, several questions were asked. For example, to what extent the subsystems had already been considered (including the transmission path) or to what level of detail the requirements should be implemented, taking into account any subsystems. The results of the following discussions were then included in the elaboration of the user requirements.

To ensure integrity in terms of the requirements based on D2.1, each activity within the previously defined scope was mapped to the relevant requirements in a checklist. This allows the conclusion that as soon as each activity of each process is executable by the requirements assigned and all processes have been addressed, the functionality of the system described in D2.1 is also reflected in the functional User-Requirements.

[Additionally, the derivation of additional features and requirements is influenced by various factors such as maintenance, migration or various other, all of which are detailed in chapter 8 - Influencing Factors.]

6.2.5 Validation and Alignment with other WPs and EGs

Validation and alignment of the requirements is already provided for through the workflow and the requirements management methodology in Polarion developed within the FP5 project (see section [6.1.3 - Requirements Management in FP5](#)). With the approval process projects members and experts from various WPs and expert groups are involved in developing and approving requirements.

However, to ensure the quality of the functional requirements further actions were taken by consulting specific technical experts. During the derivation of the requirements from the operational procedures, representatives of WP3, WP4, WP5, WP9, WP25 and the expert groups EG5 (brakes), EG6 (occupational safety) and EG7 (hazardous goods) were already involved and partly assigned as experts to several items during the activities in Polarion to support ongoing development and introduce modifications as part of feedback loops.

Especially with regard to alignment and interface exchange with WP3 and WP25, the content of the User-Requirements and Features was harmonized and a common coordination was established using allocations in Polarion. This relates to the work status when submitting the deliverable and was defined for future developments beyond this deliverable and for future releases.

An ongoing challenge is the issue of active participation of some individual railway companies and the industry. Moreover, the participation of other WPs was also challenging. This concerns both the referencing of already developed requirements of other WPs as well as planned consultations and synchronizations of other WPs and EGs. The reasons for this included delays in the content delivery of other WPs and resulting delays in project scheduling. This in turn meant that exchanges intended to supplement the content of this deliverable could not be carried out for all targeted aspects. This was a challenge to cope with in terms of the overall scope of the content which had to be restricted considerably (see [8 - Influencing Factors](#)).

7 General Assumptions & Premises

7.1 General Assumptions

It is highlighted that all requirements in this document represent the current state of discussions within FP5 TRANS4M-R based on the Target Operational Procedures, however, subject to possible changes in further development. It is intended to verify and adapt these requirements in the future, also depending on future releases of deliverable D2.1. The currently elaborated User-Requirements state a work in progress that needs to be consolidated and verified within the evaluation and verification/validation process in Polarion. Additional developments after February 29th 2024 are not included in this version of the document and need to be added in later releases.

7.2 Scope of Elaboration

The User-Requirements are defined by deriving them out of the operational procedures within the deliverable D2.1 V1.0 as mandated by the grant agreement. Although the scope is limited to the functional User-Requirements derived from D2.1, non-functional requirements that are directly related are also added. However, this additional content is clearly distinguished from the content required by the task description and there is no claim to it being complete.

D2.1 contains the operational processes, with the target process describing fully automated operation and the semi-automated processes describing partially automated operation. The functional requirements derived within the scope of this deliverable are based on the target processes. The reason being the possibility for suppliers to keep the future target scope in mind even when developing EU-Rail scope functions first. However, it should be noted that a strict separation of derived requirements from EU-Rail and target OPE is not possible, as the EU-Rail processes form the basis for the target OPE anyway and a differentiation between those two for testing and validation comes naturally. The only components or systems that can be tested or validated are those developed according to the grant agreement.

The scope of work is based on the same subject matter as D2.1, including the restrictions. Therefore, Disruption/error process, Migration, Border traffic/handover between countries and/or infrastructures, Existing operational processes (Signaller, ETCS, ...), IT interfaces (partially), Maintenance processes and Consist functions are not addressed in full. Details on these delimitations can be found in D2.1.

As the grant agreement does not include the specification of non-functional User-Requirements elsewhere, the authors expressly point out that an essential part within the project development is missing. (Due to resource constraints, any crucial content not included in this document will be highlighted.) This suggests widening the scope over the defined goals within FP5 TRANS4M-R.

Given the derivation of the functional requirements based on D2.1, the actors described there are assumed to be users in this deliverable (Yard Manager, Yard Personnel, Operator Traction Unit, Traction Unit, Wagon/Wagon Set, FDFT Backend).

Despite this, other user groups have already been identified and are taken into account additionally throughout the work. However, this paper makes no claim to completeness for additional users. Instead, additional findings in the form of features or requirements are included where indicated.

8 Influencing Factors

User-Requirements result within FP5 from various topics. Within deliverable D2.2, the majority of the functional requirements are based on the Operational Procedures from deliverable D2.1. In addition, further influencing factors were identified in this chapter which require the definition of further User-Requirements. These must be taken into account in a future overall consideration of the functional requirements of the FDFT system.

Nevertheless, this chapter does not claim completeness in terms of the User-Requirements derived from it.

In this chapter the authors point out identified topics from which functional requirements must be derived in the further stages of the FP5 project within corresponding expert groups and WPs. Not until then it will be ensured that the list of User-Requirements is complete for the system to be developed.

8.1 Operational Procedures

In deliverable 2.1, the results of preliminary operating procedures and processes were developed, presented in the form of flow charts and described accordingly. In terms of content, the operational target processes and intermediate processes were developed with the aim of European standardization and harmonization. These are the first target operating procedures agreed across Europe. These provide the basis for the future development of technical innovations and describe the goal of fully automating rail freight transport in Europe. In order to provide significantly higher transport capacities in the future, train lengths, loads and speeds on the route must be increased and process times in the train stations and operating locations must be significantly shortened. All of these factors lead to accelerated clock handovers, reduced resource consumption and fast transports. In a further step, a clustering of all individual process steps stored in the operating process and the automation components contained therein was carried out. This procedure provides a practical basis for describing and deriving the necessary requirements for the development of the technical automation components and the functional specifications with the aim of full automation. This method created a practical decision-making aid that is used for the future definition of the “technical equipment packages”, i.e. the necessary composition of automation components and their impact on operational procedures and processes.

As part of the development of the Operational Procedures and the requirements derived from it, the need emerged to be able to control certain components and systems through physical status displays on the consists without stepping into movement area. These requirements arise because the ability to physically control certain components and systems must be available until the FDFT back-end is fully implemented, but it must also be taken into account that the use of a mobile HMI will not be implemented, especially in customer sidings, smaller RUs, etc. can.

8.2 Interoperability

Interoperability is one of the central goals that must be respected and fulfilled within TRANS4M-R. The means of Interoperability are constantly applied to the whole development of the FDFT.

Especially on the coupler (mechanical and electrical) these interoperable Interfaces have already been defined in a very comprehensive process between Operators and Suppliers in TRANS4M-R. For the IT Backbone (train- and landside) these discussions are still ongoing.

In all cases, these requirements are taken into account and will be part of the various Deliverables submitted by TRANS4M-R.

8.3 Train Functions/Consist Functions

Train functions and consist functions are a fundamental part to be taken into account for continuing specification of the User-Requirements. Results that are generated as part of WP10 in the further progress of the project must therefore be integrated by the relevant WP managers in collaboration with the operators in order to derive further User-Requirements. This must be supplemented in the ongoing project with regard to the scheduling of WPs 10 and the corresponding Deliverables.

8.4 Maintenance

8.4.1 Inspection, Installation and Lifetime

The topic of maintenance is a broad subject, which needs to be elaborated and to be further detailed out. This was not possible in the given timeframe, nor part of the given task. But the subject has been identified of high importance for TRANS4M-R. This is why, a so called expert group Maintenance has been founded in TRANS4M-R. This group is now working specifically on deriving the various requirements and add them into our common requirement management tool Polarion.

8.4.2 Towing with malfunction of mechanical part/s of the DAC

A group of experts discussed future cases on when the freight train has to be towed, but the coupling point is defective and cannot be connected mechanically. Well-known aids can be used to apply tractive forces, but elements such as buffers are missing for absorbing compressive forces. Although it would theoretically be possible to replace the DAC in the field, this would be problematic due to the high weight, etc.

Experience with Scharfenberg type 10 automatic couplings shows that the probability is very low that a DAC has a defective mechanism and it cannot be reached from both sides of the train at the same time. The consensus of the group of experts was that, due to the probability, no measures are absolutely necessary in the development of the DAC. However, measures that can be planned for the wagon were identified. These are:

- A mount for a towing hitch can be constructed, which is attached to "Interface A".
- An interface on the wagon (e.g. stabilizer of the DAC) can be provided, to which a towing coupling can be attached. In this case, however, the force absorption must be ensured.

These measures may be useful, but are outside the scope of the project.

The group of experts then carried out a rough analysis of the additional requirements for rescue train deployment. This resulted in the inclusion of requirements for the DAC relating to the interface between the shaft and spring/damper assembly, the "air" interface and the power interface.

It should also be noted that if the mechanical connection with the DAC is possible, the wagon can be towed using an auxiliary coupling. However, it is important here that the cover of the electric coupling cannot open. Consideration was also given to pressure absorption (e.g. using a tow bar). However, a possible attachment must be provided for this.

8.5 Data and Information Exchange

8.5.1 Data Communication Concept

The development of FDFT requires the flow of information between all acting systems, assets down to component level. The FDFT is designed to establish a wired data connection between every consist of the train in accordance with TCN standards. FDFT relevant information can be exchanged through the created train network and enables IP based train functions during all modes of operation. Within network specifications a leading consist (usually the traction unit) is superimposed upon the network. This happens specifically during train inauguration during which the composition and orientation of each individual asset are automatically determined and the role of leading consist is either set or negotiated through standardized network protocols.

The FDFT relevant information is represented through different data types. Noteworthy are added wagon data that are essential to train inauguration as well as further FDFT required applications (e.g. train integrity monitoring).

This leading consist will be able to perform operational mode specific tasks by issuing commands through the wired train network with all coupled assets, thus forming a horizontal communication line.

Additionally all consist units will be equipped with wireless communication devices, enabling them to link up with backend services, including the FDFT backend. The FDFT backend hereby plays an essential role within FDFT by forwarding commands to uncoupled consist units or relaying status information from wagons and traction units. In addition to FDFT relevant data, further service and application data can be exchanged exclusively through wireless connection. Wireless connectivity is therefore an additional vertical communication line regardless of the fact if the consist is part of a train composition or not.

Since mobile data connectivity cannot be guaranteed in every freight rail environment the FDFT system and subsystems are designed to operate without a permanent connection to a central hub such as the FDFT backend, yet certain train functions will only be possible through wireless communication means. The leading consist will always be able to override FDFT instructions issued from the FDFT backend through manually executing predefined train functions.

Since the wireless information exchange does not interfere with the limited, yet robust wired communication line, its can be utilized for additional functions such as operator specific data upload (e.g. CBM), customer facing and added value functions (e.g. consignment monitoring) or software and patch dissemination on consist or component level.

8.5.2 Cyber Security

A cyber security program ensures the systematic and structured approach to a secure and reliable train operation. It usually includes IT and OT security. One important pillar of effective security is encryption. Communication between all assets and the FDFT as well as within the train network should be encrypted using a state of the art standard. The second pillar is an access and permissions concept where only authorized personnel is allowed to gain access to sensitive areas. OT security involves the physical protection of the onboard devices against exploitation and demolition. A cyber security expert group is in its formation phase and will concentrate on creating a holistic security concept based on EU norms.

8.6 Migration

In order to migrate the new DAC system, which is not compatible to today's coupling system, several strategies need to be applied. For several vehicles this implies the division of the mounting processes into two steps: the wagon preparation in a normal workshop and the finalization of the retrofit in additional pop-up workshops without the possibility to lift wagons. After the first retrofit step the vehicles are still compatible in the old system (screw coupler), while only with the second step the system switch to DAC is done.

Such strategies, among others, can only be applied if the new technology is well prepared for the underlying processes of the strategy. For the given example, the new components need to be prepared to be mounted in at least two steps and the vehicles need to be fully operable in the intermediate phase.

Therefore, requirements for the technical design of the new system need to be derived on the basis of features which were already defined from migration strategies and, – based on an alignment process in the EDDP WP3 [\(4.2 - EDDP](#)

Migration) included to the requirements management process of FP5 TRANS4M-R.

8.7 Environment

Only potential requirements related to the environmental influences on loading and unloading methods, as well as the goods itself, were considered. Consequently, corresponding User-Features or User-Requirements were formulated.

Not considered were:

- weather influences on the components and systems
- use of substances and materials in the manufacture of components and systems
- disposal and recycling

The relevant standards must be consulted, which are generally applicable in the railway system and must be implemented accordingly.

8.8 Load

The intended use of freight wagons should also be maintained in the future for different goods and loading methods. Freight and their loading methods (loading and unloading) can have an impact on the DAC and its components. All hardware and software which is installed on the vehicles must cover the range of use of today's freight wagons and must comply with the current goods and loading methods and valid UIC loading guidelines. The same applies for traction units and whole trains.

Within WP2, necessary User-Requirements were considered and described that are necessary from an operational point of view due to the load and loading methods. Within the analysis, we identified features in WP2 that contribute to the success of the project, but are not relevant from an operational user perspective. These features are recorded in Polarion and must be assigned to work packages that check these features for completeness and derive requirements.

8.8.1 Influencing Factor Load

The influence of corrosive load, warm load, etc. on the DAC and its components were considered. User-Requirements were recorded and described, if they were necessary from an operational perspective. Other features were not identified from an operational perspective, but are necessary for the success of the project. These additional features were recorded by WP2, but are to be processed in other WPs.

8.8.2 Loading and Unloading

Loading methods (loading and unloading) and their influence on the DAC and its components were considered - loading overlength goods (e.g. long rails), loading with magnetic crane. User-Requirements were recorded and described if they were necessary from an operational perspective. Other features are not identified from an operational perspective but are necessary for the success of the project. These additional features were recorded by WP2, but are to be processed in other WPs.

8.9 Safety, Security and Dangerous Goods

8.9.1 Safety of Employees

WP2 created User-Features/User-Requirements, that apply to operating personnel. They do not contain any requirements for occupational health and safety in other areas, e.g. maintenance.

The requirements regarding employee protection can generally be derived from existing standards and regulations on the following subject areas:

- Ergonomics
- Forces

- Expenditure protection against electric shocks / touching live parts
- Protection against entrapment
- Noise exposure

8.9.2 Incorrect Operational Handling (Security)

All functions must be protected against unauthorized or incorrect operation. In the area of electrically / electronically controlled components, this must be ensured by means of access authorizations and cyber security; corresponding requirements are defined in WP3.

Corresponding User-Features/User-Requirements have been created in the area of manual applications (e.g. uncoupling).

8.9.3 Dangerous Goods

All components and systems must be installed on the vehicles in such a way, that they do not trigger any restrictions regarding the loading of dangerous goods, compared to the current status.

Effect of driving into ATEX areas:

- Mechanical components must be designed in such a way that they can be driven on and operated in ATEX areas without restrictions.
- If possible, electrical and electronic components must be designed in such a way, that it is possible to drive in, operate the components and park vehicles in ATEX areas. If this cannot be ensured, the corresponding restrictions must be identified in order to be able to derive necessary operating restrictions (e.g. switching off components when entering the ATEX area).

