D2.1 TCCS SD2 - Operational Epics

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1 Introduction

1.1 Document Scope and Purpose

The purpose of this document is to define an overview of the SPT2TS-48931 - Diagnostics user needs based on input documents and experts analyses.

This document will define needs from the perspective of different stakeholders (e.g Railway Undertaking, Manufacturer, Infrastructure Manager...). These user needs should permit to define an exhaustive diagnostic solution to improve predictive and curative maintenance.

Applications external to diagnostics (e.g. juridical recording, security, asset management, environmental data, logging) may require data owned by diagnostics . Diagnostics may provide these data on their demand.

1.2 Definitions

Diagnostics

Diagnostics is the assessment of health and performance of an asset or a group of assets. Furthermore, the diagnostic system also provides all information of single components in the field like: software version, parametrisation file version, firmware version, hardware version, manufacturer part number, manufacturer serial number, ID in the field (e.g. NID_ENGINE), cumulated hours in operation, IP address, etc. The latter is being used for analysis purposes.

1.3 Goals of the Activity

The main objectives and goals are the provision of services for diagnostic data collection and harmonisation/standardisation of interfaces to support technical diagnostic and monitoring services.
The Operational epics (user stories/use cases) definition should permit to:

- Support the enhancement of maintenance, repair, and handling of system failures activities.
- Improve the operational reliability, availability, and maintainability of the CCS system covering on-board, trackside and CCS- external systems.
- Support definition of basic functionalities to standardize technical diagnostic and monitoring system. The list of data owned by diagnostics as well as the list of data required by diagnostics, owned by others (e.g. environmental data) but where diagnostics is used as transportation channel, is provided in the System Requirements Specification.

1.4 Stakeholder description

The operational epics in this document are addressing the Railway System, with a clear focus on diagnostic data handling of the Control Command and Signalling (CCS) System. Only epics, for which it can be assumed that the CCS system is involved in the context of diagnostic data or the CCS system's external interfaces are impacted, are listed in this document.

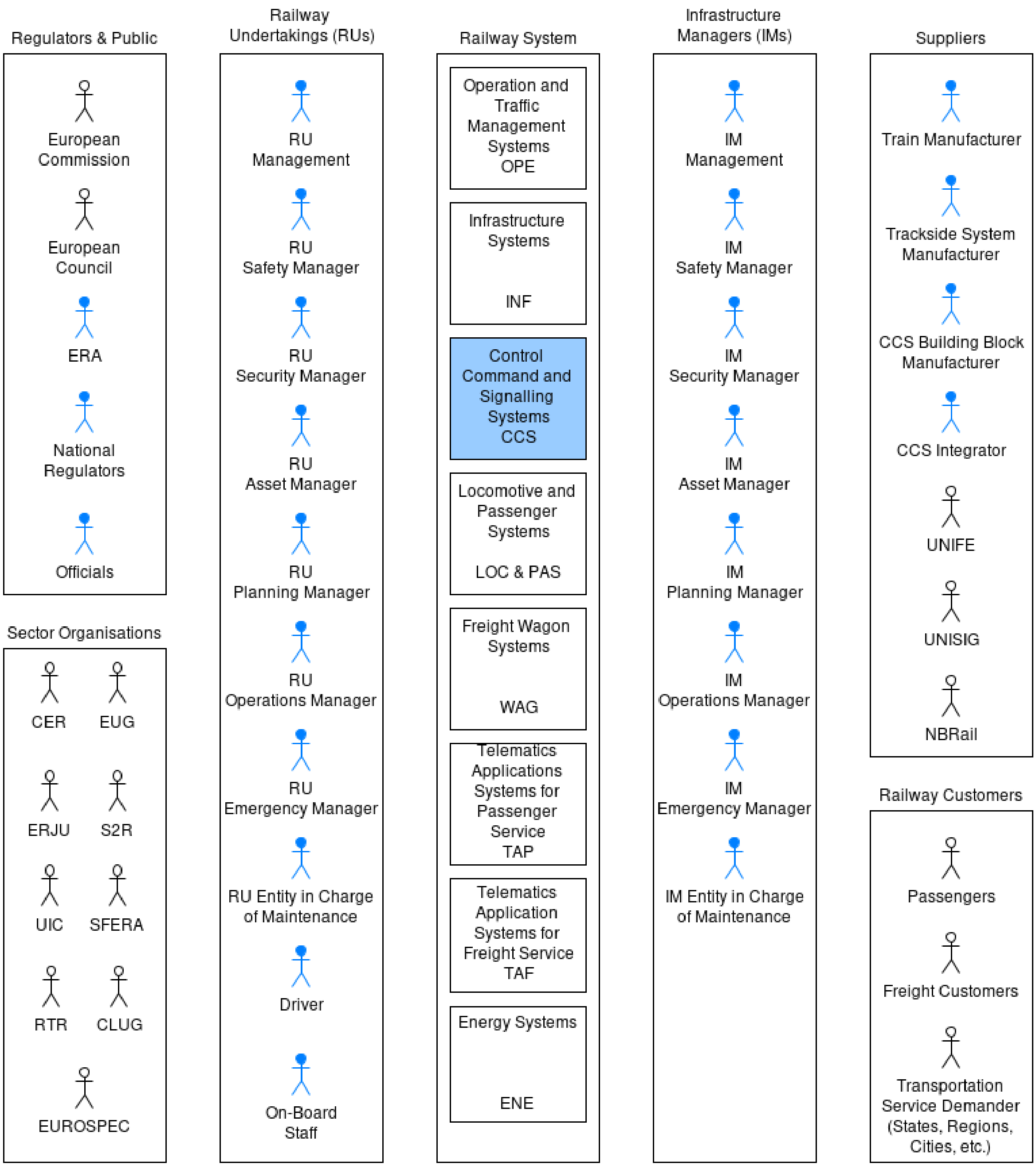

Figure 1 Railway System overview with stakeholders and their roles

***Note:** in the above figure the railway systems and stakeholder roles that are relevant for the content of this document are filled-in and have a blue colour.*

The operational epics listed in this document are focusing on the needs of the the Railway Undertakings (RUs), the Infrastructure Managers (IMs), and the Suppliers. They are captured, using a formal process (interview, review, approval). Epics of interest to Regulators, Sector Organisations, and Railway Customers may also be listed in this document, but are not systematically captured. No interviews, reviews, or approval processes are conducted with these stakeholders.

