




ERJU SYSTEM PILLAR

# TCCS System Definition



# TCCS System Definition

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Abstract	Describes the System Definition as per SEMP D3.1/3.2/3.3 for the TCCS and the Functional Architecture as the basis for Functional Chains (D3.4 SEMP).
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## 1 Preamble


### 1.1 Scope and intended audience

**SPT2TS-131243** - This document defines the System Definition for the Transversal CCS System (TCCS). The focus functional areas of TCCS are related to the configuration process and diagnostic activities, which together ensure consistent setup, monitoring, and transversal support of subsystems within the CCS system.

The configuration process refers to the controlled distribution of static  SPT2TS-127779 - Configuration Data to relevant CCS components. A core aspect of this area, in addition to the distribution process of configuration updates, is the coordination of  SPT2TS-127778 - Engineering data as input for configuration data.

The diagnostics activities cover the mechanisms for diagnostics and monitoring data collection and reporting, supporting maintenance and troubleshooting efforts.

This document outlines the purpose, functional scope, system boundaries, and the system actors involved in these processes for TCCS. [📄 Normal]

**SPT2TS-129336** - The Configuration Process covers only the distribution of static configuration data through the configuration interface as defined in the Data Terms, including  SPT2TS-127779 - Configuration Data. The dynamic or semi-dynamic data, in addition to operational data, are out of the scope of the TCCS Configuration Process and are considered to be fully distributed through the communication (SCI) interfaces. The reason is that the sharing mechanism of dynamic data is an open point: Digital registers are not specified yet, in contrast to the config repositories. The only dynamic interface data considered (with regard to specification) in the CONEMP/TCCS scope is the diagnostic data collected from the assets.

*Note: this restriction is not valid for the data model (CCS/TMS Ontology) defined by TCCS/CONEMP, which will be applied for all communication interfaces exchanging dynamic data.*

DRAFT

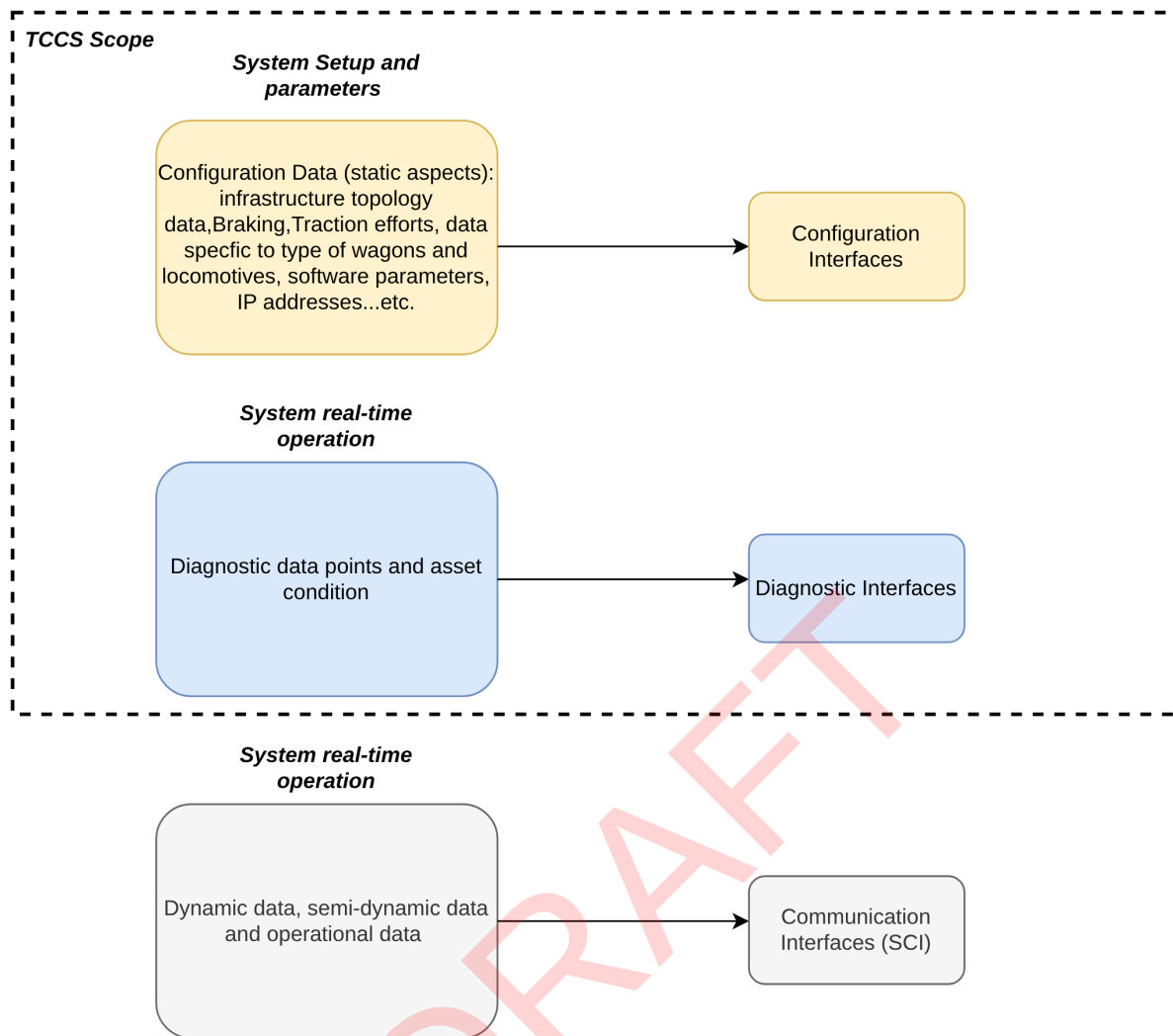


Figure 1 TCCS data scope

[Normal]