8.10 Special Operations during Wagon Processing

The following special operations in shunting were considered for this document, but only at an operational level. There is no claim to completeness and consideration of all possible shunting types (e.g. special customer sidings):

- Manual Shunting: The process involves the displacement of wagons through human force, achieved by either pushing the wagons along the side walls or corners or utilizing a lifting bar positioned between the rail and wheel tire. It is presupposed that during manual shifting, decoupling may occur through both electric and manual activation of the emergency release
- Fixed Shunting means with cable-pull: This method employs a cable attached to the wagon, which is then electrically winched to effect movement. Similar to manual shunting, this approach avoids direct coupling interaction, as force is applied directly to the wagon
- Shunting by two-way-vehicle, indirectly powered shunting devices, shunting robots without "intelligence," and without pneumatic supply: The two-way-vehicle operates on both rails and roads. The coupling mechanism may differ from that of locomotives, necessitating the development of special (Digital) Automatic Couplings for shunting means with spatial constraints distinct from locomotives. These couplings can be either fixedly installed on the shunting means or configured as adapters. For shunting means equipped with draw hooks, a specific adapter for compatibility with vehicles featuring a DAC is required
- Shunting by two-way-vehicle, indirectly powered shunting devices, shunting robots with "intelligence" (capable of interacting with the wagon - CCU interface)

- Non-railbound shunting vehicles: Currently, non-railbound vehicles are employed, applying impact force directly to the buffers. These vehicles are additionally equipped with a coupler or utilize a specialized drawbar placed over the draw hook on the wagon side, connected to the shifting vehicle via a conventional trailer coupling. These non-railbound vehicles should be adaptable to a solution analogous to two-way vehicles for the absorption of compressive and tensile forces
- Shunting by forklift with individual structures: Structures must be adjusted, including the installation of a DAC counterpart with force absorption. It may be possible to use them without modification, with crossbeam (currently used as buffer plank) serving as a contact point
- Automatic shunting in loading systems: Wagon movement is achieved by engaging the wheels, with no direct interaction with the coupling

9 User-Requirements

This chapter lists all user requirements derived within this deliverable, arranged according to thematic clusters. The requirements are hierarchically linked to features that cannot necessarily be assigned to the defined clusters, as these contain complex cross-cluster functional descriptions. An overview of the feature structure is therefore listed independently of the cluster.

9.1 User-Features

9.1.1 General Overview

The following Overview shows the main functionalities defined with User-Features. Therefore, this overview does not contain User-Requirements. In the following chapters 9.1.X every User-Feature will be displayed including all User-Requirements that have been defined within this User-Feature.

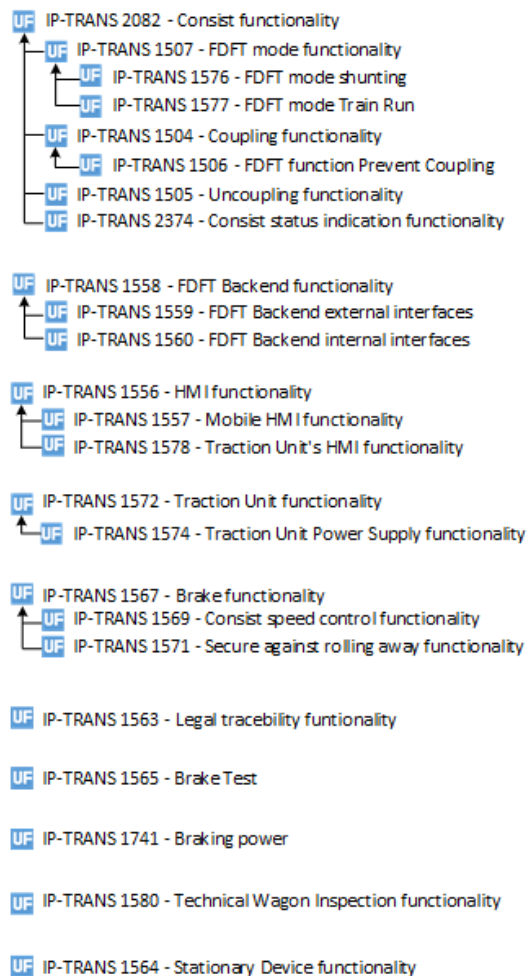


Figure 6 : Feature Overview

9.1.2 Derived Functional User-Features

IPTRANS-2082 - Consist functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1639 - The leading Consist shall detect unpowered coupled Consist. , _ is parent of:  IPTRANS-1504 - Coupling functionality , _ is parent of:  IPTRANS-1505 - Uncoupling functionality , _ is parent of:  IPTRANS-1507 - FDFT mode functionality , _ is parent of:  IPTRANS-2374 - Consist status indication functionality , _ is parent of:  IPTRANS-2456 - Emergency consist handling , _ is parent of:  IPTRANS-1532 - The leading Consist shall be able to activate the FDFT function Prevent Coupling on one uncoupled Consist end of its Consist Composition independently. , _ is parent of:  IPTRANS-1597 - The Stationary Device shall be able to connect automatically to a Consist or Consist Composition at standstill. , _ is parent of:  IPTRANS-1650 - The Traction Unit shall enable the Authorized Personnel to remotely check the identification, orientation, order and number of the Consists in the Consist Composition. , _ is parent of:  IPTRANS-1824 - The Consist shall have a standardized interface so that additional sensors can be added. , _ is parent of:  IPTRANS-2058 - If the specific Consist is in FDFT mode Shunting, the FDFT Backend shall be able to command reducing the rolling speed of a specific Consist. , _ is parent of:  IPTRANS-2073 - The leading Traction Unit shall know the braking status of each braking system of each Consist in the Consist Composition. , _ is parent of:  IPTRANS-2089 - The leading Consist shall know order, orientation and number of coupled Consists in Consist Composition immediately after changes occur. , _ is parent of:  IPTRANS-2090 - The Mobile HMI shall display the orientation, order and number of Consists of a specific Consist Composition to the Authorized Personnel. , _ is parent of:  IPTRANS-2096 - Only if Consist is at a standstill, the Consist shall be able to secure itself against rolling away. , _ is parent of:  IPTRANS-2117 - The FDFT Backend shall know the Consist Status Data of each Consist. , _ is parent of:  IPTRANS-2128 - The leading Traction Unit shall know the status of FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. , _ is parent of:  IPTRANS-2165 - The FDFT Backend shall know the Consist Data of each Consist. , _ is parent of:  IPTRANS-2183 - The FDFT Backend shall know the orientation, order and number of Consists of a specific Consists Composition. , _ is parent of:  IPTRANS-2189 - The FDFT Backend shall be able to know the state of the Service Brake of a specific Consist. , _ is parent of:  IPTRANS-2328 - The Personnel shall be able to manually connect the Stationary Device to a Consist or Consist Composition at standstill. , _ is parent of:  IPTRANS-2335 - If the Consist has automatic rear end signal capability, the Mobile HMI shall enable the Authorized Personnel to activate the rear end signals for a specific Consist. , _ is parent of:  IPTRANS-2336 - If the Consist has automatic rear end signal capability, the Mobile HMI shall enable the Authorized Personnel to deactivate the rear end signals for a specific Consist. , _ is parent of:  IPTRANS-2337 - The Personnel shall be able to manually disconnect the Stationary Device from a Consist Composition or Consist at standstill. , _ is parent of:  IPTRANS-2348 - The FDFT Backend shall know whether a specific Consist Composition has a leading Consist. , _ is parent of:  IPTRANS-2362 - If the Consist has automatic rear end signal capability, the Traction Unit shall enable the Authorized Personnel to deactivate the rear end signals for a specific Consist. ,

_ is parent of: **UR** IPTRANS-2363 - If the Consist has automatic rear end signal capability, the Traction Unit shall enable the Authorized Personnel to activate the rear end signals for a specific Consist. ,

_ is parent of: **UR** IPTRANS-2364 - The Consist Composition shall implement an open interface to exchange data between Consists of Consist Composition. ,

_ is parent of: **UR** IPTRANS-2401 - The Traction Unit shall inform the Personnel when a Consist in the Consist Composition has derailed. ,

_ is parent of: **UR** IPTRANS-2402 - The Consist shall determine and store its running mileage. ,

_ is parent of: **UR** IPTRANS-2403 - The Consist shall store its sensor data for later use. ,

_ is parent of: **UR** IPTRANS-2404 - The leading Traction Unit's HMI shall inform the Authorized Personnel when a sensor reading of a coupled Consist Composition hits a predefined value. ,

_ is parent of: **UR** IPTRANS-2414 - The Consist shall store its Static Consist Data locally ,

_ is parent of: **UR** IPTRANS-6727 - The Consist Network shall offer future extensibility, so that additional applications can be connected for use of communications and power at any later point in time.

IPTRANS-1505 - Uncoupling functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , _ is parent of:  IPTRANS-1514 - Before electrical uncoupling is executed, the Consist shall initiate the FDFT function Prevent Coupling at its end of the Uncoupling Point. , _ is parent of:  IPTRANS-1515 - If in FDFT mode Train Run, the Consist shall not execute uncoupling. , _ is parent of:  IPTRANS-1651 - In case of unintentional uncoupling in Consist Composition, the leading Traction Unit shall inform the Authorized Personnel. , _ is parent of:  IPTRANS-1798 - Before uncoupling in Consist Composition is executed, the Consist Composition shall deactivate the Power Supply. , _ is parent of:  IPTRANS-2028 - The Mobile HMI shall enable the Authorized Personnel to remotely uncouple two Consists of a specific Consist Composition at Uncoupling Point. , _ is parent of:  IPTRANS-2029 - The leading Traction Unit shall enable the Authorized Personnel to remotely uncouple between two Consists of its Consist Composition at Uncoupling Point. , _ is parent of:  IPTRANS-2111 - If the Power Supply at the intended uncoupling point is active, the Consist shall not execute uncoupling. , _ is parent of:  IPTRANS-2112 - The Consist shall enable Personnel to execute uncoupling by manual interaction at the Consist. , _ is parent of:  IPTRANS-2181 - Personnel shall be able to uncouple two coupled Consists by pure manual interaction. , _ is parent of:  IPTRANS-2346 - The FDFT Backend shall be able to uncouple two Consists of a specific Consists Composition at Uncoupling Point. , _ is parent of:  IPTRANS-2390 - If uncoupling prevention is active on the uncoupling point, the two coupled Consists shall prevent execution of uncoupling. , _ is parent of:  IPTRANS-2391 - The leading Traction Unit shall enable the Authorized Personnel to activate uncoupling prevention for a specific coupling point of two coupled Consists. , _ is parent of:  IPTRANS-2392 - The leading Traction Unit shall enable the Authorized Personnel to deactivate uncoupling prevention for a specific coupling point of two coupled Consists. , _ is parent of:  IPTRANS-2393 - The Mobile HMI shall enable the Authorized Personnel to activate uncoupling prevention for a specific coupling point of two coupled Consists. , _ is parent of:  IPTRANS-2394 - The Mobile HMI shall enable the Authorized Personnel to deactivate uncoupling prevention for a specific coupling point of two coupled Consists.

IPTRANS-1504 - Coupling functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , _ is parent of:  IPTRANS-1506 - FDFT function Prevent Coupling , _ is parent of:  IPTRANS-1514 - Before electrical uncoupling is executed, the Consist shall initiate the FDFT function Prevent Coupling at its end of the Uncoupling Point. , _ is parent of:  IPTRANS-1552 - Two DAC coupler heads between Consists shall form a mechanical connection as result of coupling. , _ is parent of:  IPTRANS-1629 - The Mobile HMI shall be able to display the status of FDFT function Prevent Coupling of a specific Consist' end to the Authorized Personnel. , _ is parent of:  IPTRANS-2120 - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply of a specific Consist Composition. , _ is parent of:  IPTRANS-2125 - If the Consist Composition is in FDFT mode Shunting, the leading Traction Unit shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. , _ is parent of:  IPTRANS-2126 - The Mobile HMI shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end. , _ is parent of:  IPTRANS-2326 - The leading Traction Unit shall enable the Authorized Personnel to determine the coupling state of its ends. , _ is parent of:  IPTRANS-2327 - The FDFT Backend shall know the coupling state of the ends of a specific Consist. , _ is parent of:  IPTRANS-2426 - The Consist shall enable the Personnel to visually check whether it is successfully coupled to the other Consist without stepping into movement area. , _ is parent of:  IPTRANS-2427 - The Consist shall enable the Personnel to visually check whether it is ready to couple at a Consist's end without stepping into movement area. , _ is parent of:  IPTRANS-5217 - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply on a specific end of a Consist.

IPTRANS-1506 - FDFT function Prevent Coupling

Type	 User-Feature
Functionality	 Functional Feature

Linked
Work
Items

has parent: **UF** IPTRANS-1504 - Coupling functionality ,

_ is parent of: **UR** IPTRANS-1514 - Before electrical uncoupling is executed, the Consist shall initiate the FDFT function Prevent Coupling at its end of the Uncoupling Point. ,

_ is parent of: **UR** IPTRANS-1518 - If its Consist Composition is in FDFT mode Train Run, the Consist shall not activate FDFT function Prevent Coupling. ,

_ is parent of: **UR** IPTRANS-1547 - If the FDFT function Prevent Coupling is active for a Consist's end, the Consist shall prevent coupling for this end. ,

_ is parent of: **UR** IPTRANS-1628 - The FDFT Backend shall know the status of FDFT function Prevent Coupling of a specific Consist's end. ,

_ is parent of: **UR** IPTRANS-1629 - The Mobile HMI shall be able to display the status of FDFT function Prevent Coupling of a specific Consist' end to the Authorized Personnel. ,

_ is parent of: **UR** IPTRANS-2030 - The leading Traction Unit shall be able to activate the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2031 - The leading Traction Unit shall be able to deactivate the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2086 - Before its Consist Composition switches to FDFT mode Train Run, the Consist shall deactivate the FDFT function Prevent Coupling for its ends of Consist Composition. ,

_ is parent of: **UR** IPTRANS-2123 - The leading Traction Unit shall enable the Authorized Personnel to check the state of the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2124 - If the FDFT function Prevent Coupling is active and its Consist Composition is in FDFT mode Shunting, the FDFT Backend shall be able to deactivate the FDFT function Prevent Coupling for a specific Consist's end. ,

_ is parent of: **UR** IPTRANS-2125 - If the Consist Composition is in FDFT mode Shunting, the leading Traction Unit shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2126 - The Mobile HMI shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end. ,

_ is parent of: **UR** IPTRANS-2128 - The leading Traction Unit shall know the status of FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2130 - The leading Traction Unit shall enable the Authorized Personnel to activate the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2407 - The Consist shall enable the Personnel to visually check whether the status of FDFT function Prevent Coupling is active for a Consist's end without stepping into movement area. ,

_ is parent of: **UR** IPTRANS-2408 - The Consist shall enable Personnel to activate the FDFT function Prevent Coupling at a specific Consist's end manually. ,

_ is parent of: **UR** IPTRANS-2409 - The Consist shall enable Personnel to deactivate the FDFT function Prevent Coupling at a specific Consist's end manually. ,

_ is parent of: **UR** IPTRANS-2410 - If the Consist is able to actuate FDFT function Prevent Coupling automatically and the auto-reset timer for FDFT function Prevent Coupling was set, the Consist shall deactivate the FDFT function Prevent Coupling automatically after the auto-reset timer expires. ,

_ is parent of: **UR** IPTRANS-2411 - The leading Traction Unit shall be able set the auto-reset timer for the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2412 - The Mobile HMI shall be able set the auto-reset timer for the FDFT function Prevent Coupling at a specific Consist's end. ,

_ is parent of: **UR** IPTRANS-2413 - If the Consist is not able to deactivate the FDFT function Prevent Coupling automatically, the Consist shall enable the infrastructure to deactivate the FDFT function Prevent Coupling at a specific Consist's end by manual interaction when the Consists moves over a track device.