The following tables provide a brief description of the railway systems, the stakeholders and their roles.

Railway Systems	Abbr.	Description
Operation and Traffic Management Systems	OPE	Operation and traffic management systems of infrastructure managers and railway undertakings, related to the operation of trains on the rail system.
Infrastructure Systems	INF	Structural and maintenance related Infrastructure Systems.
Control Command and Signalling	CCS	Control command and signalling on-board and trackside systems.
Locomotives and Passenger Carriages Systems	LOC & PAS	Rolling stock systems of the following types of rolling stock: self-propelling thermal or electric trains, thermal or electric traction units, passenger carriages, mobile railway infrastructure construction and maintenance equipment
Freight Wagons Systems	WAG	Rolling stock systems of freight wagons including vehicles designed to carry lorries.
Telematics Applications for Passenger Service	TAP	Systems providing passengers with information before and during the journey, reservation and payment systems, luggage management and management of connections between trains and with other modes of transport.
Telematics Applications for Freight Service	TAF	Systems supporting real-time monitoring of freight and freight trains, marshalling, reservations, invoicing, payments, management of connections with other modes of transport, and production of electronic accompanying documents.
Energy Systems	ENE	Systems to supply traction energy to a train.

Table 1 Description of the railway systems

Roles of the Infrastructure Manager (IM)

Title	Description
IM Asset Manager	The person within the IM organisation responsible to define and plan the lifecycle for a

	specific asset, for instance a specific interlocking. This person will specify the asset, is involved in purchasing and acceptance activities, provides a release plan, etc.
IM Capacity Manager	The entity responsible for the coherence of projects to meet the requested performance and capacity forecast on the network.
IM Emergency Manager	The person within the IM organisation responsible to find solutions for critical issues that can occur during railways operation.
IM Entity in Charge of Maintenance	The department within the IM organisation responsible to maintain and service the infrastructure CCS components. This includes people responsible for maintenance and service of a specific interlocking as well as technicians working locally.
IM Management	The person within the IM organisation responsible to improve efficiency and reduce costs of the IM.
IM Operations Manager	The person within the IM organisation responsible for the rolling train runs planning according to schedule and current situations (e.g. occurred incidents, train delays, etc.).
IM Planning Manager	The person within the IM organisation responsible for the planning of the infrastructure usage, from the allocation of routes to the planning of the infrastructure maintenance.
IM Safety Manager	The person within the IM organisation responsible to enforce safety measures to ensure the safety of the railway system.
IM Security Manager	The person within the IM organisation responsible to enforce cyber security measures in order to protect the assets from malicious intrusions that can affect the safety or availability of the railway system.

9 items found

Roles of the Railway Undertaking (RU)

Title	Description
Driver	The Driver is a person capable and authorised to drive trains, including locomotives, shunting locomotives, work trains, maintenance railway vehicles or trains for the carriage of passengers or goods by rail in an autonomous, responsible, and safe manner. Source: Directive 2007/59/EC of the European Parliament and of the Council.
On-Board Staff	The On-Board Staff (OBS) is the personnel of the Railway Undertaking (RU), which may escort the Passenger Train. The Train Attendant is responsible for passenger and train service (e.g. indicate to the driver when he can leave a station, etc.), if present on-board he may check the passenger tickets, assist the passengers (e.g. in case of incidents), generally provide information, etc.).
RU Asset Manager	The person within the RU organisation responsible to define and plan the lifecycle for a specific asset, for instance the ETCS on-board. This person will specify the asset, is

	involved in purchasing and acceptance activities, provides a release plan, etc.
RU Emergency Manager	The person within the RU organisation responsible to find solutions for non-planned issues that can occur during rolling-stock operation.
RU Entity in Charge of Maintenance	The department within the RU organisation responsible to maintain and service the vehicles. This includes people responsible for maintenance and service of a whole fleet, as well as technicians working on-board the vehicles when these are in the work shop.
RU Management	The person within the RU organisation responsible to improve efficiency and reduce costs of the railway undertaking.
RU Operations Manager	The person within the RU organisation responsible to plan the operation of the single train units (which train unit operates which train run, etc.), but also the drivers schedules, the train conductors schedule, etc.
RU Planning Manager	The person within the RU organisation responsible to plan the available trains in different train runs, including the planning of maintenance activities. The planning of the available trains in different train runs is typically made on a yearly base.
RU Safety Manager	The person within the RU organisation responsible to enforce safety measures to ensure the safety of the railway system.
RU Security Manager	The person within the RU organisation responsible to enforce cyber security measures in order to protect the assets from malicious intrusions that can affect the safety or availability of the railway system.