IPTRANS-1507 - FDFT mode functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , _ is parent of:  IPTRANS-1576 - FDFT mode Shunting , _ is parent of:  IPTRANS-1577 - FDFT mode Train Run , _ is parent of:  IPTRANS-1641 - The leading Backend shall know the state of the FDFT mode of the Consist Composition immediately after the FDFT mode changed. , _ is parent of:  IPTRANS-1643 - The FDFT Backend shall know the FDFT mode of a specific Consist Composition. , _ is parent of:  IPTRANS-1644 - The Authorized Personnel in the Traction Unit shall know the FDFT mode of its Consist Composition immediately after changes occur. , _ is parent of:  IPTRANS-1645 - The Mobile HMI shall enable the Authorized Personnel to retrieve the FDFT mode of a specific Consist Composition.

IPTRANS-1576 - FDFT mode Shunting

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-1507 - FDFT mode functionality , _ is parent of:  IPTRANS-1509 - The FDFT Backend shall be able to switch a specific Consist Composition or Consist to FDFT mode Shunting. , _ is parent of:  IPTRANS-1635 - The leading Traction Unit shall enable the Authorized Personnel to switch its Consist Composition to FDFT mode Shunting. , _ is parent of:  IPTRANS-1636 - Before switching to FDFT mode Shunting, the Traction Unit shall deactivate the Power Supply. , _ is parent of:  IPTRANS-2018 - The Mobile HMI shall enable the the Authorized Personnel to switch a specific Consist Composition to FDFT mode Shunting. , _ is parent of:  IPTRANS-2080 - If the Consist or Consist Composition is moving, it shall not switch between FDFT modes.

IPTRANS-1577 - FDFT mode Train Run

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-1507 - FDFT mode functionality , _ is parent of:  IPTRANS-1513 - After the Consist Composition switched to FDFT mode Train Run, the leading Traction Unit shall activate the Power Supply. , _ is parent of:  IPTRANS-1515 - If in FDFT mode Train Run, the Consist shall not execute uncoupling. , _ is parent of:  IPTRANS-1518 - If its Consist Composition is in FDFT mode Train Run, the Consist shall not activate FDFT function Prevent Coupling. , _ is parent of:  IPTRANS-2020 - The FDFT Backend shall be able to initiate the switch of a specific Consist Composition to FDFT mode Train Run. , _ is parent of:  IPTRANS-2021 - The Mobile HMI shall enable the Authorized Personnel to switch a specific Consist Composition to FDFT mode Train Run. , _ is parent of:  IPTRANS-2022 - The leading Traction Unit shall enable the Authorized Personnel to switch its Consist Composition to FDFT mode Train Run. , _ is parent of:  IPTRANS-2086 - Before its Consist Composition switches to FDFT mode Train Run, the Consist shall deactivate the FDFT function Prevent Coupling for its ends of Consist Composition.

IPTRANS-2374 - Consist status indication functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , _ is parent of:  IPTRANS-2378 - The Consist shall enable the Personnel to visually check whether the Consist is secured by itself against rolling away without stepping into the movement area of the Consist. , _ is parent of:  IPTRANS-2382 - The Consist shall enable the Personnel to visually check whether the Consist is not secured by itself against rolling away without stepping into the movement area of the Consist. , _ is parent of:  IPTRANS-2385 - The Personnel shall be able to visually determine the current state of charge of the Consist's battery without stepping into the movement area of the Consist. , _ is parent of:  IPTRANS-2386 - If the Consist is equipped with a controllable valve, the Personnel shall be able to visually determine the state of the Consist's controllable valve without stepping into the movement area of the Consist. , _ is parent of:  IPTRANS-2387 - If the Consist is equipped with a draft gear, the Personnel shall be able to visually determine whether the Consist's draft gear was overused and an irreversible deformation has occurred. , _ is parent of:  IPTRANS-2407 - The Consist shall enable the Personnel to visually check whether the status of FDFT function Prevent Coupling is active for a Consist's end without stepping into movement area. , _ is parent of:  IPTRANS-2426 - The Consist shall enable the Personnel to visually check whether it is successfully coupled to the other Consist without stepping into movement area. , _ is parent of:  IPTRANS-2427 - The Consist shall enable the Personnel to visually check whether it is ready to couple at a Consist's end without stepping into movement area.

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IPTRANS-1556 - HMI functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1557 - Mobile HMI functionality , _ is parent of:  IPTRANS-1578 - Traction Unit's HMI functionality

IPTRANS-1557 - Mobile HMI functionality

Type	 User-Feature
Functionality	 Functional Feature
	has parent:  IPTRANS-1556 - HMI functionality , _ is parent of:  IPTRANS-1629 - The Mobile HMI shall be able to display the status of FDFT function Prevent Coupling of a specific Consist' end to the Authorized Personnel. , _ is parent of:  IPTRANS-1645 - The Mobile HMI shall enable the Authorized Personnel to retrieve the FDFT mode of a specific Consist Composition. , _ is parent of:  IPTRANS-1743 - The Mobile HMI shall enable the Authorized Personnel to check the Consist Data of a specific Consist. , _ is parent of:  IPTRANS-1752 - The Mobile HMI shall enable the Authorized Personnel to mark a specific Consist in the Consist Composition as ready for shunting. , _ is parent of:  IPTRANS-1782 - The Mobile HMI shall enable the Authorized Personnel to input the result of a manual brake test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-1825 - The Mobile HMI shall enable the Authorized Personnel to input the intermediate result of a manual wagon inspection of a specific Consist. , _ is parent of:  IPTRANS-1826 - The Mobile HMI shall enable the Authorized Personnel to send the result of a manual technical wagon inspection to the FDFT Backend. , _ is parent of:  IPTRANS-2018 - The Mobile HMI shall enable the the Authorized Personnel to switch a specific Consist Composition to FDFT mode Shunting. , _ is parent of:  IPTRANS-2021 - The Mobile HMI shall enable the Authorized Personnel to switch a specific Consist Composition to FDFT mode Train Run. , _ is parent of:  IPTRANS-2028 - The Mobile HMI shall enable the Authorized Personnel to remotely uncouple two Consists of a specific Consist Composition at Uncoupling Point. , _ is parent of:  IPTRANS-2071 - The Mobile HMI shall be able to display the G/P setting of the service brake of a specific Consist to the Authorized Personnel. , _ is parent of:  IPTRANS-2075 - The Mobile HMI shall display the state of the Service Brake of a specific Consist to the Authorized Personnel. , _ is parent of:  IPTRANS-2077 - The Mobile HMI shall be able to display if a specific Consist is secured against rolling away to the Authorized Personnel. , _ is parent of:  IPTRANS-2078 - The Mobile HMI shall be able to display the available braking power of a specific Consist to the Authorized Personnel. , _ is parent of:  IPTRANS-2090 - The Mobile HMI shall display the orientation, order and number of Consists of a specific Consist Composition to the Authorized Personnel. , _ is parent of:  IPTRANS-2106 - The Mobile HMI shall enable the Authorized Personnel to remotely secure a specific Consist against rolling away. , _ is parent of:  IPTRANS-2107 - The Mobile HMI shall enable the Authorized Personnel to remotely revert securing a specific Consist against rolling away. , 

Linked Work Items

- _ is parent of: [UR IPTRANS-2110](#) - The Mobile HMI shall display the current status of the Power Supply of a Consist Composition or a specific Consist's end to the Authorized Personnel. ,
- _ is parent of: [UR IPTRANS-2115](#) - The Mobile HMI shall be able to display the Consist Status Data of a specific Consist to the Authorized Personnel. ,
- _ is parent of: [UR IPTRANS-2116](#) - The Mobile HMI shall enable the Authorized Personnel to input the final result of a manual wagon inspection of a specific Consist. ,
- _ is parent of: [UR IPTRANS-2120](#) - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply of a specific Consist Composition. ,
- _ is parent of: [UR IPTRANS-2126](#) - The Mobile HMI shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end. ,
- _ is parent of: [UR IPTRANS-2134](#) - The Mobile HMI shall store the final result of a technical wagon inspection for Consist Composition. ,
- _ is parent of: [UR IPTRANS-2137](#) - After securing a Consist or Consist Composition against rolling away by using the Mobile HMI, the Mobile HMI shall store this action and related data. ,
- _ is parent of: [UR IPTRANS-2138](#) - After reverting securing a Consist or Consist Composition against rolling away by using the Mobile HMI, the Mobile HMI shall store this action and related data. ,
- _ is parent of: [UR IPTRANS-2139](#) - The Mobile HMI shall enable the Authorized Personnel to revert marking a specific Consist as secured by legacy braking means. ,
- _ is parent of: [UR IPTRANS-2140](#) - The Mobile HMI shall enable the Authorized Personnel to mark a specific Consist as secured by legacy braking means. ,
- _ is parent of: [UR IPTRANS-2141](#) - After marking a Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data. ,
- _ is parent of: [UR IPTRANS-2142](#) - After reverting marking a Consist or Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data. ,
- _ is parent of: [UR IPTRANS-2179](#) - The result of a manual technical wagon inspection of a specific Consist shall be available through an open interface. ,
- _ is parent of: [UR IPTRANS-2180](#) - The Mobile HMI shall enable the Authorized Personnel to send the result of a manual brake test for a specific Consist Composition or Consist to the FDFT Backend. ,
- _ is parent of: [UR IPTRANS-2325](#) - The Mobile HMI shall enable the Authorized Personnel to mark a specific Consist Composition as ready for train preparation. ,
- _ is parent of: [UR IPTRANS-2329](#) - The Mobile HMI shall enable the Authorized Personnel to check the result of a brake test for a specific Consist Composition or Consist. ,
- _ is parent of: [UR IPTRANS-2334](#) - The Mobile HMI shall enable the Authorized Personnel to check the final result of the technical wagon inspection for a specific Consist Composition. ,
- _ is parent of: [UR IPTRANS-2335](#) - If the Consist has automatic rear end signal capability, the Mobile HMI shall enable the Authorized Personnel to activate the rear end signals for a specific Consist. ,
- _ is parent of: [UR IPTRANS-2336](#) - If the Consist has automatic rear end signal capability, the Mobile HMI shall enable the Authorized Personnel to deactivate the rear end signals for a specific Consist. ,
- _ is parent of: [UR IPTRANS-2342](#) - The Mobile HMI shall enable the Authorized Personnel to report that a specific Consist Composition has arrived on a specific track. ,
- _ is parent of: [UR IPTRANS-2354](#) - The Mobile HMI shall enable the Authorized Personnel to check whether a specific Consist is secured by legacy braking means. ,
- _ is parent of: [UR IPTRANS-2365](#) - The FDFT Backend shall be able to command the Authorized Personnel to perform a task via the Mobile HMI. ,
- _ is parent of: [UR IPTRANS-2393](#) - The Mobile HMI shall enable the Authorized Personnel to activate uncoupling prevention for a specific coupling point of two coupled Consists. ,
- _ is parent of: [UR IPTRANS-2394](#) - The Mobile HMI shall enable the Authorized Personnel to deactivate uncoupling prevention for a specific coupling point of two coupled Consists. ,
- _ is parent of: [UR IPTRANS-2412](#) - The Mobile HMI shall be able set the auto-reset timer for the FDFT function Prevent Coupling at a specific Consist's end. ,

	_ is parent of: UR IPTRANS-2415 - The Mobile HMI shall be able to display the Consist Restrictions of a specific Consist to the Authorized Personnel. , _ is parent of: UR IPTRANS-2416 - The Mobile HMI shall enable the Authorized Personnel to edit the Consist Restrictions of a specific Consist. , _ is parent of: UR IPTRANS-5217 - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply on a specific end of a Consist.
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IPTRANS-1578 - Traction Unit's HMI functionality

Type	UF User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent: UF IPTRANS-1556 - HMI functionality , _ is parent of: UR IPTRANS-1631 - The leading Traction Unit shall enable the Authorized Personnel to check the Consist Status Data of a specific Consist of its Consist Composition. , _ is parent of: UR IPTRANS-1635 - The leading Traction Unit shall enable the Authorized Personnel to switch its Consist Composition to FDFT mode Shunting. , _ is parent of: UR IPTRANS-1649 - The leading Traction Unit shall enable the Authorized Personnel to remotely secure a Consist of its Consist Composition against rolling away. , _ is parent of: UR IPTRANS-1650 - The Traction Unit shall enable the Authorized Personnel to remotely check the identification, orientation, order and number of the Consists in the Consist Composition. , _ is parent of: UR IPTRANS-1666 - The Traction Unit shall enable the Authorized Personnel to remotely check if a specific Consist of its Consist Composition is secured against rolling away. , _ is parent of: UR IPTRANS-1748 - The Traction Unit shall enable the Authorized Personnel to remotely check the available braking power of a specific Consist of its Consist Composition. , _ is parent of: UR IPTRANS-1750 - The Traction Unit shall enable the Authorized Personnel to mark its Consist Composition as ready for shunting. , _ is parent of: UR IPTRANS-1800 - The leading Traction Unit shall be able to display the current status of the Power Supply of its Consist Composition to the Authorized Personnel. , _ is parent of: UR IPTRANS-2029 - The leading Traction Unit shall enable the Authorized Personnel to remotely uncouple between two Consists of its Consist Composition at Uncoupling Point. , _ is parent of: UR IPTRANS-2069 - The leading Traction Unit shall enable the Authorized Personnel to input that legacy braking means are not applied at its Consist or Consist Composition. , _ is parent of: UR IPTRANS-2070 - The leading Traction Unit shall enable the Authorized Personnel to remotely check the G/P setting of the Service Brake of a specific Consist of its Consist Composition. , _ is parent of: UR IPTRANS-2074 - The Traction Unit shall enable the Authorized Personnel to remotely check the Service Brake status of a specific Consist of its Consist Composition. , _ is parent of: UR IPTRANS-2093 - The leading Traction Unit shall enable the Authorized Personnel to remotely revert securing against rolling away of a specific Consist of its Consist Composition. , _ is parent of: UR IPTRANS-2121 - The leading Traction Unit shall enable the Authorized Personnel to deactivate the Power Supply of Consist Composition. , _ is parent of: UR IPTRANS-2123 - The leading Traction Unit shall enable the Authorized Personnel to check the state of the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. , _ is parent of: UR IPTRANS-2125 - If the Consist Composition is in FDFT mode Shunting, the leading Traction Unit shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. , _ is parent of: UR IPTRANS-2130 - The leading Traction Unit shall enable the Authorized Personnel to activate the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2178 - The leading Traction Unit shall enable the Authorized Personnel to check if a specific Consist of its Consist Composition is marked as secured against rolling away by legacy braking means. ,

_ is parent of: **UR** IPTRANS-2324 - The Traction Unit shall enable the Authorized Personnel to mark its Consist Composition as ready for train preparation. ,

_ is parent of: **UR** IPTRANS-2326 - The leading Traction Unit shall enable the Authorized Personnel to determine the coupling state of its ends. ,

_ is parent of: **UR** IPTRANS-2332 - The Traction Unit shall enable the Authorized Personnel to check the final result of the technical wagon inspection for its Consist Composition. ,

_ is parent of: **UR** IPTRANS-2339 - The Traction Unit shall enable the Authorized Personnel to mark its Consist Composition as ready for departure. ,

_ is parent of: **UR** IPTRANS-2362 - If the Consist has automatic rear end signal capability, the Traction Unit shall enable the Authorized Personnel to deactivate the rear end signals for a specific Consist. ,

_ is parent of: **UR** IPTRANS-2363 - If the Consist has automatic rear end signal capability, the Traction Unit shall enable the Authorized Personnel to activate the rear end signals for a specific Consist. ,

_ is parent of: **UR** IPTRANS-2391 - The leading Traction Unit shall enable the Authorized Personnel to activate uncoupling prevention for a specific coupling point of two coupled Consists. ,

_ is parent of: **UR** IPTRANS-2392 - The leading Traction Unit shall enable the Authorized Personnel to deactivate uncoupling prevention for a specific coupling point of two coupled Consists. ,

_ is parent of: **UR** IPTRANS-2401 - The Traction Unit shall inform the Personnel when a Consist in the Consist Composition has derailed. ,

_ is parent of: **UR** IPTRANS-2417 - The leading Traction Unit shall be able to display the Consist Restrictions of a specific Consist in the Consist Composition to the Authorized Personnel. ,

_ is parent of: **UR** IPTRANS-2418 - The Traction Unit shall enable the Authorized Personnel to edit the Consist Restrictions of a specific Consist in the Consist Composition.

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IPTRANS-1572 - Traction Unit functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1574 - Traction Unit Power Supply functionality , _ is parent of:  IPTRANS-1596 - The Traction Unit shall supply air for brake test. , _ is parent of:  IPTRANS-1651 - In case of unintentional uncoupling in Consist Composition, the leading Traction Unit shall inform the Authorized Personnel. , _ is parent of:  IPTRANS-1798 - Before uncoupling in Consist Composition is executed, the Consist Composition shall deactivate the Power Supply. , _ is parent of:  IPTRANS-2030 - The leading Traction Unit shall be able to activate the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition. , _ is parent of:  IPTRANS-2031 - The leading Traction Unit shall be able to deactivate the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition. , _ is parent of:  IPTRANS-2080 - If the Consist or Consist Composition is moving, it shall not switch between FDFT modes. , _ is parent of:  IPTRANS-2176 - The leading Traction Unit shall store the result of an Automated Brake Test. , _ is parent of:  IPTRANS-2177 - The leading Traction Unit shall be able send the result of an Automated Brake Test to FDFT Backend. , _ is parent of:  IPTRANS-2411 - The leading Traction Unit shall be able set the auto-reset timer for the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition. , _ is parent of:  IPTRANS-6725 - The leading Traction unit shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-6726 - The Mobile HMI shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist.

IPTRANS-1574 - Traction Unit Power Supply functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-1572 - Traction Unit functionality , _ is parent of:  IPTRANS-1513 - After the Consist Composition switched to FDFT mode Train Run, the leading Traction Unit shall activate the Power Supply. , _ is parent of:  IPTRANS-1636 - Before switching to FDFT mode Shunting, the Traction Unit shall deactivate the Power Supply. , _ is parent of:  IPTRANS-1798 - Before uncoupling in Consist Composition is executed, the Consist Composition shall deactivate the Power Supply. , _ is parent of:  IPTRANS-1800 - The leading Traction Unit shall be able to display the current status of the Power Supply of its Consist Composition to the Authorized Personnel. , _ is parent of:  IPTRANS-2110 - The Mobile HMI shall display the current status of the Power Supply of a Consist Composition or a specific Consist's end to the Authorized Personnel. , _ is parent of:  IPTRANS-2111 - If the Power Supply at the intended uncoupling point is active, the Consist shall not execute uncoupling. , _ is parent of:  IPTRANS-2119 - The FDFT Backend shall be able to deactivate the Power Supply of a Consist Composition. , _ is parent of:  IPTRANS-2120 - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply of a specific Consist Composition. , _ is parent of:  IPTRANS-2121 - The leading Traction Unit shall enable the Authorized Personnel to deactivate the Power Supply of Consist Composition. , _ is parent of:  IPTRANS-5214 - The FDFT Backend shall be able to deactivate the Power Supply on a specific coupling/uncoupling point. , _ is parent of:  IPTRANS-5217 - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply on a specific end of a Consist.

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IPTRANS-1580 - Technical Wagon Inspection functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1824 - The Consist shall have a standardized interface so that additional sensors can be added. , _ is parent of:  IPTRANS-1825 - The Mobile HMI shall enable the Authorized Personnel to input the intermediate result of a manual wagon inspection of a specific Consist. , _ is parent of:  IPTRANS-1826 - The Mobile HMI shall enable the Authorized Personnel to send the result of a manual technical wagon inspection to the FDFT Backend. , _ is parent of:  IPTRANS-2115 - The Mobile HMI shall be able to display the Consist Status Data of a specific Consist to the Authorized Personnel. , _ is parent of:  IPTRANS-2116 - The Mobile HMI shall enable the Authorized Personnel to input the final result of a manual wagon inspection of a specific Consist. , _ is parent of:  IPTRANS-2179 - The result of a manual technical wagon inspection of a specific Consist shall be available through an open interface. , _ is parent of:  IPTRANS-2332 - The Traction Unit shall enable the Authorized Personnel to check the final result of the technical wagon inspection for its Consist Composition. , _ is parent of:  IPTRANS-2334 - The Mobile HMI shall enable the Authorized Personnel to check the final result of the technical wagon inspection for a specific Consist Composition. , _ is parent of:  IPTRANS-2344 - The FDFT Backend shall be able to perform a technical wagon inspection for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-2345 - The FDFT Backend shall have an open interface to retrieve additional sensor information for a specific Consist from further server systems. , _ is parent of:  IPTRANS-2398 - The FDFT Backend shall have an open interface for providing results of the technical wagon inspection.

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IPTRANS-1567 - Brake functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1569 - Consist speed control functionality , _ is parent of:  IPTRANS-1571 - Secure against rolling away functionality , _ is parent of:  IPTRANS-2069 - The leading Traction Unit shall enable the Authorized Personnel to input that legacy braking means are not applied at its Consist or Consist Composition. , _ is parent of:  IPTRANS-2070 - The leading Traction Unit shall enable the Authorized Personnel to remotely check the G/P setting of the Service Brake of a specific Consist of its Consist Composition. , _ is parent of:  IPTRANS-2071 - The Mobile HMI shall be able to display the G/P setting of the service brake of a specific Consist to the Authorized Personnel. , _ is parent of:  IPTRANS-2073 - The leading Traction Unit shall know the braking status of each braking system of each Consist in the Consist Composition. , _ is parent of:  IPTRANS-2074 - The Traction Unit shall enable the Authorized Personnel to remotely check the Service Brake status of a specific Consist of its Consist Composition. , _ is parent of:  IPTRANS-2075 - The Mobile HMI shall display the state of the Service Brake of a specific Consist to the Authorized Personnel. , _ is parent of:  IPTRANS-2189 - The FDFT Backend shall be able to know the state of the Service Brake of a specific Consist.

IPTRANS-1569 - Consist speed control functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-1567 - Brake functionality , _ is parent of:  IPTRANS-1589 - If not coupled to a Traction Unit, the Consist or Consist Composition shall be able to reduce its rolling speed. , _ is parent of:  IPTRANS-2058 - If the specific Consist is in FDFT mode Shunting, the FDFT Backend shall be able to command reducing the rolling speed of a specific Consist. , _ is parent of:  IPTRANS-2162 - When rolling freely, the Consist or Consist Composition shall be able to stop itself after a given distance. , _ is parent of:  IPTRANS-2163 - When rolling freely, the FDFT Backend shall be able to control a specific Consist or Consist Composition to stop after a set distance.

IPTRANS-1571 - Secure against rolling away functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-1567 - Brake functionality , _ is parent of:  IPTRANS-1649 - The leading Traction Unit shall enable the Authorized Personnel to remotely secure a Consist of its Consist Composition against rolling away. , _ is parent of:  IPTRANS-1666 - The Traction Unit shall enable the Authorized Personnel to remotely check if a specific Consist of its Consist Composition is secured against rolling away. , _ is parent of:  IPTRANS-1736 - The FDFT Backend shall be able to know if a specific Consist is secured against rolling away. , _ is parent of:  IPTRANS-1737 - The Mobile HMI shall enable the Authorized Personnel to confirm that braking means for a specific Consist are released. , _ is parent of:  IPTRANS-2077 - The Mobile HMI shall be able to display if a specific Consist is secured against rolling away to the Authorized Personnel. , _ is parent of:  IPTRANS-2093 - The leading Traction Unit shall enable the Authorized Personnel to remotely revert securing against rolling away of a specific Consist of its Consist Composition. , _ is parent of:  IPTRANS-2096 - Only if Consist is at a standstill, the Consist shall be able to secure itself against rolling away. , _ is parent of:  IPTRANS-2104 - The FDFT Backend shall be able to remotely secure a specific Consist against rolling away. , _ is parent of:  IPTRANS-2105 - The FDFT Backend shall be able to remotely revert securing a specific Consist against rolling away. , _ is parent of:  IPTRANS-2106 - The Mobile HMI shall enable the Authorized Personnel to remotely secure a specific Consist against rolling away. , _ is parent of:  IPTRANS-2107 - The Mobile HMI shall enable the Authorized Personnel to remotely revert securing a specific Consist against rolling away. , _ is parent of:  IPTRANS-2139 - The Mobile HMI shall enable the Authorized Personnel to revert marking a specific Consist as secured by legacy braking means. , _ is parent of:  IPTRANS-2140 - The Mobile HMI shall enable the Authorized Personnel to mark a specific Consist as secured by legacy braking means. , _ is parent of:  IPTRANS-2141 - After marking a Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data. , _ is parent of:  IPTRANS-2142 - After reverting marking a Consist or Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data. , _ is parent of:  IPTRANS-2178 - The leading Traction Unit shall enable the Authorized Personnel to check if a specific Consist of its Consist Composition is marked as secured against rolling away by legacy braking means. , _ is parent of:  IPTRANS-2354 - The Mobile HMI shall enable the Authorized Personnel to check whether a specific Consist is secured by legacy braking means. , _ is parent of:  IPTRANS-2378 - The Consist shall enable the Personnel to visually check whether the Consist is secured by itself against rolling away without stepping into the movement area of the Consist. , _ is parent of:  IPTRANS-2382 - The Consist shall enable the Personnel to visually check whether the Consist is not secured by itself against rolling away without stepping into the movement area of the Consist. , _ is parent of:  IPTRANS-2383 - If the Consist secured itself against rolling away, the Personnel shall be able to revert securing against rolling away of the Consist manually. , _ is parent of:  IPTRANS-2384 - The Personnel shall be able to command the Consist to secure itself against rolling away manually.

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IPTRANS-1565 - Brake Test

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , _ is parent of:  IPTRANS-1595 - The Stationary Device shall supply air for the Consists or Consist Composition. , _ is parent of:  IPTRANS-1596 - The Traction Unit shall supply air for brake test. , _ is parent of:  IPTRANS-1662 - If connected to Consist or Consist Composition, the Stationary Device shall allow Authorized Personnel to measure the air pipe pressure. , _ is parent of:  IPTRANS-1740 - The FDFT Backend shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-1742 - The FDFT Backend shall provide the Brake Test Relevant Data of the connected Consist Composition to the Stationary Device. , _ is parent of:  IPTRANS-1782 - The Mobile HMI shall enable the Authorized Personnel to input the result of a manual brake test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-2071 - The Mobile HMI shall be able to display the G/P setting of the service brake of a specific Consist to the Authorized Personnel. , _ is parent of:  IPTRANS-2172 - The Stationary Device shall be able to perform an Automated Brake Test of connected Consist Composition or Consist. , _ is parent of:  IPTRANS-2173 - The Stationary Device shall be able to determine the G/P setting of the Service Brake of a specific Consist of connected Consist Composition. , _ is parent of:  IPTRANS-2174 - The Stationary Device shall be able send the result of an Automated Brake Test to FDFT Backend. , _ is parent of:  IPTRANS-2175 - The Stationary Device shall store the result of an Automated Brake Test. , _ is parent of:  IPTRANS-2176 - The leading Traction Unit shall store the result of an Automated Brake Test. , _ is parent of:  IPTRANS-2177 - The leading Traction Unit shall be able send the result of an Automated Brake Test to FDFT Backend. , _ is parent of:  IPTRANS-2180 - The Mobile HMI shall enable the Authorized Personnel to send the result of a manual brake test for a specific Consist Composition or Consist to the FDFT Backend. , _ is parent of:  IPTRANS-2329 - The Mobile HMI shall enable the Authorized Personnel to check the result of a brake test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-6725 - The leading Traction unit shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-6726 - The Mobile HMI shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist.

IPTRANS-1741 - Braking power

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1748 - The Traction Unit shall enable the Authorized Personnel to remotely check the available braking power of a specific Consist of its Consist Composition. , _ is parent of:  IPTRANS-1794 - The FDFT Backend shall be able to know the available braking power of a specific Consist. , _ is parent of:  IPTRANS-2078 - The Mobile HMI shall be able to display the available braking power of a specific Consist to the Authorized Personnel.

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IPTRANS-1563 - Legal traceability functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-2134 - The Mobile HMI shall store the final result of a technical wagon inspection for Consist Composition. , _ is parent of:  IPTRANS-2135 - The FDFT Backend shall store the final result of a technical wagon inspection for a Consist Composition. , _ is parent of:  IPTRANS-2136 - After securing a Consist or Consist Composition against rolling away, the FDFT Backend shall store this action and related data. , _ is parent of:  IPTRANS-2137 - After securing a Consist or Consist Composition against rolling away by using the Mobile HMI, the Mobile HMI shall store this action and related data. , _ is parent of:  IPTRANS-2138 - After reverting securing a Consist or Consist Composition against rolling away by using the Mobile HMI, the Mobile HMI shall store this action and related data. , _ is parent of:  IPTRANS-2141 - After marking a Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data. , _ is parent of:  IPTRANS-2142 - After reverting marking a Consist or Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data. , _ is parent of:  IPTRANS-2175 - The Stationary Device shall store the result of an Automated Brake Test. , _ is parent of:  IPTRANS-2176 - The leading Traction Unit shall store the result of an Automated Brake Test. , _ is parent of:  IPTRANS-2331 - The FDFT Backend shall store the result of a brake calculation for a Consist Composition. , _ is parent of:  IPTRANS-2353 - After reverting securing a Consist Composition or a Consist against rolling away, the FDFT Backend shall store this action and related data. , _ is parent of:  IPTRANS-6725 - The leading Traction unit shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-6726 - The Mobile HMI shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist.