10 items found

Roles of the Suppliers

Title	Description
CCS Building Block Manufacturer	Entity in charge of: • designing the cabinet / rack (for hosting electronic boards) and its electrical wiring, • designing, realising and validating the component (including hardware electronic boards) according to requirements including test requirements (i.e., test bench and procedures), • assembling the components in their electrical/mechanical cabinet/rack, • realising the safe integration of the selected components, • configurating the components for the concerned CCS project(s), • realising the Generic Product Safety Case (component scope), • performing the further modifications of the components according to enhanced requirements (e.g., new functionalities, improvements), • validating the CCS System according to test requirements (i.e., test bench and

	procedures), • performing the further modifications of the CCS System (e.g., new components, exchanges, new configuration...), • export application conditions to CCS (if any), • managing the other assessment types (e.g., ISA, NoBo, DeBo), • submitting and obtain the Application for Placing On the Market (APOM for the supplier: official document allowing the building block as an interoperability constituent to be placed in commercial revenue) to the ERA and the National Safety Authorities (NSAs), • describing the maintenance constraints and procedures applicable for the building block to ease its maintainability.
CCS Integrator	Entity in charge of: • application safety cases (Specific Application on rollingstock or interlocking and network, and Generic Application on the fully equipped rollingstock or interlocking), • realising the Generic Application Safety Case or the Specific Application Safety Case of the full CCS System, • managing and provide the input to the other assessment types (e.g. NoBo, DeBo, etc.), • performing the safe integration of the rollingstock or interlocking and its dedicated network (e.g., ERTMS line (n)), • realising the safe data preparation: rollingstock or interlocking into network (main technical task), • submitting and obtain the Application for Placing On the Market (APOM for the integrator: official document allowing the rollingstock or trackside subsystem to be placed in commercial revenue) to the ERA and the National Safety Authorities (NSAs), • defining the functionalities required from the CCS System, • designing the integration phase (e.g. electrical drawings, mechanical specifications), • assigning these last tasks to the train manufacturer, CCS component manufacturer and CCS integrator, • realising the safe integration of the CCS sub-system into the rollingstock or network, • physically integrating the CCS sub-system into the rollingstock or the network, • testing the complete rollingstock or network integration in the scope of TSI CCS/TSI LOC&PAS using the CCS sub-system and the rollingstock or network as black boxes, • realising the data preparation of the CCS sub-system on the dedicated rollingstock or network.
Communication Manufacturer	Manufacturer of railway mobile radio, entity in charge of: • designing the cabinet / rack (for hosting electronic boards) and its electrical wiring, • designing the communication components, • designing, realising and validating the component (including hardware electronic boards) according to requirements including test requirements (i.e., test bench and procedures), • assembling the components in their electrical/mechanical cabinet/rack, • realising the of the selected components, • configuring the components for the concerned project(s), • performing the further modifications of the components according to enhanced requirements (e.g., new functionalities, improvements),

	• managing other assessment types (e.g., telecom bodies), • describing the maintenance constraints and procedures applicable for the building block to ease its maintainability.
Trackside System Manufacturer	An entity that designs, produces, and integrates systems for the railway industry, ensuring they meet interoperability and safety standards like ERTMS. This includes the testing and certification of trackside equipment.
UNIFE	UNIFE is the European Rail Supply Industry Association. It represents Europe's rail supply companies, which are active in the design, manufacture, maintenance, and refurbishment of rail transport systems, subsystems, and related equipment. UNIFE also encompasses 15 national rail industry associations, advocating on behalf of over 100 of Europe’s leading rail supply companies.
UNISIG	UNISIG, the Union of the Signalling Industry, was established under UNIFE to develop the technical specifications for the ERTMS/ETCS. It includes major companies in railway signalling and train control systems, contributing to the advancement of the European Rail Traffic Management System (ERTMS) through collaboration with the European Union Agency for Railways.
Vehicle Manufacturer	Entity in charge of • Specifying the vehicle system including software and hardware interfaces in line with the last European Specifications • Including in the new vehicle development LRU modules to facilitate the maintenance by the final user • Designing the vehicle and its mechanical and electrical schematics, • Testing and validating all the vehicle interfaces according to requirements including test requirements (i.e., test bench and procedures) • Realising the safety analyses with the ISA/NOBO/DeBO certifications • Configurating the components for the concerned CCS project(s), • Realising the Generic Vehicle Safety Case (vehicle scope including CCS aspects), • Performing the further modifications of the components according to enhanced requirements (e.g., new functionalities, improvements),

7 items found

Roles of the Regulators & Public

Title	Description
European Commission	The European Commission is the executive branch of the European Union, responsible for proposing legislation, implementing decisions, upholding the EU treaties, and managing the day-to-day business of the EU.
European Council	The European Council is the EU institution that defines the general political direction and priorities of the European Union.
European Union Agency for Railways (ERA)	The European Union Agency for Railways or ERA helps to create a safer and cross national European railway network. It aims at doing so through reporting on the rail safety in the European Union, and developping viable common technical standards, safety measures, and a uniform signalling system in Europe.

National Regulators	National Regulators are authorities within individual states responsible for overseeing the implementation and enforcement of European railway standards, safety regulations, and ensuring compliance with EU directives at the national level.
Officials	The person within a public organisation responsible to analyse data in case of accidents in order to identify the root cause of a specific accident, and describe the fault that resulted in the accident.

5 items found

Roles of the Sector Organisations

Title	Description
Certifiable Localisation Unit with GNSS in the railway environment (CLUG)	CLUG is a project for developing a certifiable, GNSS-based localization unit for trains to enhance navigation and safety across Europe's railways.
Community of European Railway and Infrastructure Companies (CER)	CER is a Brussels-based group that represents European railway operators, infrastructure companies, and related associations, focusing on advocacy within the EU.
ERTMS User Group (EUG)	EUG is the technical body gathering ERTMS users and leading specialised expert working group on TSI specification.
Europe's Rail Joint Undertaking (ERJU)	ERJU is an initiative under the Horizon Europe programme focusing on research and innovation to enhance the EU railway network.
European Specification for railway vehicles (EUROSPEC)	EUROSPEC, initiated by several European railway companies in 2011, develops unified technical specifications for railway vehicles and components, aiming to standardise trains and enhance their quality and procurement, without being in the competitive domain.
NBRail	NB-Rail is an international non-profit organisation comprised of various conformity assessment bodies in the European railway sector. Its main purpose is to support interoperability and safety in the railway industry, by complementing activities not covered by basic regulatory documents.
Round Table Rail (RTR)	RTR (Round Table Rail) is a European initiative focused on transforming the traditional project-oriented rolling stock procurement into a more efficient, product-oriented approach since 2018.
Shift2Rail (S2R)	Shift2Rail focuses on innovative rail solutions to double the European rail system's capacity, increase reliability and service quality by 50%, and halve life-cycle costs.
Smart communications For Efficient Rail Activities (SFERA)	SFERA focuses on standardizing languages for Driving Advisory Systems to facilitate data exchange and reduce costs, aiming to improve energy efficiency and CO2 commitments in the rail sector.