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IPTRANS-1564 - Stationary Device functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1565 - Brake Test , _ is parent of:  IPTRANS-1595 - The Stationary Device shall supply air for the Consists or Consist Composition. , _ is parent of:  IPTRANS-1597 - The Stationary Device shall be able to connect automatically to a Consist or Consist Composition at standstill. , _ is parent of:  IPTRANS-1662 - If connected to Consist or Consist Composition, the Stationary Device shall allow Authorized Personnel to measure the air pipe pressure. , _ is parent of:  IPTRANS-1742 - The FDFT Backend shall provide the Brake Test Relevant Data of the connected Consist Composition to the Stationary Device. , _ is parent of:  IPTRANS-1754 - The Stationary Device shall be able to check its correct functioning. , _ is parent of:  IPTRANS-1796 - The Stationary Device shall be able to automatically disconnect from the connected Consist or Consist Composition. , _ is parent of:  IPTRANS-2119 - The FDFT Backend shall be able to deactivate the Power Supply of a Consist Composition. , _ is parent of:  IPTRANS-2172 - The Stationary Device shall be able to perform an Automated Brake Test of connected Consist Composition or Consist. , _ is parent of:  IPTRANS-2173 - The Stationary Device shall be able to determine the G/P setting of the Service Brake of a specific Consist of connected Consist Composition. , _ is parent of:  IPTRANS-2174 - The Stationary Device shall be able send the result of an Automated Brake Test to FDFT Backend. , _ is parent of:  IPTRANS-2175 - The Stationary Device shall store the result of an Automated Brake Test. , _ is parent of:  IPTRANS-2328 - The Personnel shall be able to manually connect the Stationary Device to a Consist or Consist Composition at standstill. , _ is parent of:  IPTRANS-2337 - The Personnel shall be able to manually disconnect the Stationary Device from a Consist Composition or Consist at standstill. , _ is parent of:  IPTRANS-5214 - The FDFT Backend shall be able to deactivate the Power Supply on a specific coupling/uncoupling point.

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IPTRANS-1558 - FDFT Backend functionality

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-1559 - FDFT Backend external interfaces , _ is parent of:  IPTRANS-1560 - FDFT Backend internal interfaces , _ is parent of:  IPTRANS-1594 - The FDFT Backend shall know that a Consist or Consist Composition is in state ready for train preparation. , _ is parent of:  IPTRANS-2135 - The FDFT Backend shall store the final result of a technical wagon inspection for a Consist Composition. , _ is parent of:  IPTRANS-2136 - After securing a Consist or Consist Composition against rolling away, the FDFT Backend shall store this action and related data. , _ is parent of:  IPTRANS-2138 - After reverting securing a Consist or Consist Composition against rolling away by using the Mobile HMI, the Mobile HMI shall store this action and related data. , _ is parent of:  IPTRANS-2331 - The FDFT Backend shall store the result of a brake calculation for a Consist Composition. , _ is parent of:  IPTRANS-2344 - The FDFT Backend shall be able to perform a technical wagon inspection for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-2353 - After reverting securing a Consist Composition or a Consist against rolling away, the FDFT Backend shall store this action and related data. , _ is parent of:  IPTRANS-2366 - The FDFT Backend shall be able to command securing a specific Consist Composition or Consist against rolling away by infrastructure means.

IPTRANS-1560 - FDFT Backend internal interfaces

Type	 User-Feature
Functionality	 Functional Feature
	has parent:  IPTRANS-1558 - FDFT Backend functionality , _ is parent of:  IPTRANS-1509 - The FDFT Backend shall be able to switch a specific Consist Composition or Consist to FDFT mode Shunting. , _ is parent of:  IPTRANS-1628 - The FDFT Backend shall know the status of FDFT function Prevent Coupling of a specific Consist's end. , _ is parent of:  IPTRANS-1641 - The leading Backend shall know the state of the FDFT mode of the Consist Composition immediately after the FDFT mode changed. , _ is parent of:  IPTRANS-1643 - The FDFT Backend shall know the FDFT mode of a specific Consist Composition. , _ is parent of:  IPTRANS-1736 - The FDFT Backend shall be able to know if a specific Consist is secured against rolling away. , _ is parent of:  IPTRANS-1740 - The FDFT Backend shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist. , _ is parent of:  IPTRANS-1742 - The FDFT Backend shall provide the Brake Test Relevant Data of the connected Consist Composition to the Stationary Device. , _ is parent of:  IPTRANS-1794 - The FDFT Backend shall be able to know the available braking power of a specific Consist. , _ is parent of:  IPTRANS-2020 - The FDFT Backend shall be able to initiate the switch of a specific Consist Composition to FDFT mode Train Run. , _ is parent of:  IPTRANS-2058 - If the specific Consist is in FDFT mode Shunting, the FDFT Backend shall be able to command reducing the rolling speed of a specific Consist. ,

Linked
Work
Items

_ is parent of: [UR](#)IPTRANS-2104 - The FDFT Backend shall be able to remotely secure a specific Consist against rolling away. ,

_ is parent of: [UR](#)IPTRANS-2105 - The FDFT Backend shall be able to remotely revert securing a specific Consist against rolling away. ,

_ is parent of: [UR](#)IPTRANS-2117 - The FDFT Backend shall know the Consist Status Data of each Consist. ,

_ is parent of: [UR](#)IPTRANS-2119 - The FDFT Backend shall be able to deactivate the Power Supply of a Consist Composition. ,

_ is parent of: [UR](#)IPTRANS-2124 - If the FDFT function Prevent Coupling is active and its Consist Composition is in FDFT mode Shunting, the FDFT Backend shall be able to deactivate the FDFT function Prevent Coupling for a specific Consist's end. ,

_ is parent of: [UR](#)IPTRANS-2163 - When rolling freely, the FDFT Backend shall be able to control a specific Consist or Consist Composition to stop after a set distance. ,

_ is parent of: [UR](#)IPTRANS-2165 - The FDFT Backend shall know the Consist Data of each Consist. ,

_ is parent of: [UR](#)IPTRANS-2174 - The Stationary Device shall be able send the result of an Automated Brake Test to FDFT Backend. ,

_ is parent of: [UR](#)IPTRANS-2177 - The leading Traction Unit shall be able send the result of an Automated Brake Test to FDFT Backend. ,

_ is parent of: [UR](#)IPTRANS-2183 - The FDFT Backend shall know the orientation, order and number of Consists of a specific Consists Composition. ,

_ is parent of: [UR](#)IPTRANS-2189 - The FDFT Backend shall be able to know the state of the Service Brake of a specific Consist. ,

_ is parent of: [UR](#)IPTRANS-2327 - The FDFT Backend shall know the coupling state of the ends of a specific Consist. ,

_ is parent of: [UR](#)IPTRANS-2340 - The FDFT Backend shall know that a Consist Composition or Consist is ready for departure. ,

_ is parent of: [UR](#)IPTRANS-2342 - The Mobile HMI shall enable the Authorized Personnel to report that a specific Consist Composition has arrived on a specific track. ,

_ is parent of: [UR](#)IPTRANS-2346 - The FDFT Backend shall be able to uncouple two Consists of a specific Consists Composition at Uncoupling Point. ,

_ is parent of: [UR](#)IPTRANS-2348 - The FDFT Backend shall know whether a specific Consist Composition has a leading Consist. ,

_ is parent of: [UR](#)IPTRANS-2365 - The FDFT Backend shall be able to command the Authorized Personnel to perform a task via the Mobile HMI. ,

_ is parent of: [UR](#)IPTRANS-2419 - The FDFT Backend shall know the Consist Restrictions of a specific Consist. ,

_ is parent of: [UR](#)IPTRANS-2420 - The FDFT Backend shall be able to edit the Consist Restrictions of a specific Consist. ,

_ is parent of: [UR](#)IPTRANS-5214 - The FDFT Backend shall be able to deactivate the Power Supply on a specific coupling/uncoupling point. ,

_ is parent of: [UR](#)IPTRANS-6727 - The Consist Network shall offer future extensibility, so that additional applications can be connected for use of communications and power at any later point in time.

IPTRANS-1559 - FDFT Backend external interfaces

Type	 User-Feature
Functionality	 Functional Feature
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , _ is parent of:  IPTRANS-1747 - The FDFT Backend shall be able to inform the FDFT Yard that a Composition is marked as ready for shunting. , _ is parent of:  IPTRANS-2056 - The FDFT Backend shall have an open interface to receive the Dynamic Consist Data of a specific Consist from Legacy Systems. , _ is parent of:  IPTRANS-2330 - The FDFT Backend shall have an open interface to receive track properties for the route of a specific Consist Composition from Legacy Systems. , _ is parent of:  IPTRANS-2338 - The FDFT Backend shall have an open interface to be informed about a specific Consist Composition or Consist as ready for departure. , _ is parent of:  IPTRANS-2341 - The FDFT Backend shall have an open interface to be informed about an arrival of a specific Consist Composition at a specific track. , _ is parent of:  IPTRANS-2343 - The FDFT Backend shall have an open interface to check whether a specific Consist Composition or Consist can be secured against rolling away by Legacy Systems. , _ is parent of:  IPTRANS-2345 - The FDFT Backend shall have an open interface to retrieve additional sensor information for a specific Consist from further server systems. , _ is parent of:  IPTRANS-2367 - The FDFT Backend shall have a standardized interface to check whether a specific Consist Composition or Consist can be slowed down by Legacy Systems. , _ is parent of:  IPTRANS-2398 - The FDFT Backend shall have an open interface for providing results of the technical wagon inspection. , _ is parent of:  IPTRANS-2400 - The FDFT Backend shall have an open interface for ATO/ASO functionality to issue movement commands for Consist Compositions. , _ is parent of:  IPTRANS-2421 - The FDFT Backend shall have a standardized interface to exchange Consist Restrictions for a specific Consist. , _ is parent of:  IPTRANS-2428 - The FDFT Backend shall have a standardized interface to exchange Consist Data of each Consist.

9.1.3 Derived Non-Functional User-Features

IPTRANS-2452 - Electromagnetic compatibility

Type	 User-Feature
Functionality	 Non-Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-2453 - The requirements for electromagnetic emissions shall comply with the specifications of the authorities in the countries of approval for the FDFT System components. , _ is parent of:  IPTRANS-2454 - The electrical components shall not interfere with railway signalling systems or telecommunications systems

IPTRANS-2460 - Environmental influences

Type	 User-Feature
Functionality	 Non-Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-2464 - Loading influences

IPTRANS-2464 - Loading influences

Type	 User-Feature
Functionality	 Non-Functional Feature
Linked Work Items	has parent:  IPTRANS-2460 - Environmental influences

IPTRANS-2455 - Ergonomic handling

Type	 User-Feature
Functionality	 Non-Functional Feature
Linked Work Items	has parent:  IPTRANS-2463 - Personnel safety

IPTRANS-2463 - Personnel safety

Type	 User-Feature
Functionality	 Non-Functional Feature
Linked Work Items	_ is parent of:  IPTRANS-2455 - Ergonomic handling , _ is parent of:  IPTRANS-2459 - The Personnel shall be able to isolate the battery power supply of a Consist manually.

IPTRANS-2462 - Maintainability

Type	 User-Feature
Functionality	 Non-Functional Feature
Linked Work Items	

IPTRANS-2461 - Noise emissions

Type	 User-Feature
Functionality	 Non-Functional Feature
Linked Work Items	

9.1.4 Derived Mixed-Functional User-Features

IPTRANS-2456 - Emergency consist handling

Type	 User-Feature
Functionality	 Non-Functional Feature,  Functional Feature
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , _ is parent of:  IPTRANS-2457 - The DAC coupler head shall be easy to dismantle whilst on track using standard tools , _ is parent of:  IPTRANS-2458 - The DAC coupler head air interface shall allow connection of an auxiliary air pipe. , _ is parent of:  IPTRANS-2459 - The Personnel shall be able to isolate the battery power supply of a Consist manually.

9.2 General User-Requirements

9.2.1 Cluster Definition

The System in General describes everything, that effects the whole FDFT system. This can include requirements effecting multiple components or requirements regarding design choices or outer circumstances effecting the FDFT system, like the gauge width or the use of UIC 530-1. More examples would be the overall height, outer limits, environmental conditions, cabling or pipework.

9.2.2 Functional Requirements

IPTRANS-2142 - After reverting marking a Consist or Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data.

Type	 User-Requirement
Rational	This information has to be passed on to Yard Management System.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP22
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1563 - Legal traceability functionality , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4413 - TP22 - Secure Wagon (Set) Against Rolling Away

IPTRANS-1662 - If connected to Consist or Consist Composition, the Stationary Device shall allow Authorized Personnel to measure the air pipe pressure.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1589 - If not coupled to a Traction Unit, the Consist or Consist Composition shall be able to reduce its rolling speed.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	Chapter 6.1: Terms
Linked Work Items	has parent:  IPTRANS-1569 - Consist speed control functionality

IPTRANS-2335 - If the Consist has automatic rear end signal capability, the Mobile HMI shall enable the Authorized Personnel to activate the rear end signals for a specific Consist.

Type	 User-Requirement
Rational	For Target State, rear end signals should not be necessary as train integrity monitoring is implemented in a Consist Composition. This requirement is needed for transitioning or if mandatory by national regulations.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03/TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2336 - If the Consist has automatic rear end signal capability, the Mobile HMI shall enable the Authorized Personnel to deactivate the rear end signals for a specific Consist.

Type	 User-Requirement
Rational	For Target State, rear end signals should not be necessary as train integrity monitoring is implemented in a Consist Composition. This requirement is needed for transitioning or if mandatory by national regulations.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03/TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2363 - If the Consist has automatic rear end signal capability, the Traction Unit shall enable the Authorized Personnel to activate the rear end signals for a specific Consist.

Type	 User-Requirement
Rational	For Target State, rear end signals should not be necessary as train integrity monitoring is implemented in a Consist Composition. This requirement is needed for transitioning or if mandatory by national regulations.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03/TP11
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2362 - If the Consist has automatic rear end signal capability, the Traction Unit shall enable the Authorized Personnel to deactivate the rear end signals for a specific Consist.

Type	 User-Requirement
Rational	For Target State, rear end signals should not be necessary as train integrity monitoring is implemented in a Consist Composition. This requirement is needed for transitioning or if mandatory by national regulations.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03/TP11
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2364 - The Consist Composition shall implement an open interface to exchange data between Consists of Consist Composition.

Type	 User-Requirement
Rational	The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications (e.g. rear view detection, derailment detection).
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2348 - The FDFT Backend shall know whether a specific Consist Composition has a leading Consist.

Type	 User-Requirement
Rational	FDFT Backend shall know if a leading Consist is available to perform further actions with/without leading Consist available.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-1594 - The FDFT Backend shall know that a Consist or Consist Composition is in state ready for train preparation.

Type	 User-Requirement
Rational	Single Consist can start some train preparation actions beforehand.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1509 - The FDFT Backend shall be able to switch a specific Consist Composition or Consist to FDFT mode Shunting.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1576 - FDFT mode Shunting , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-2345 - The FDFT Backend shall have an open interface to retrieve additional sensor information for a specific Consist from further server systems.