Union Internationale des Chemins de fer (UIC)	UIC is a technical body for the railway operating community.

10 items found

Roles of the Railway Customers

Title	Description
Freight Customers	Entities that use rail services to transport goods.
Passengers	Individuals or groups who use rail services for personal or business travel.
Transportation Service Demander (Steates, Regions, Cities, etc.)	Governmental bodies or regional entities that demand rail transport services for economic development, connectivity, and public welfare.

3 items found

2 Input Analysis and References

Document ID	Document description	Version
OCORA-TW08-030	MDCM - Monitoring, Diagnostics , Configuration, Maintenance subsystem - System Requirement Specification	1.00
SUBSET-149	OMS - Online Monitoring System	0.0.6
SUBSET-27	FIS Juridical Recording	3.3.0
SC5 DP1.2	System Pillar Common Business Objectives	1.00
SC5 DP1.5	CCS and TMS/CMS System Architecture	1.00
EU.Doc.18	Maintenance and data management specifications	4.0(0.A)
Eurospec	Specification: Availability of On-board Data	1st ed, 2021
Eurospec	Specification TCMS Data Service	1st ed, 2019
EULYNX EU.Doc.94	Interface specification SDI Generic	4.0
EULYNX EU.Doc.77	Interface definition SDI	3.0

Table 2 List of input documents

Note: The Subset-149 is planned to be mentioned in the application guide of the TSI CCS 2023 as informative specification. This subset includes for data transmission from on-board to trackside only the juridical data information as defined in the Subset-027.

3 Operational Epics (User stories)

SPT2TS-1375 - Template for Operational Epic definition

As a <*stakeholder role*>, I want to <*need description*>, in order to <*expected benefit / goal / rationale*>.

Linked Work Items	has parent: SPT2TS-1347 - Operational Epics (User stories)

3.1 Generally valid epics

SPT2TS-1358 - Standardised Remote Maintenance Entry Point (interface)

As an entity in charge of maintenance, I want to use a standardised remote maintenance (including monitoring & diagnostic) entry point (interface) to the railway system and its assets by commonly specified diagnostics data structure and semantics, in order to only have to operate one maintenance server application I am familiar with, independently from the supplier of the single railway system asset and components. This enables me to be more efficient because I know the processes in connection with the server application.

Linked Work Items	is derived from: SPT1RS-194 - independent lifecycle, simple exchange is derived from: SPT1RS-196 - increase market size by standardisation has parent: SPT2TS-1351 - Generally valid epics _ is derived by: SPT2TS-124391 - The TCCS system shall provide a standardised interface to facilitate the collect...

SPT2TS-1359 - System Condition

As an entity in charge of maintenance, I want to use accurate system condition information, in order to be more efficient and prevent failures. The system's condition has to be precise enough and available in a timely manner that allows to schedule and carry out the maintenance activity before a component fails (preventive maintenance).

Linked Work Items	is derived from: SPT1RS-154 - availability, robustness, reliability has parent: SPT2TS-1351 - Generally valid epics _ is derived by: SPT2TS-124396 - The TCCS system shall provide diagnostic service functionality to enable further... _ is derived by: SPT2TS-124259 - Provide data collection capability

SPT2TS-1360 - Fault Occurrence Prognosis

As an entity in charge of maintenance, I want to use a fault occurrence prognosis of the system including asset's wear reserve and mean time before failure data, in order to be able to reduce causes of faults.

Linked Work Items	is derived from: SPT1RS-154 - availability, robustness, reliability is derived from: SPT1RS-156 - continuous supervision

	has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1361 - Fault Clearing Prioritisation

As an entity in charge of maintenance, I want to be able to dynamically prioritise repair activities (for fault corrections) based on functional dependencies and information such as condition, environmental data and other, in order to be more efficient.

Example: Point heater controlling device fails; functionally dependent points / switches are no longer heated; no problem in summer, and no problem if forecast weather for the next days is warm (even during winter season).

Assumption: fusion of different data (e.g. also evaluating environmental condition, etc.) would occur in a centralised diagnostic system (analytics).

Linked Work Items	is derived from: SPT1RS-199 - system robustness and robustness against weather has parent: SPT2TS-1351 - Generally valid epics _ is derived by: SPT2TS-124393 - The TCCS system shall offer the capability to support decision making for priori...

SPT2TS-1423 - Maintainer / fault clearance service

As an entity in charge of maintenance, I want to quickly grasp the situation of the system without the need to obtain any information from manufacturer-specific documentation, in order to get an overview on the status of the system, this also includes the temporal behaviour of all components of a CCS system instance (e.g. an interlocking) from shortly before to the time when a fault has occurred, without having to ask the train dispatcher or other people.

Linked Work Items	is derived from: SPT1RS-156 - continuous supervision is derived from: SPT1RS-154 - availability, robustness, reliability is derived from: SPT1RS-208 - automated field force communication has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1377 - Standardising models and semantics to simplify training for railway maintenance personnel

As an entity in charge of maintenance, I want to have standardised models (that allow the representation of information and data flow related to railway maintenance in order to have an efficient communication between different systems and maintenance teams reducing ambiguity and errors in data interpretation) and semantic (that has a set of standardised terms and definitions to describe the processes involved in railway maintenance, helping to avoid confusion and misunderstandings between the different actors involved), in order to improve and simplify the capability of my maintenance personnel for almost all system components except those who need a particular treatment (as particular manufacturers or old systems).

Linked Work Items	is derived from: SPT1RS-196 - increase market size by standardisation has parent: SPT2TS-1351 - Generally valid epics _ is related to: SPT2TS-1442 - Goal: To simplify training for railway maintenance personnel by standardizing mo... _ is derived by: SPT2TS-124391 - The TCCS system shall provide a standardised interface to facilitate the collect...

SPT2TS-1442 - Goal : To simplify training for railway maintenance personnel by standardizing models and semantics, reducing the need for specialists in specific cases.

Background: A railway company is responsible for the maintenance of several different railway systems, including systems manufactured by different companies. Currently, maintenance personnel are required to be trained in all systems, regardless of their specialty. This results in a lengthy and complex training process, which is time-consuming and costly. In addition, the lack of standardization in models and semantics used in different railway systems makes it difficult for maintenance personnel to transfer their knowledge from one system to another.
Use Case: The railway company wants to implement a training program that is more efficient and cost-effective. The program should be designed to simplify training for railway maintenance personnel, reducing the need for specialists in specific cases. To achieve this goal, the company will standardize the models and semantics used in different railway systems.
Steps:
1. Assess the different railway systems that require maintenance and identify which systems are used most frequently.
2. Standardize the models and semantics used in the different railway systems.
3. Develop a training program for the railway maintenance personnel, focusing on the most frequently used systems.
4. Train railway maintenance personnel on the systems that they will be working with most frequently.
5. In special cases, when a railway system from a particular manufacturer requires maintenance, a specialist trained in that system will be brought in to perform the necessary work.
6. Monitor the effectiveness of the training program and make any necessary adjustments.
Expected Outcome: By standardizing the models and semantics used in different railway systems and implementing this training program, the railway company will be able to simplify the training process for railway maintenance personnel, reducing the need for specialists in specific cases. This will result in a more efficient and cost-effective training program, allowing the company to better meet the needs of its clients and ensure the smooth operation of the railway systems. In addition, the standardization of models and semantics will make it easier for maintenance personnel to transfer their knowledge from one system to another, improving the overall efficiency of the maintenance process.

Linked Work Items	relates to: SPT2TS-1377 - Standardising models and semantics to simplify training for railway maintenance personnel has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1378 - Availability of statistical reporting with regard to the past availability of asset types /components

As an asset manager, I want to have statistical data available about issues and incidents of all different CCS asset types/components independently from the supplier, in order to monitor the performance. This supports my strategical activity with the purpose to purchase the best option for railway operation, both trackside and on-board. The statistical data evaluation shall consider the functional dependencies required in SPT2TS-1420.

Note: statistical data can be the number of incidents occurred with a component from a specific supplier, or the type of occurred incidents, and others.

Note: 'consider functional dependencies' means that a component provides the reason why it went into a specific state. Based on this information it is possible to properly recognise the root cause of an issue. E.g. a safety relevant component goes into 'failure' state, although the component is doing fine, but an input information is no longer good. So this indication should be made available in the statistical data.

Linked Work Items	is derived from: SPT1RS-155 - smart/assisted incidence handling is derived from: SPT1RS-154 - availability, robustness, reliability has parent: SPT2TS-1351 - Generally valid epics _ is related to: SPT2TS-1443 - Goal: The goal is to ensure that the railway company (RU & IM) has reliable and...

SPT2TS-1443 - Goal : The goal is to ensure that the railway company (RU & IM) has reliable and readily available assets for maintenance both trackside and onboard, to minimize downtime and ensure that trains run on schedule.
Background: In the railway industry, the availability of assets such as train components, track components, and other equipment is critical to ensuring that the trains run on schedule and that maintenance can be performed as needed. In order to ensure that these assets are available, the railway company needs to be able to compare the past availability of different asset types from different vendors.
Use Case: Comparing the past availability of asset types/components from different vendors for the purpose of purchasing the best option for railway maintenance both trackside and onboard.
Steps:
1. Identify the asset types/components that are needed for railway maintenance both trackside and onboard.
2. Gather data on the past availability of these asset types/components from different vendors.
3. Analyze the data to determine the vendor that has provided the most reliable and readily available assets in the past.
4. Make a purchasing decision based on the vendor that has provided the best past availability of the assets needed.
Expected Outcome: By comparing the past availability of asset types/components from different vendors, the railway company will be able to purchase the best option for railway maintenance both trackside and onboard. This will ensure that the company has reliable and readily available assets for maintenance and operation, which will minimize downtime and ensure that trains run on schedule.

Linked Work Items	relates to: SPT2TS-1378 - Availability of statistical reporting with regard to the past availability of asset types /components has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1419 - Historical metrics

As an asset manager, I want to get historical metrics of the different asset types & components (for instance information about asset availability), in order to manage performance indicators and statistics. This allows me to recognise dependencies and to strategically optimise the existing system.

Note: 'historical metrics' means that different timestamped data is continuously generated and recorded, this data can be analysed in a dedicated application (locally or remotely). The data is a number of different variables and variable types (boolean, analogue, etc.) that are being recorded. The request is to have something similar to a on-board recording device (black box) installed in trains. It is then possible to reproduce what occurred at a specific point in time, and see how a specific situation evolved over time.

Assumption: the historical metrics of field components are periodically (or on trigger) generated by the components, then possibly aggregated for a limited time (e.g. 1 hour, 6 hours, 1 day, etc.) on a local data collector, and finally transmitted and stored in a dedicated centralised diagnostic system (analytics) running on a server.

Linked Work Items	is derived from: SPT1RS-156 - continuous supervision is derived from: SPT1RS-154 - availability, robustness, reliability has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1414 - Standardised functional view from operational perspective

As an operation manager, I need a standardised functional view, in order to explicitly understand if I can continue to operate my system (ready for safe operation).
Basically the components shall indicate if they are in a state that allows to keep them in regular operations, the indication to be provided by means of a standardised functional view. The latter being the same for components from different suppliers.