Type	 User-Requirement
Rational	Needed to get data from e.g. Video gates, hot-axle-detection, ... for e.g. a technical wagon inspection. Important for future applications.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2089 - The leading Consist shall know order, orientation and number of coupled Consists in Consist Composition immediately after changes occur.

Type	 User-Requirement
Rational	Changes of number, order and orientation of coupled Consists.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP32
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection

IPTRANS-1629 - The Mobile HMI shall be able to display the status of FDFT function Prevent Coupling of a specific Consist' end to the Authorized Personnel.

Type	 User-Requirement
Rational	Needed for Transformational State for Personnel to check that FDFT function Prevent Coupling is deactivated.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2115 - The Mobile HMI shall be able to display the Consist Status Data of a specific Consist to the Authorized Personnel.

Type	 User-Requirement
Rational	Consist Status Data is basis for decision whether Consist is allowed to run or not.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2328 - The Personnel shall be able to manually connect the Stationary Device to a Consist or Consist Composition at standstill.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2337 - The Personnel shall be able to manually disconnect the Stationary Device from a Consist Composition or Consist at standstill.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1796 - The Stationary Device shall be able to automatically disconnect from the connected Consist or Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1754 - The Stationary Device shall be able to check its correct functioning.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P09
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-1597 - The Stationary Device shall be able to connect automatically to a Consist or Consist Composition at standstill.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1595 - The Stationary Device shall supply air for the Consists or Consist Composition.

Type	 User-Requirement
Rational	E.g. for the Brake Test.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1644 - The Authorized Personnel in the Traction Unit shall know the FDFT mode of its Consist Composition immediately after changes occur.

Type	 User-Requirement
Rational	The Authorized Personnel shall be able to check the FDFT mode of Consist in Consist Composition to verify FDFT mode change was successful.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1507 - FDFT mode functionality , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-1596 - The Traction Unit shall supply air for brake test.

Type	 User-Requirement
Rational	Stationary Devices can be used to accelerate overall process as waiting for Traction Unit is not needed. The usage of Stationary Devices does not bind Traction Units for preparation activities.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1565 - Brake Test , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1783 - The Yard Legacy system shall know, if the Consist or Consist Composition is secured against rolling away after it has been secured.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP05
Linked Work Items	is derived from:  IPTRANS-4404 - TP05 - Hump Shunting

IPTRANS-2162 - When rolling freely, the Consist or Consist Composition shall be able to stop itself after a given distance.

Type	 User-Requirement
Rational	Fly shunting, hump shunting: Consist or Consist Composition brakes itself to a standstill as required by Yard.
Origin	Operational Procedures D2.1 V1.0
Origin ID	Chapter 6.1: Terms
Linked Work Items	has parent:  IPTRANS-1569 - Consist speed control functionality

IPTRANS-2163 - When rolling freely, the FDFT Backend shall be able to control a specific Consist or Consist Composition to stop after a set distance.

Type	 User-Requirement
Rational	Fly shunting, hump shunting: Consist or Consist Composition brakes itself to a standstill as required by FDFT Yard.
Origin	Operational Procedures D2.1 V1.0
Origin ID	Chapter 6.1: Terms
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1569 - Consist speed control functionality

9.2.3 Non-functional Requirements

IPTRANS-2458 - The DAC coupler head air interface shall allow connection of an auxiliary air pipe.

Type	 User-Requirement
Rational	In case of an emergency, an auxiliary train without DAC coupling functionality shall be able to release the brakes of a Consist or Consist Composition.
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-2456 - Emergency consist handling

IPTRANS-2454 - The electrical components shall not interfere with railway signalling systems or telecommunications systems

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-2452 - Electromagnetic compatibility

IPTRANS-2453 - The requirements for electromagnetic emissions shall comply with the specifications of the authorities in the countries of approval for the FDFT System components.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-2452 - Electromagnetic compatibility

9.3 User-Requirements for the DAC System

9.3.1 Cluster Definition

The DAC System includes everything directly in contact with the DAC. This includes the mechanical coupler with the draw gear as well as the electrical coupler and the pneumatics. Additionally migration related requirements that affect the DAC System fall in this definition, e.g. the DAC-Ready state. Another example would be sensoric in relation to the couple functions.

9.3.2 Functional Requirements

IPTRANS-2086 - Before its Consist Composition switches to FDFT mode Train Run, the Consist shall deactivate the FDFT function Prevent Coupling for its ends of Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P31
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1577 - FDFT mode Train Run , is derived from:  IPTRANS-4418 - TP31 - Switch to FDFT mode Train Run

IPTRANS-1514 - Before electrical uncoupling is executed, the Consist shall initiate the FDFT function Prevent Coupling at its end of the Uncoupling Point.

Type	 User-Requirement
Rational	Needed to prevent recoupling due to relative movement between consists (e.g. spring tension). FDFT function Prevent Coupling is technically activated after the uncoupling.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P20
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , is derived from:  IPTRANS-4411 - TP20 - Uncouple , _linked test case:  IPTRANS-2371 - Prevent to recouple test 1(x)

IPTRANS-1515 - If in FDFT mode Train Run, the Consist shall not execute uncoupling.

Type	 User-Requirement
Rational	Execute uncoupling does not prohibit emergency uncoupling.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P31
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1577 - FDFT mode Train Run , is derived from:  IPTRANS-4418 - TP31 - Switch to FDFT mode Train Run

IPTRANS-1518 - If its Consist Composition is in FDFT mode Train Run, the Consist shall not activate FDFT function Prevent Coupling.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P31
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1577 - FDFT mode Train Run , is derived from:  IPTRANS-4418 - TP31 - Switch to FDFT mode Train Run

IPTRANS-2125 - If the Consist Composition is in FDFT mode Shunting, the leading Traction Unit shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition.

Type	 User-Requirement
Rational	The two uncoupled ends of a Consist Composition should be able to be activated independently of the uncoupling process and the FDFT function Prevent Coupling should be activated or deactivated. For example: Prevent unintentional coupling of further Consists to the Consist Composition.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2410 - If the Consist is able to actuate FDFT function Prevent Coupling automatically and the auto-reset timer for FDFT function Prevent Coupling was set, the Consist shall deactivate the FDFT function Prevent Coupling automatically after the auto-reset timer expires.

Type	 User-Requirement
Rational	Time-based auto reset of FDFT function Prevent Coupling.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2413 - If the Consist is not able to deactivate the FDFT function Prevent Coupling automatically, the Consist shall enable the infrastructure to deactivate the FDFT function Prevent Coupling at a specific Consist's end by manual interaction when the Consists moves over a track device.

Type	 User-Requirement
Rational	DAC4 manual reset of prevent coupling. No power on consist available.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2124 - If the FDFT function Prevent Coupling is active and its Consist Composition is in FDFT mode Shunting, the FDFT Backend shall be able to deactivate the FDFT function Prevent Coupling for a specific Consist's end.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-1547 - If the FDFT function Prevent Coupling is active for a Consist's end, the Consist shall prevent coupling for this end.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	Chapter 6.1: Terms
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling

IPTRANS-2390 - If uncoupling prevention is active on the uncoupling point, the two coupled Consists shall prevent execution of uncoupling.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality

IPTRANS-1651 - In case of unintentional uncoupling in Consist Composition, the leading Traction Unit shall inform the Authorized Personnel.

Type	 User-Requirement
Rational	In case of unintentional uncoupling (uncoupling not activated by Personnel or FDFT Backend), the Traction Unit shall inform personnel.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP32
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection

IPTRANS-2181 - Personnel shall be able to uncouple two coupled Consists by pure manual interaction.

Type	 User-Requirement
Rational	DAC "uncoupling lever", no electrical power needed.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-1532 - The leading Consist shall be able to activate the FDFT function Prevent Coupling on one uncoupled Consist end of its Consist Composition independently.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality

IPTRANS-2112 - The Consist shall enable Personnel to execute uncoupling by manual interaction at the Consist.

Type	 User-Requirement
Rational	DAC manual eg. "push button" and actuator solution
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2408 - The Consist shall enable Personnel to activate the FDFT function Prevent Coupling at a specific Consist's end manually.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2427 - The Consist shall enable the Personnel to visually check whether it is ready to couple at a Consist's end without stepping into movement area.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-2374 - Consist status indication functionality

IPTRANS-2426 - The Consist shall enable the Personnel to visually check whether it is successfully coupled to the other Consist without stepping into movement area.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-2374 - Consist status indication functionality

IPTRANS-2407 - The Consist shall enable the Personnel to visually check whether the status of FDFT function Prevent Coupling is active for a Consist's end without stepping into movement area.

Type	 User-Requirement
Rational	Needed for personnel to see, if they need to revert prevent coupling manually.
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-2374 - Consist status indication functionality

IPTRANS-2327 - The FDFT Backend shall know the coupling state of the ends of a specific Consist.

Type	 User-Requirement
Rational	Valid for each consist that is in use. For any Consist, for each coupler, it shall be possible to identify the status (coupled, uncoupled, ...) It should be able for all situations (coupled to TU, coupled in train, stand-alone,...) Storage in FDFT Backend shall be possible as needed.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP3/TP21
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2346 - The FDFT Backend shall be able to uncouple two Consists of a specific Consists Composition at Uncoupling Point.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4411 - TP20 - Uncouple , _ is parent of:  IPTRANS-293 - Concept 8: Trigger decoupling command

IPTRANS-2411 - The leading Traction Unit shall be able set the auto-reset timer for the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2030 - The leading Traction Unit shall be able to activate the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2031 - The leading Traction Unit shall be able to deactivate the FDFT function Prevent Coupling at a specific Consist's end of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2128 - The leading Traction Unit shall know the status of FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2130 - The leading Traction Unit shall enable the Authorized Personnel to activate the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	General assumption
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality

IPTRANS-2123 - The leading Traction Unit shall enable the Authorized Personnel to check the state of the FDFT function Prevent Coupling on a specific Consist's end of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2029 - The leading Traction Unit shall enable the Authorized Personnel to remotely uncouple between two Consists of its Consist Composition at Uncoupling Point.

Type	 User-Requirement
Rational	Only leading Consist shall be able to initiate uncoupling by its HMI.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2126 - The Mobile HMI shall enable the Authorized Personnel to deactivate the FDFT function Prevent Coupling on a specific Consist's end.

Type	 User-Requirement
Rational	The two uncoupled ends of a Consist Composition should be able to be activated independently of the uncoupling process and the FDFT function Prevent Coupling should be activated or deactivated. For example: Prevent unintentional coupling of further Consists to the Consist Composition.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2028 - The Mobile HMI shall enable the Authorized Personnel to remotely uncouple two Consists of a specific Consist Composition at Uncoupling Point.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple , _ is parent of:  IPTRANS-160 - Concept 2: Decoupling command

IPTRANS-2139 - The Mobile HMI shall enable the Authorized Personnel to revert marking a specific Consist as secured by legacy braking means.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP23
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4414 - TP23 - Remove, Release Braking Means

IPTRANS-2326 - The leading Traction Unit shall enable the Authorized Personnel to determine the coupling state of its ends.

Type	 User-Requirement
Rational	Needed to check if Traction Unit is coupled to other Consists or not.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP3/TP21
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2404 - The leading Traction Unit's HMI shall inform the Authorized Personnel when a sensor reading of a coupled Consist Composition hits a predefined value.

Type	 User-Requirement
Rational	Today's and future sensor data shall be used to provide early warning (i.e. safety relevant) to Authorized Personnel for immediate actions. Examples are sensor data on hot boxes, derailment, open doors, overheated brakes.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P32
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection

IPTRANS-1552 - Two DAC coupler heads between Consists shall form a mechanical connection as result of coupling.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2386 - If the Consist is equipped with a controllable valve, the Personnel shall be able to visually determine the state of the Consist's controllable valve without stepping into the movement area of the Consist.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-2374 - Consist status indication functionality

IPTRANS-2387 - If the Consist is equipped with a draft gear, the Personnel shall be able to visually determine whether the Consist's draft gear was overused and an irreversible deformation has occurred.

Type	 User-Requirement
Rational	Over usage has to be identified as easily as possible in the field without the need of specific equipment, infrastructure or workshop.
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-2374 - Consist status indication functionality

IPTRANS-2393 - The Mobile HMI shall enable the Authorized Personnel to activate uncoupling prevention for a specific coupling point of two coupled Consists.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1557 - Mobile HMI functionality

IPTRANS-2394 - The Mobile HMI shall enable the Authorized Personnel to deactivate uncoupling prevention for a specific coupling point of two coupled Consists.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1557 - Mobile HMI functionality

IPTRANS-2391 - The leading Traction Unit shall enable the Authorized Personnel to activate uncoupling prevention for a specific coupling point of two coupled Consists.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality

IPTRANS-2392 - The leading Traction Unit shall enable the Authorized Personnel to deactivate uncoupling prevention for a specific coupling point of two coupled Consists.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality

9.4 User-Requirements for the Power System

9.4.1 Cluster Definition

The Power System describes everything related to the power distribution. This includes the overall power supply from the traction unit or an external power supply as well the battery, infrastructure and the safety requirements.

9.4.2 Functional Requirements

IPTRANS-1513 - After the Consist Composition switched to FDFT mode Train Run, the leading Traction Unit shall activate the Power Supply.

Type	 User-Requirement
Rational	Related to the power supply that occur via the e-coupler.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP31
Linked Work Items	has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , has parent:  IPTRANS-1577 - FDFT mode Train Run , is derived from:  IPTRANS-4418 - TP31 - Switch to FDFT mode Train Run

IPTRANS-1636 - Before switching to FDFT mode Shunting, the Traction Unit shall deactivate the Power Supply.

Type	 User-Requirement
Rational	To prevent contact with hazardous voltages for Personnel at DAC.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , has parent:  IPTRANS-1576 - FDFT mode Shunting , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-1798 - Before uncoupling in Consist Composition is executed, the Consist Composition shall deactivate the Power Supply.

Type	 User-Requirement
Rational	If power supply is activated during uncoupling this could result in harmful electric arc.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P20
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1572 - Traction Unit functionality , has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2121 - The leading Traction Unit shall enable the Authorized Personnel to deactivate the Power Supply of Consist Composition.

Type	 User-Requirement
Rational	In case more than one Traction Unit is part of the Consist Composition only the leading Traction Unit shall be able to activate/deactivate the Power Supply.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2111 - If the Power Supply at the intended uncoupling point is active, the Consist shall not execute uncoupling.

Type	 User-Requirement
Rational	See Power Supply Definition in Glossary
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1505 - Uncoupling functionality , has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2119 - The FDFT Backend shall be able to deactivate the Power Supply of a Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , is derived from:  IPTRANS-4412 - TP21 - Couple , _ is parent of:  IPTRANS-290 - Concept 8: Deactivate electric power supply

IPTRANS-5214 - The FDFT Backend shall be able to deactivate the Power Supply on a specific coupling/uncoupling point.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2110 - The Mobile HMI shall display the current status of the Power Supply of a Consist Composition or a specific Consist's end to the Authorized Personnel.