Linked Work Items	is derived from: SPT1RS-194 - independent lifecycle, simple exchange is derived from: SPT1RS-196 - increase market size by standardisation has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1827 - Standardised information about product architecture

As an asset manager, I need to identify within a short time (a few hours maximum) a faulty LRU (Line Replaceable Unit)(understand this based on the architecture of a supplied product - equipment of the System Pillar architecture - to the LRU level of detail), in order to replace it and bring the system into regular operation.
By default the information about the product architecture shall be provided for each order, the information structure / skeleton shall be standardised: same for all products, independently from the supplier. The latter helps the asset manager to better and easier understand the described architecture, and quicker recognise a faulty LRU.

Linked Work Items	is derived from: SPT1RS-196 - increase market size by standardisation has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1768 - Proprietary Event Logging Information

As a CCS building block manufacturer, I need the possibility to obtain continuously sent building block specific event logging information from operator, in order to have the data available for further analysis and product enhancements.

Linked Work Items	is derived from: SPT1RS-196 - increase market size by standardisation has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-2265 - Data to analyse an accident and identify the root cause

As an official, I need timely (not more than a few days) access to all relevant data of an accident (all data required to analyse the accident), in order to timely start the analysis of the accident. Scope of the analysis it to identify the root cause of the accident, and describe the fault(s) that resulted in the accident.

Linked Work Items	is derived from: SPT1RS-155 - smart/assisted incidence handling has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-2266 - Data needed for homologation purposes

As an ERA or National Regulator (National Safety Authority), I might need access to specific diagnostic data, in order to use the data as evidence or other purposes during a homologation process.

Note: here diagnostic data is understood as the indication of the operational software version, firmware version, parametrisation file version, hardware version, etc. - In order to confirm that a system tested in the laboratory corresponds to the system running in a field test campaign, and corresponds to the system running operationally, you can rely on such diagnostic data that is directly provided and published by the system itself. The diagnostic data is the feedback loop to the operator after installation is completed.

Linked Work Items	is derived from: SPT1RS-238 - simplify certificates and their impacts has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1415 - Single source of truth as-built

As an operation manager, I want to have an up-to-date representation of my system as built and in operation. Therefore I need information from one single source of truth for the system configuration data (the system representation should be in the form of digital twin), in order not to have to collect configuration data form different systems / sources that may not be synchronised between each others.

Linked Work Items	is derived from: SPT1RS-156 - continuous supervision has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1418 - Get information describing the system model

As an asset manager, I want to get anytime information relevant for the asset planning that describes the system model as it currently is, in order to be able to compare the 'shall model' with the 'is data'. Basically I want to have a feedback loop that allows to compare the system model in the planning system with the current system as it is in the field.

Linked Work Items	is derived from: SPT1RS-154 - availability, robustness, reliability is derived from: SPT1RS-156 - continuous supervision has parent: SPT2TS-1351 - Generally valid epics _ is related to: SPT2TS-1757 - Handling of information describing the system model _ is related to: SPT2TS-1758 - Sub-domain scope: is the comparison of models within the scope of SD2

SPT2TS-1417 - Reliable asset configuration information (report)

As an asset manager or as an entity in charge of maintenance, I want to pull at any time a reliable report (inventory report) of all CCS components I am responsible for, in order to get the information about the units and versions that are currently installed.
The report shows all component identification and running versions of the different CCS components (hardware, software, firmware, parametrisation files, etc.). This information shall be retrievable from remote as well as locally.

Note: This information could be used to plan migration and rollout activities, or to verify that the correct units and versions are installed.

Linked Work Items	is derived from: SPT1RS-156 - continuous supervision has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1421 - Component identification information

As an asset manager, I need the component identification information, in order to spot where this component is in operational use in case of identified systematic errors. This allows me to evaluate in which CCS system instance it is installed, and also to recognise when the same component is used in other assets, this means in assets form different manufactures, or it has been installed during a repair and replacement activity.

Example : a supplier indicates that components from a specific manufacturing lot have to be replaced, for instance due to manufacturing problems. He also provides all serial numbers of the affected components. The components are installed in the field. Based on the component identification information the asset manager should be capable to recognise where the relevant components are located. The service technician can then plan his mission accordingly.

Linked Work Items	is derived from: SPT1RS-154 - availability, robustness, reliability is derived from: SPT1RS-155 - smart/assisted incidence handling has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-1420 - Functional dependencies

As an entity in charge of maintenance, I need functional dependencies descriptions, in order to recognise the source of a failure. This may help to strategically optimise maintenance processes and maintenance guidelines. Basically, a maintenance manager needs documentation describing how different functions / components interact between each other.

Note: 'functional dependencies description' means that documentation provides information how data is exchanged between components, and information about functional chains. Based on this information it is possible to properly recognise the root cause of an issue. E.g. a safety relevant component goes into 'failure' state, although the component is doing fine, but an input information is no longer good.

Linked Work Items	is derived from: SPT1RS-154 - availability, robustness, reliability has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-26624 - Automated CCS System components status reporting

As an entity in charge of maintenance, I want to be automatically informed about the status (warning, faults, active errors, severity, etc.) of CCS components, in order to follow adequate operational procedures. This ensures that in case of issues I can handle appropriately.

Linked Work Items	is derived from: SPT1RS-155 - smart/assisted incidence handling is derived from: SPT1RS-203 - operations/maintenance: assisted systems has parent: SPT2TS-1351 - Generally valid epics _ is parent of: SPT2TS-124260 - Timely CCS System components status reporting for alarms

SPT2TS-124260 - Timely CCS System components status reporting for alarms

As an entity in charge of maintenance, I want to be timely (e.g. within 10 minutes) and automatically informed about defects in a specific CCS trackside component (e.g. defect interlocking, solid frozen switch, etc.) or in specific CCS on-board components (e.g. defect odometry system, etc.), in order be able to quickly react on this issue ensuring a higher availability of the railway system. The goal is to minimise the impact of the defect on the overall system.

Note: The scope of this operational epic is not about safety relevant information, but about information that needs to be handled in near real time (alarms / alerts). Where a quick reaction at operational level is required.

Linked Work Items	is derived from: SPT1RS-155 - smart/assisted incidence handling is derived from: SPT1RS-203 - operations/maintenance: assisted systems is derived from: SPT1RS-154 - availability, robustness, reliability has parent: SPT2TS-26624 - Automated CCS System components status reporting _ is derived by: SPT2TS-124392 - The system shall provide alerts or immediate notifications within 10 min for cri...

SPT2TS-26625 - Optimise the number of maintenance activities, less interruptions of the CCS system mission

As an entity in charge of maintenance, I want to have less frequent maintenance activities, either preventive (per schedule) or corrective maintenance (on failure), this in order to have less interruptions of the mission schedule/infrastructure for the technical system I am responsible for.
A possible solution might be by the monitoring of components based on Condition Based Maintenance (CBM) principles. Whereas diagnostic functions support CBM as transportation channel for the relevant data.

Linked Work Items	is derived from: SPT1RS-154 - availability, robustness, reliability is derived from: SPT1RS-203 - operations/maintenance: assisted systems is derived from: SPT1RS-208 - automated field force communication has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-26629 - Ability to pull CCS components logging data

As an entity in charge of maintenance, I want to remotely pull logging data from all CCS components installed, in order to make a detailed issue analysis or have the possibility to send the logging data to the component manufacturer. The logging data can be pulled centrally (from remote) or locally (on-site, next to the component). The information might only be available when the components are powered and running.

Note: the ability to pull logging data on-site shall remain.
Note: Logging data is the data that each component stores internally, and that the suppliers of the different components require, to analyse issues of their components.

Linked Work Items	is derived from: SPT1RS-156 - continuous supervision has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-48916 - Have access to juridical data

As an emergency manager, I want to remotely pull recorded data and to have timely (not more than a few hours) and easy access to juridical data (e.g. ORD data: SUBSET-027, possibly very similar data is also sufficient) from CCS components in order to perform detailed analysis in case of incidents. This allows recognising the root cause of rather seldom issues occurring during normal operation. The information might only be retrievable when the components are powered and running.

Note: the ability to pull the recorded data on-site shall remain .

Linked Work Items	is derived from: SPT1RS-155 - smart/assisted incidence handling has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-124472 - Define backwards compatible and 'future proof' interfaces

As an entity in charge of maintenance or as CCS integrator, I want that the interfaces between different units are backwards compatible and 'future proof', in order to reduce the complexity in the lifecycle management and data collection. This is based on the experience that interfaces will always evolve (for instance new variables are introduced). Basically, the interfaces should be adaptable. Furthermore, this feature provides investments protection.

Note: if the interfaces do not fulfil this operational epic there is an issue when handling different units communicating with each other. One has always to make accurately sure that units are always compatible with their environment, not only from operational perspective, also with regard to diagnostic and monitoring. This activity can become quite complex when operating a large CCS system.

Linked Work Items	is derived from: SPT1RS-235 - viable forward/backward compatibility is derived from: SPT1RS-234 - viable migration path has parent: SPT2TS-1351 - Generally valid epics

SPT2TS-125887 - Cyber security protection of the diagnostic and monitoring channels

As an entity in charge of maintenance, I want the cyber security protection of the diagnostic and monitoring channels to ensure the integrity and confidentiality of transmitted data. This protection should include real-time threat detection, robust encryption, and secure authentication measures to prevent unauthorised access and maintain system reliability.

Linked Work Items	is derived from: SPT1RS-212 - non invasive/noticeable cyber security is derived from: SPT1RS-213 - local environment cyber security is derived from: SPT1RS-214 - suitable cyber-security levels has parent: SPT2TS-1351 - Generally valid epics

3.2 Track side stakeholder related epics

SPT2TS-49114 - Receive diagnostic information of passive or semi-isolated trackside components

As an IM planning manager, I want to get diagnostic data related to the functioning (availability) of my balises and Euroloops in the field, in order to know if a specific balise / balise group / Euroloop is defect and needs to be repaired.

Note: Based on the fact that passive balises and other semi-isolated trackside components are not connected to any network, this information can possibly only be gathered from trains running on my infrastructure (simpler solution), or dedicated runs with special equipment (more elaborate solution).

Linked Work Items	is derived from: SPT1RS-208 - automated field force communication is derived from: SPT1RS-187 - reduce human elements and factors is derived from: SPT1RS-413 - Definitions for operational processes for the business2business information exchange is derived from: SPT1RS-154 - availability, robustness, reliability has parent: SPT2TS-1352 - Track side stakeholder related epics

SPT2TS-1452 - Timely reporting of timetable relevant defects in a specific interlocking

As an IM operation manager, I want to be timely (e.g. within 10 minutes) and automatically informed about timetable relevant defects in a specific traffic control area (e.g. solid frozen switch, etc.), in order to dynamically adapt the rolling timetable planning to the new situation. The goal is to have the least impact on the overall system, including trains running in the affected track.

Linked Work Items	is derived from: SPT1RS-203 - operations/maintenance: assisted systems has parent: SPT2TS-1352 - Track side stakeholder related epics

SPT2TS-33144 - Timely reporting of timetable relevant defects on-board a train

As an IM operation manager, I want to be timely (e.g. within 10 minutes) and automatically informed about timetable relevant defects on a specific train (e.g. reduced brake performance, reduced traction performance, faulty doors, etc.), in order to dynamically adapt the rolling timetable planning to the new situation. The goal is to have the least impact on the overall system, including other trains running in the same track.