Type	 User-Requirement
Rational	Authorized Personnel must be able to check if power is on if in transformational state or required by operator rules.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple , _ is parent of:  IPTRANS-102 - Concept 2: Deactivate electric power supply

IPTRANS-2120 - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply of a specific Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , is derived from:  IPTRANS-4412 - TP21 - Couple , _ is parent of:  IPTRANS-103 - Concept 2: Deactivate electric power supply , _ is parent of:  IPTRANS-157 - Concept 2: Deactivate electric power supply

IPTRANS-5217 - The Mobile HMI shall enable the Authorized Personnel to deactivate the Power Supply on a specific end of a Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21
Linked Work Items	has parent:  IPTRANS-1504 - Coupling functionality , has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2385 - The Personnel shall be able to visually determine the current state of charge of the Consist's battery without stepping into the movement area of the Consist.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-2374 - Consist status indication functionality

9.4.3 Non-functional Requirements

IPTRANS-2459 - The Personnel shall be able to isolate the battery power supply of a Consist manually.

Type	UR User-Requirement
Rational	In case of an emergency, personnel must make sure that no harmful voltages are activated at the consist.
Origin	Other
Origin ID	
Linked Work Items	has parent: UF IPTRANS-2456 - Emergency consist handling , has parent: UF IPTRANS-2463 - Personnel safety

9.5 User-Requirements for the Data System

9.5.1 Cluster Definition

The Data System describes everything related to data processing like the Wagon Onboard Unit (CCU) or the data interfaces as well as the Train Functions.

9.5.2 Functional Requirements

IPTRANS-2141 - After marking a Consist Composition as secured by legacy braking means by using the Mobile HMI, the Mobile HMI shall store this input and related data.

Type	UR User-Requirement
Rational	This information has to be passed on to Yard Management System.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP22
Linked Work Items	has parent: UF IPTRANS-1557 - Mobile HMI functionality , has parent: UF IPTRANS-1563 - Legal traceability functionality , has parent: UF IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4413 - TP22 - Secure Wagon (Set) Against Rolling Away

IPTRANS-2138 - After reverting securing a Consist or Consist Composition against rolling away by using the Mobile HMI, the Mobile HMI shall store this action and related data.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP23
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1558 - FDFT Backend functionality , has parent:  IPTRANS-1563 - Legal traceability functionality , is derived from:  IPTRANS-4414 - TP23 - Remove, Release Braking Means

IPTRANS-2353 - After reverting securing a Consist Composition or a Consist against rolling away, the FDFT Backend shall store this action and related data.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP23
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , has parent:  IPTRANS-1563 - Legal traceability functionality , is derived from:  IPTRANS-4414 - TP23 - Remove, Release Braking Means

IPTRANS-2137 - After securing a Consist or Consist Composition against rolling away by using the Mobile HMI, the Mobile HMI shall store this action and related data.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP22
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1563 - Legal traceability functionality , is derived from:  IPTRANS-4413 - TP22 - Secure Wagon (Set) Against Rolling Away

IPTRANS-2136 - After securing a Consist or Consist Composition against rolling away, the FDFT Backend shall store this action and related data.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP22
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , has parent:  IPTRANS-1563 - Legal traceability functionality , is derived from:  IPTRANS-4413 - TP22 - Secure Wagon (Set) Against Rolling Away

IPTRANS-2344 - The FDFT Backend shall be able to perform a technical wagon inspection for a specific Consist Composition or Consist.

Type	 User-Requirement
Rational	The result of a technical wagon inspection is whether the wagon is allowed to continue, continue with restriction, or not, based on the necessary data to take this decision.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2080 - If the Consist or Consist Composition is moving, it shall not switch between FDFT modes.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30, general assumption
Linked Work Items	has parent:  IPTRANS-1572 - Traction Unit functionality , has parent:  IPTRANS-1576 - FDFT mode Shunting , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-1641 - The leading Backend shall know the state of the FDFT mode of the Consist Composition immediately after the FDFT mode changed.

Type	 User-Requirement
Rational	Active state change transmission allows for a most recent process view in FDFT Backend.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1507 - FDFT mode functionality , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-2402 - The Consist shall determine and store its running mileage.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P32
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection

IPTRANS-2409 - The Consist shall enable Personnel to deactivate the FDFT function Prevent Coupling at a specific Consist's end manually.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-1824 - The Consist shall have a standardized interface so that additional sensors can be added.

Type	 User-Requirement
Rational	Sensor data is the basis for an automated wagon inspection. The DAC platform must provide data transfer to FDFT Backend or HMI (Mobile) where the decision can be made, if a Consist is ok or nok.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P11
Linked Work Items	has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2117 - The FDFT Backend shall know the Consist Status Data of each Consist.

Type	 User-Requirement
Rational	In Consist Status Data it is defined that the FDFT Backend will be updated when changes of Consist Status Data occurred. It should be discussed in detail with industry/developers/operators etc. if some of this data does not need be updated immediately after changes (e.g. mileage).
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2403 - The Consist shall store its sensor data for later use.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P32
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection

IPTRANS-2414 - The Consist shall store its Static Consist Data locally

Type	 User-Requirement
Rational	Used for e.g. wagon restrictions like "no hump shunting".
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP3/TP21
Linked Work Items	has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2340 - The FDFT Backend shall know that a Consist Composition or Consist is ready for departure.

Type	 User-Requirement
Rational	It is possible that a single Traction Unit (Consist) is ready for departure. A single Wagon (Consist) can not be ready for departure.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2183 - The FDFT Backend shall know the orientation, order and number of Consists of a specific Consists Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P32
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection , _ is parent of:  IPTRANS-285 - Concept 8: Comparison of cut list with train composition

IPTRANS-2420 - The FDFT Backend shall be able to edit the Consist Restrictions of a specific Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-1747 - The FDFT Backend shall be able to inform the FDFT Yard that a Composition is marked as ready for shunting.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP02
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , has parent:  IPTRANS-1592 - FDFT Yard functionality , is derived from:  IPTRANS-4401 - TP02 - Wagon Processing

IPTRANS-2419 - The FDFT Backend shall know the Consist Restrictions of a specific Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-1643 - The FDFT Backend shall know the FDFT mode of a specific Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1507 - FDFT mode functionality , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-2165 - The FDFT Backend shall know the Consist Data of each Consist.

Type	 User-Requirement
Rational	FDFT Backend shall detect Static Consist Data from other systems or the Consist itself.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP01
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4400 - TP01 - Shunting Preparation

IPTRANS-1628 - The FDFT Backend shall know the status of FDFT function Prevent Coupling of a specific Consist's end.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-1598 - The FDFT Backend shall know the Consist Status Data from a specific Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP01
Linked Work Items	

IPTRANS-2020 - The FDFT Backend shall be able to initiate the switch of a specific Consist Composition to FDFT mode Train Run.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP31
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1577 - FDFT mode Train Run , is derived from:  IPTRANS-4418 - TP31 - Switch to FDFT mode Train Run

IPTRANS-2400 - The FDFT Backend shall have an open interface for ATO/ASO functionality to issue movement commands for Consist Compositions.

Type	 User-Requirement
Rational	The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2398 - The FDFT Backend shall have an open interface for providing results of the technical wagon inspection.

Type	 User-Requirement
Rational	The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2341 - The FDFT Backend shall have an open interface to be informed about an arrival of a specific Consist Composition at a specific track.

Type	 User-Requirement
Rational	FDFT Backend detects train arrival automatically and can initiate further steps. The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP04
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4403 - TP04 - Train Run

IPTRANS-2338 - The FDFT Backend shall have an open interface to be informed about a specific Consist Composition or Consist as ready for departure.

Type	 User-Requirement
Rational	FDFT System needs to know when routes are set and signalling allows train to move. A single Traction unit (Consist) can be ready for departure. A single Wagon (Consist) can not be ready for departure. The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications (e.g. rear view detection, derailment detection).
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2343 - The FDFT Backend shall have an open interface to check whether a specific Consist Composition or Consist can be secured against rolling away by Legacy Systems.

Type	 User-Requirement
Rational	If current infrastructure is capable of securing a Consist Composition or Consist against rolling away, this infrastructure's functionality can be connected (transitional state) to the FDFT Backend. For target state, this functionality is part of the FDFT environment. (e.g. automatic brake shoe) The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP05
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4404 - TP05 - Hump Shunting

IPTRANS-2428 - The FDFT Backend shall have a standardized interface to exchange Consist Data of each Consist.

Type	 User-Requirement
Rational	Date exchange with RU's internal Legacy Systems.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2421 - The FDFT Backend shall have a standardized interface to exchange Consist Restrictions for a specific Consist.

Type	 User-Requirement
Rational	Date exchange with RU's internal Legacy Systems.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2056 - The FDFT Backend shall have an open interface to receive the Dynamic Consist Data of a specific Consist from Legacy Systems.

Type	 User-Requirement
Rational	Dynamic Consist data: e.g., type of load, restrictions, total weight provided by legacy rail undertaking's systems. The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP01
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4400 - TP01 - Shunting Preparation

IPTRANS-2330 - The FDFT Backend shall have an open interface to receive track properties for the route of a specific Consist Composition from Legacy Systems.

Type	 User-Requirement
Rational	Needed for brake calculation (e.g. self braked wagon). (Gradient, max. axle load, ...) The TBN (Train Backbone Node) shall offer future extensibility, so that additional applications can be connected to the Consist Network for use of communications and power at any later point in time. Important for future applications.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2135 - The FDFT Backend shall store the final result of a technical wagon inspection for a Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	activities with operational necessity
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , has parent:  IPTRANS-1563 - Legal traceability functionality

IPTRANS-2331 - The FDFT Backend shall store the result of a brake calculation for a Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , has parent:  IPTRANS-1563 - Legal traceability functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1635 - The leading Traction Unit shall enable the Authorized Personnel to switch its Consist Composition to FDFT mode Shunting.

Type	 User-Requirement
Rational	Personnel can be Yard Personnel or Operator TU
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1576 - FDFT mode Shunting , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-2022 - The leading Traction Unit shall enable the Authorized Personnel to switch its Consist Composition to FDFT mode Train Run.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP31
Linked Work Items	has parent:  IPTRANS-1577 - FDFT mode Train Run , is derived from:  IPTRANS-4418 - TP31 - Switch to FDFT mode Train Run

IPTRANS-2412 - The Mobile HMI shall be able set the auto-reset timer for the FDFT function Prevent Coupling at a specific Consist's end.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP20
Linked Work Items	has parent:  IPTRANS-1506 - FDFT function Prevent Coupling , has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple , _ is parent of:  IPTRANS-158 - Concept 2: Set time span to reset prevent recoupling , _ is parent of:  IPTRANS-159 - Concept 2: Set time span to reset prevent recoupling , _ is parent of:  IPTRANS-160 - Concept 2: Decoupling command , _ is parent of:  IPTRANS-166 - Concept 2: Set time span to reset prevent recoupling

IPTRANS-2415 - The Mobile HMI shall be able to display the Consist Restrictions of a specific Consist to the Authorized Personnel.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2090 - The Mobile HMI shall display the orientation, order and number of Consists of a specific Consist Composition to the Authorized Personnel.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P32
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection , _ is parent of:  IPTRANS-147 - Concept 2: Request train composition , _ is parent of:  IPTRANS-148 - Concept 2: Request train composition , _ is parent of:  IPTRANS-149 - Concept 2: Display train composition

IPTRANS-1743 - The Mobile HMI shall enable the Authorized Personnel to check the Consist Data of a specific Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP02
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4401 - TP02 - Wagon Processing

IPTRANS-2334 - The Mobile HMI shall enable the Authorized Personnel to check the final result of the technical wagon inspection for a specific Consist Composition.

Type	 User-Requirement
Rational	In some cases a technical wagon inspection can be carried out for single Consists only.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03/TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2354 - The Mobile HMI shall enable the Authorized Personnel to check whether a specific Consist is secured by legacy braking means.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP23
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4414 - TP23 - Remove, Release Braking Means

IPTRANS-2416 - The Mobile HMI shall enable the Authorized Personnel to edit the Consist Restrictions of a specific Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2116 - The Mobile HMI shall enable the Authorized Personnel to input the final result of a manual wagon inspection of a specific Consist.

Type	 User-Requirement
Rational	In transformational state the result of a manuel inspection has to be transported to FDFT Systems (i.e. Backend)
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-1825 - The Mobile HMI shall enable the Authorized Personnel to input the intermediate result of a manual wagon inspection of a specific Consist.

Type	 User-Requirement
Rational	Intermediate result is used as part of the decision making process.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2325 - The Mobile HMI shall enable the Authorized Personnel to mark a specific Consist Composition as ready for train preparation.

Type	 User-Requirement
Rational	The Personnel sends the information to Yard Legacy System and/or FDFT Yard.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2140 - The Mobile HMI shall enable the Authorized Personnel to mark a specific Consist as secured by legacy braking means.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP22
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4413 - TP22 - Secure Wagon (Set) Against Rolling Away

IPTRANS-1752 - The Mobile HMI shall enable the Authorized Personnel to mark a specific Consist in the Consist Composition as ready for shunting.

Type	 User-Requirement
Rational	The Personnel sends the information to Yard Legacy System and/or FDFT Yard.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP02
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4401 - TP02 - Wagon Processing

IPTRANS-2342 - The Mobile HMI shall enable the Authorized Personnel to report that a specific Consist Composition has arrived on a specific track.

Type	 User-Requirement
Rational	Personnel is able to report train arrival if it cannot be done automatically.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP04
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4403 - TP04 - Train Run

IPTRANS-1645 - The Mobile HMI shall enable the Authorized Personnel to retrieve the FDFT mode of a specific Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1507 - FDFT mode functionality , has parent:  IPTRANS-1557 - Mobile HMI functionality , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-1826 - The Mobile HMI shall enable the Authorized Personnel to send the result of a manual technical wagon inspection to the FDFT Backend.

Type	 User-Requirement
Rational	The result of a technical wagon inspection is whether the wagon is allowed to continue, continue with restriction or not.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2021 - The Mobile HMI shall enable the Authorized Personnel to switch a specific Consist Composition to FDFT mode Train Run.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP31
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1577 - FDFT mode Train Run , is derived from:  IPTRANS-4418 - TP31 - Switch to FDFT mode Train Run

IPTRANS-2018 - The Mobile HMI shall enable the the Authorized Personnel to switch a specific Consist Composition to FDFT mode Shunting.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP30
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1576 - FDFT mode Shunting , is derived from:  IPTRANS-4417 - TP30 - Switch to FDFT mode Shunting

IPTRANS-2134 - The Mobile HMI shall store the final result of a technical wagon inspection for Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	activities with operational necessity
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1563 - Legal traceability functionality

IPTRANS-2179 - The result of a manual technical wagon inspection of a specific Consist shall be available through an open interface.

Type	 User-Requirement
Rational	The result of a technical wagon inspection is wether the wagon is allowed to continue, continue with restriction or not.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-2417 - The leading Traction Unit shall be able to display the Consist Restrictions of a specific Consist in the Consist Composition to the Authorized Personnel.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-1800 - The leading Traction Unit shall be able to display the current status of the Power Supply of its Consist Composition to the Authorized Personnel.

Type	 User-Requirement
Rational	Personnel shall be able to check if the Power Supply for the Composition is on.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P20
Linked Work Items	has parent:  IPTRANS-1574 - Traction Unit Power Supply functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4411 - TP20 - Uncouple

IPTRANS-2332 - The Traction Unit shall enable the Authorized Personnel to check the final result of the technical wagon inspection for its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , has parent:  IPTRANS-1580 - Technical Wagon Inspection functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

IPTRANS-1631 - The leading Traction Unit shall enable the Authorized Personnel to check the Consist Status Data of a specific Consist of its Consist Composition.

Type	 User-Requirement
Rational	The Consist Status Data are e.g. state of DAC coupler heads, state of brake system. The Personnel checks and confirms via HMI.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP01
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4400 - TP01 - Shunting Preparation

IPTRANS-2418 - The Traction Unit shall enable the Authorized Personnel to edit the Consist Restrictions of a specific Consist in the Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP21, P03
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation , is derived from:  IPTRANS-4412 - TP21 - Couple

IPTRANS-2339 - The Traction Unit shall enable the Authorized Personnel to mark its Consist Composition as ready for departure.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1750 - The Traction Unit shall enable the Authorized Personnel to mark its Consist Composition as ready for shunting.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP02
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4401 - TP02 - Wagon Processing

IPTRANS-2324 - The Traction Unit shall enable the Authorized Personnel to mark its Consist Composition as ready for train preparation.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP02
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4401 - TP02 - Wagon Processing

IPTRANS-1650 - The Traction Unit shall enable the Authorized Personnel to remotely check the identification, orientation, order and number of the Consists in the Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P32
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection

IPTRANS-2176 - The leading Traction Unit shall store the result of an Automated Brake Test.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1563 - Legal traceability functionality , has parent:  IPTRANS-1565 - Brake Test , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2401 - The Traction Unit shall inform the Personnel when a Consist in the Consist Composition has derailed.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P32
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4419 - TP32 - Composition Detection

IPTRANS-6725 - The leading Traction unit shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1563 - Legal traceability functionality , has parent:  IPTRANS-1565 - Brake Test , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-6726 - The Mobile HMI shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1563 - Legal traceability functionality , has parent:  IPTRANS-1565 - Brake Test , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-6727 - The Consist Network shall offer future extensibility, so that additional applications can be connected for use of communications and power at any later point in time.

Type	 User-Requirement
Rational	There is a need for future applications (further FDFT functions) to be developed by different suppliers.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP11
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4410 - TP11 - Technical Wagon Inspection

9.6 User-Requirements for the Brake System

9.6.1 Cluster Definition

The 9.1.5 Brake System describes everything related to the brakes. This includes everything to do with the Automatic Brake Test or the different types of brakes, like the EP-Brake, the Parking Brake or the Service Brake. Data communication is excluded from this cluster as it is covered by the data system cluster ([9.5 - User-Requirements for the Data System](#)).

9.6.2 Functional Requirements

IPTRANS-2383 - If the Consist secured itself against rolling away, the Personnel shall be able to revert securing against rolling away of the Consist manually.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality

IPTRANS-1655 - If the Consist was secured against rolling away, the Consist shall inform the leading Traction Unit that it is secured against rolling away.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25
Linked Work Items	

IPTRANS-2058 - If the specific Consist is in FDFT mode Shunting, the FDFT Backend shall be able to command reducing the rolling speed of a specific Consist.

Type	 User-Requirement
Rational	The technical solution could be a kind of a brake system on the Consist, but in the User Requirements the guideline is not to formulate a technical solution.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP05
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1569 - Consist speed control functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4404 - TP05 - Hump Shunting

IPTRANS-2096 - Only if Consist is at a standstill, the Consist shall be able to secure itself against rolling away.

Type	 User-Requirement
Rational	The brake system that secures the Consist against rolling away shall only be applied/activated when consist is in standstill. A check before activation is therefore needed.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25/TP26/General assumptions
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4415 - TP25 - Apply Parking Brake , is derived from:  IPTRANS-4416 - TP26 - Release Parking Brake

IPTRANS-2382 - The Consist shall enable the Personnel to visually check whether the Consist is not secured by itself against rolling away without stepping into the movement area of the Consist.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , has parent:  IPTRANS-2374 - Consist status indication functionality

IPTRANS-2378 - The Consist shall enable the Personnel to visually check whether the Consist is secured by itself against rolling away without stepping into the movement area of the Consist.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , has parent:  IPTRANS-2374 - Consist status indication functionality

IPTRANS-2073 - The leading Traction Unit shall know the braking status of each braking system of each Consist in the Consist Composition.

Type	 User-Requirement
Rational	This includes service , controllable and parking brake systems. Each system has to report its status.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1567 - Brake functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2366 - The FDFT Backend shall be able to command securing a specific Consist Composition or Consist against rolling away by infrastructure means.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP05
Linked Work Items	has parent:  IPTRANS-1558 - FDFT Backend functionality , is derived from:  IPTRANS-4404 - TP05 - Hump Shunting , _ is parent of:  IPTRANS-3 - Geometric dimensions , _ is parent of:  IPTRANS-4 - Location of installation , _ is parent of:  IPTRANS-5 - Holding forces/capabilities , _ is parent of:  IPTRANS-6 - Environmental conditions , _ is parent of:  IPTRANS-15 - Workers' safety , _ is parent of:  IPTRANS-66 - Controller , _ is parent of:  IPTRANS-67 - RAMS , _ is parent of:  IPTRANS-68 - Retarder signal , _ is parent of:  IPTRANS-69 - System definition

IPTRANS-1740 - The FDFT Backend shall be able to initiate an Automated Brake Test for a specific Consist Composition or Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2365 - The FDFT Backend shall be able to command the Authorized Personnel to perform a task via the Mobile HMI.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-1736 - The FDFT Backend shall be able to know if a specific Consist is secured against rolling away.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P26
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4416 - TP26 - Release Parking Brake , _ is parent of:  IPTRANS-289 - Concept 8: Deactivate parking brakes

IPTRANS-2105 - The FDFT Backend shall be able to remotely revert securing a specific Consist against rolling away.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP26
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4416 - TP26 - Release Parking Brake , _ is parent of:  IPTRANS-289 - Concept 8: Deactivate parking brakes

IPTRANS-2104 - The FDFT Backend shall be able to remotely secure a specific Consist against rolling away.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4415 - TP25 - Apply Parking Brake

IPTRANS-1794 - The FDFT Backend shall be able to know the available braking power of a specific Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP03
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1741 - Braking power , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2189 - The FDFT Backend shall be able to know the state of the Service Brake of a specific Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1567 - Brake functionality , has parent:  IPTRANS-2082 - Consist functionality , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2367 - The FDFT Backend shall have a standardized interface to check whether a specific Consist Composition or Consist can be slowed down by Legacy Systems.

Type	 User-Requirement
Rational	Due to different infrastructure systems that can brake Consists after uncoupling (e.g. hump shunting), it is necessary for the FDFT system to know whether it has to control the Consist individually for braking or whether this should be done via existing infrastructure systems or other operating procedures.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP05
Linked Work Items	has parent:  IPTRANS-1559 - FDFT Backend external interfaces , is derived from:  IPTRANS-4404 - TP05 - Hump Shunting

IPTRANS-1742 - The FDFT Backend shall provide the Brake Test Relevant Data of the connected Consist Composition to the Stationary Device.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2093 - The leading Traction Unit shall enable the Authorized Personnel to remotely revert securing against rolling away of a specific Consist of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP26
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4416 - TP26 - Release Parking Brake

IPTRANS-1649 - The leading Traction Unit shall enable the Authorized Personnel to remotely secure a Consist of its Consist Composition against rolling away.

Type	 User-Requirement
Rational	securing against rolling away by applying the parking brake.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4415 - TP25 - Apply Parking Brake

IPTRANS-2077 - The Mobile HMI shall be able to display if a specific Consist is secured against rolling away to the Authorized Personnel.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4415 - TP25 - Apply Parking Brake , _ is parent of:  IPTRANS-154 - Concept 2: Deactivate parking brakes

IPTRANS-2078 - The Mobile HMI shall be able to display the available braking power of a specific Consist to the Authorized Personnel.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP02
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1741 - Braking power , is derived from:  IPTRANS-4401 - TP02 - Wagon Processing

IPTRANS-2071 - The Mobile HMI shall be able to display the G/P setting of the service brake of a specific Consist to the Authorized Personnel.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1565 - Brake Test , has parent:  IPTRANS-1567 - Brake functionality , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2075 - The Mobile HMI shall display the state of the Service Brake of a specific Consist to the Authorized Personnel.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	General assumption
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1567 - Brake functionality

IPTRANS-2329 - The Mobile HMI shall enable the Authorized Personnel to check the result of a brake test for a specific Consist Composition or Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-1737 - The Mobile HMI shall enable the Authorized Personnel to confirm that braking means for a specific Consist are released.

Type	 User-Requirement
Rational	Legacy or Consist braking means.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP23
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4414 - TP23 - Remove, Release Braking Means

IPTRANS-1782 - The Mobile HMI shall enable the Authorized Personnel to input the result of a manual brake test for a specific Consist Composition or Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2106 - The Mobile HMI shall enable the Authorized Personnel to remotely secure a specific Consist against rolling away.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4415 - TP25 - Apply Parking Brake

IPTRANS-2107 - The Mobile HMI shall enable the Authorized Personnel to remotely revert securing a specific Consist against rolling away.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP26
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1571 - Secure against rolling away functionality , is derived from:  IPTRANS-4416 - TP26 - Release Parking Brake , _ is parent of:  IPTRANS-155 - Concept 2: Deactivate parking brakes , _ is parent of:  IPTRANS-156 - Concept 2: Deactivate parking brakes

IPTRANS-2180 - The Mobile HMI shall enable the Authorized Personnel to send the result of a manual brake test for a specific Consist Composition or Consist to the FDFT Backend.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1557 - Mobile HMI functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2384 - The Personnel shall be able to command the Consist to secure itself against rolling away manually.

Type	 User-Requirement
Rational	
Origin	Other
Origin ID	
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality

IPTRANS-2174 - The Stationary Device shall be able send the result of an Automated Brake Test to FDFT Backend.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2173 - The Stationary Device shall be able to determine the G/P setting of the Service Brake of a specific Consist of connected Consist Composition.

Type	 User-Requirement
Rational	e.g. for the Automated Brake Test.
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2172 - The Stationary Device shall be able to perform an Automated Brake Test of connected Consist Composition or Consist.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2175 - The Stationary Device shall store the result of an Automated Brake Test.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1563 - Legal traceability functionality , has parent:  IPTRANS-1564 - Stationary Device functionality , has parent:  IPTRANS-1565 - Brake Test , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2177 - The leading Traction Unit shall be able send the result of an Automated Brake Test to FDFT Backend.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	P03
Linked Work Items	has parent:  IPTRANS-1560 - FDFT Backend internal interfaces , has parent:  IPTRANS-1565 - Brake Test , has parent:  IPTRANS-1572 - Traction Unit functionality , is derived from:  IPTRANS-4402 - TP03 - Train Preparation

IPTRANS-2178 - The leading Traction Unit shall enable the Authorized Personnel to check if a specific Consist of its Consist Composition is marked as secured against rolling away by legacy braking means.

Type	 User-Requirement
Rational	To check if a Consist was secured by legacy breaking means and this was inputted by personnel into the FDFT System.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4415 - TP25 - Apply Parking Brake

IPTRANS-2069 - The leading Traction Unit shall enable the Authorized Personnel to input that legacy braking means are not applied at its Consist or Consist Composition.

Type	 User-Requirement
Rational	legacy braking means like drag shoe, hand brake, track brake.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP23
Linked Work Items	has parent:  IPTRANS-1567 - Brake functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4414 - TP23 - Remove, Release Braking Means

IPTRANS-1666 - The Traction Unit shall enable the Authorized Personnel to remotely check if a specific Consist of its Consist Composition is secured against rolling away.

Type	 User-Requirement
Rational	To check if a Consist secured itself against rolling away.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP25
Linked Work Items	has parent:  IPTRANS-1571 - Secure against rolling away functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4415 - TP25 - Apply Parking Brake

IPTRANS-1748 - The Traction Unit shall enable the Authorized Personnel to remotely check the available braking power of a specific Consist of its Consist Composition.

Type	 User-Requirement
Rational	Check to ensure that enough brake power is available.
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP02
Linked Work Items	has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , has parent:  IPTRANS-1741 - Braking power , is derived from:  IPTRANS-4401 - TP02 - Wagon Processing

IPTRANS-2070 - The leading Traction Unit shall enable the Authorized Personnel to remotely check the G/P setting of the Service Brake of a specific Consist of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP09
Linked Work Items	has parent:  IPTRANS-1567 - Brake functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4408 - TP09 - Automated Brake Test

IPTRANS-2074 - The Traction Unit shall enable the Authorized Personnel to remotely check the Service Brake status of a specific Consist of its Consist Composition.

Type	 User-Requirement
Rational	
Origin	Operational Procedures D2.1 V1.0
Origin ID	TP23
Linked Work Items	has parent:  IPTRANS-1567 - Brake functionality , has parent:  IPTRANS-1578 - Traction Unit's HMI functionality , is derived from:  IPTRANS-4414 - TP23 - Remove, Release Braking Means

10 Conclusions

This document constitutes Deliverable 2.2 User Requirements Specification of Flagship Area 5 project FP5 TRANS4M-R. The project aims to boost innovation for the European rail freight sector, concretely by developing, validating, and demonstrating FP5 TRANS4M-R technical enablers. The objective of this document was to develop the functional requirements of the operators based on the Target Operational Procedures D2.1, the first agreed throughout Europe Target Operational Procedures for rail freight.

With this work in D2.2 a major step towards collaborative list of requirements have been made. Elaborating the User-Requirements based on the Target Operational Procedures provided essential groundwork for the FDFT system development. D2.2 defines the first baseline for the further requirements work. The User-Requirements will serve as a base for subsequently linked System- and Subsystem-Requirements to be defined throughout the further scope of the project. However, these User-Requirements state a work in progress that needs to be consolidated and verified within the evaluation and verification/validation process in Polarion.

By comprehensively assessing the User-Requirements as part of the overall project development process in accordance with the defined methodology (chapter 6.2), white spots within the TRANS4M-R project were identified.

These include additional non-functional requirements, which interact directly with the functional requirements and define fundamental performance characteristics of the system. In addition, the elaboration of further User-Requirements beyond the Operational Procedures (see chapter 8) and the needs of other users outside the Operational Procedures is necessary to further approximate the completeness of the User-Requirements.

As a result, an amendment process has been initiated in which these white spots have been addressed.

This document states some additional delimitations, such as already identified delimitations from the Operational Procedures (chapter 7). Furthermore, CBA and authorization were not included. These are nevertheless highly relevant for requirements in general in terms of the V-model. These aspects affect the User-Requirements and decide whether they are not only technically feasible but also implementable in terms of these influences. This contributes to the assessment that the User-Requirements as a result of this document must be followed by further iteration processes with the help of relevant WPs and expert groups.

This version of the deliverable and the User-Requirements contained in it represents a work in progress that will be further adapted and extended as the FP5 TRANS4M-R project in continuously progressing. Changes to the content throughout ongoing project development are therefore possible and expected.

11 References

Reference	Titel
[1]	DACcelerate; DELIVERABLE D 4.2 FINAL RECOMMENDATIONS ; 2022-05-31; V1.0
[2]	International Organization for Standardization; ISO/IEC/IEEE 72089:2018 ; 2018
[3]	IEEE Standards Association; IEEE 830-1993 ; 1993
[4]	Das Deutsche Institut für Normung e.V.; DIN EN 50126-1:2018-10 ; 2018