Linked Work Items	is derived from: SPT1RS-203 - operations/maintenance: assisted systems has parent: SPT2TS-1352 - Track side stakeholder related epics

3.3 On Board stakeholder related epics

SPT2TS-1374 - One single service point on-board

As an RU entity in charge of maintenance responsible for a fleet, in addition to remote access, I want to have one single service point on-board the vehicles (connector, accessing point) from where the technicians can interact with all different CCS and non-CCS on-board components, this in order to simplify the access for the people working on-board.

Linked Work Items	has parent: SPT2TS-1353 - On Board stakeholder related epics

SPT2TS-1407 - Statistical issue reporting for CCS on-board components

As a RU asset manager, I want to have statistical data available about issues of CCS on-board components, in order to monitor the performance. This supports my activity when I am in contact with suppliers of the different components.

Note: statistical data can be the number of incidents occurred with a component from a specific supplier, or the type of occurred incidents, and others.

Linked Work Items	is derived from: SPT1RS-155 - smart/assisted incidence handling has parent: SPT2TS-1353 - On Board stakeholder related epics

SPT2TS-48913 - Ability to show diagnostic information

As a driver and / or on-board staff, I want to be able to read diagnostic information from CCS on-board components, in order to support operational procedures in case of issues. The reading shall be possible without the need of tools like maintenance laptop or similar.

Linked Work Items	is derived from: SPT1RS-208 - automated field force communication has parent: SPT2TS-1353 - On Board stakeholder related epics

SPT2TS-48918 - Automated and frequently updated juridical data stored on off-board server

As a RU emergency manager, I want to automatically have frequently updated juridical data (JRU data: SUBSET-027, possibly very similar data is also sufficient) stored on an off-board server from CCS on-board of all vehicles I am responsible for, in order to perform detailed analysis in case of issues. This allows recognising the root cause of rather seldom issues occurring during normal operation.

Linked Work Items	is derived from: SPT1RS-155 - smart/assisted incidence handling is derived from: SPT1RS-156 - continuous supervision has parent: SPT2TS-1353 - On Board stakeholder related epics

4 Status of the work, open points, issues

It has to be clarified if Juridical Data is in the scope of Transversal CCS - SD2 (Diagnostic)

During the weekly meeting on 20.04.2023 it was questioned if Juridical Data handling is in the scope of TCCS-SD2 (Diagnostic).
It has been recognised that the accident / incident examination centres in the different countries often complain about not having the required data in time and / or in the required quality. As a consequence accident / incident examinations are laborious with regard to data preparation and take a long time before the reports are being published, or in worst cases sometimes the needed data is not fully or no longer available.
The Juridical Data required for accident examination is often the same or at least overlapping with diagnostic data. This means that the juridical and diagnostic data can originate from the same source, share at least some variables / information and are transmitted through the same networks / buses.
Question to the domain lead: shall the handling of Juridical Data be addressed within the TCCS-SD2 (Diagnostic), YES or NO?
Possibly this question needs to be aligned with Core-group.

It has to be clarified where manual control of a component is allocated within the System Pillar

It has been recognised that currently it is not defined where the manual control of a component by a user / operator (maintenance activities) is allocated within the System Pillar.
Example of maintenance activities: remote reset of a component to reboot, checking installed versions (software, firmware, hardware, parametrisation files, etc.), checking values of parametrisation variables (e.g. wheel diameters, vehicle UIC ID, etc.), adjusting values of parametrisation variables (e.g. wheel diameters for the odometry system of ETCS on-board), triggering calibration procedure, triggering the dispatch of diagnostic data, triggering the dispatch of logging data, adjusting network settings, exporting diagnostic / log data, monitoring of variable values for test purposes, simulation of variable values for test purposes, etc.

On July 26 2023, the security domain came with the following basic requirement: "The system shall provide the operator with the ability to change the network configuration.".

The following activities have been recognised where a certain degree of standardisation could help:

- A component in the field is defect and is replaced with a new one. The new component comes with factory settings, some basic settings need to be adjusted manually in order to ensure that the new component can communicate with the environment. The basic settings could be: network configuration, component identifier, etc.
  Today every component from another supplier comes with its own maintenance tool (used to adjust the basic settings). Technicians in the field need to be familiar with a number of tools from different suppliers, all looking differently, all having different HMI. However, the technicians seldom have to use the tools, therefore are not familiar with them. The latter is an issue.
  One solution option is to standardise the interface for adjusting the basic settings. Then technicians could use one same tool for all devices from the different suppliers in order to adjust the basic settings.
  Another solution option is to store the basic settings in a plug (dongle, USB-stick, key) inserted in the device. The plug can then be moved from the defect component to the new replacement component.
- The static balises from the different suppliers all come with their specific programming hardware and tool. When a balise needs to be programmed the technicians need to be familiar with different programming hardware and tools, although the data packet contained in the balise could be the same.
  One solution option is to standardise the programming interface. Then technicians could use one same tool for the balises from all different suppliers.

In a first step the topic could be addressed for 3 different components: Balise (programming), Object Controller, Odometry subsystem (on-board).

Question to the domain lead: where is the maintenance interface for maintenance activities allocated within the System Pillar (in which domain, who is responsible)?
Possibly this question needs to be aligned with Coregroup.

Handling of information describing the system model

This question is related to SPT2TS-1418 - Get information describing the system model .
It has to be decided if the feedback loop is transferred via diagnostic or configuration interface.
The feedback loop provides data / information describing the system model as it currently is. This data allows to compare the infrastructure model in the planning system with the current system as it is in the field.

Sub-domain scope: is the comparison of models within the scope of SD2

This question is related to SPT2TS-1418 - Get information describing the system model .
It has to be decided if the function of comparing the infrastructure model in the planning system with the model information provided by components from the field is in the scope of SD2.

5 Tables

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Please update the table of figures.

6 Document checklist, open points, issues

Checklist Render Error: The document checklist custom field 'docChecklist' is not of type 'Text' but it is: PrimitiveTypetypeName=java.lang.String, subtype=null. (or the custom fields is not defined). Please, configure this custom field properly.