**SPT2TS-131239** - The intended audience are all the domains, stakeholders, and actors that are part of System Pillar. [Normal]

### 1.1.1 Rationale for this scoping

#### Separation for different purposes and frequencies

The configuration data is usually less frequent and needed during system setup or reconfiguration, while dynamic/semi-dynamic data are more frequently exchanged and usually during system operation and runtime, which results in more high-performance requirements for the distribution interface, especially for safety-critical systems.

#### Synchronization

By separating the channel for static data and dynamic data, we avoid concurrent communication of runtime data and the associated synchronization problems, especially in the safety-critical system.

#### Migration/backwards compatibility

Today, all dynamic data are communicated over the SCI interfaces. For example, some train data is already part of SCI, e.g. for ATO. Also a similar approach for the Trackside asset/ EULYNX subsystem where the dynamic data is communicated over SCI interfaces.

### Self-contained systems with minimum dependencies

Modern architectures avoid dependencies by self-contained systems, ensuring high availability and reliability during operation.

#### 1.1.2 Scope of Risk Analysis


**SPT2TS-127213** - The TCCS Services system consists of safety-relevant and non safety-relevant data-related functionalities. Hence, it is necessary to differentiate these and define a clear scope for the safety analysis.

The following capabilities and system functions are in scope for the safety analysis



-  SPMS-2428 - Activate configuration data

 Normal ]

#### 1.2 Purpose of TCCS

**SPT2TS-100798** - The purpose of Transversal CCS Components is to provide the service functions that facilitate and secure the operational requirements of multiple CCS and TMS systems in a standardized way. This includes coordination of configuration data, maintenance & diagnostics, system & product configuration, and assurance.  Normal ]

#### 1.3 Glossary

**SPT2TS-131138** - For terms and definitions, refer to  SPT2TS-127830 - Data Terms for Configuration  Normal ]

DRAFT



## 2 System Definition and Mission Profile(s)

### 2.1 System, mission profiles and assumptions

#### 2.1.1 System Description

**SPT2TS-131241** - The goal of Transversal CCS is to define all relevant and necessary supporting systems and service functions for

- Configuration Activation: Ensuring systems receive correct configuration data for safe and efficient operation.
- System Asset Diagnostics: Enabling health monitoring and fault detection across asset.

[  Normal ]

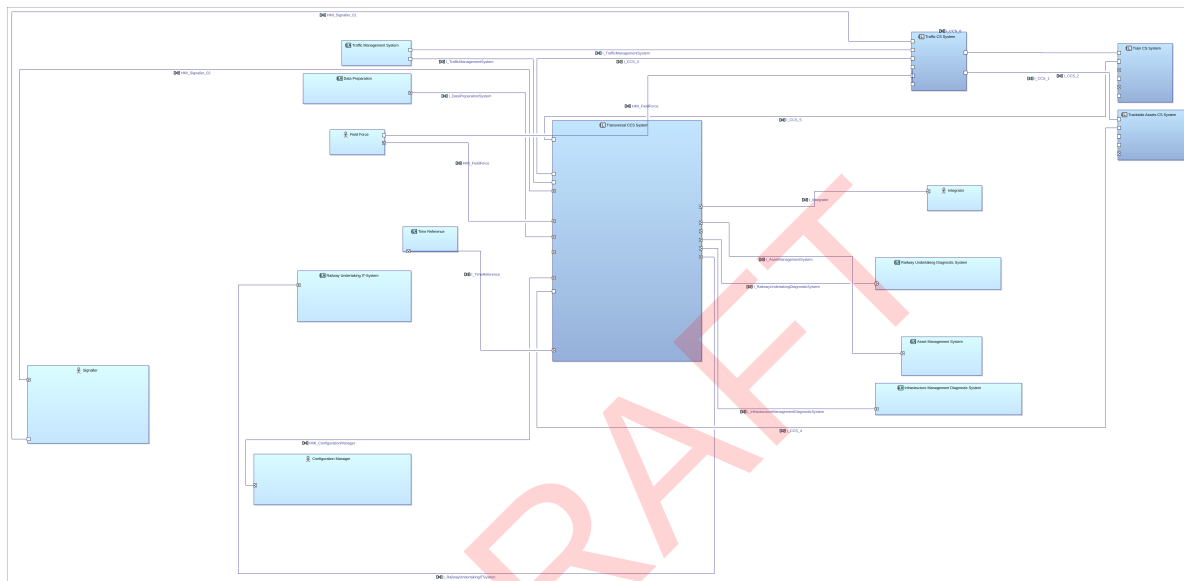


Figure 2 Diagram [LAB] Transversal CCS System [System context]

#### 2.1.2 External Systems Actors

##### SPMS-5390 - Data Preparation

Is responsible to prepare and validate configuration data required by the CCS system.

This system encompasses the contributions of three types of stakeholders:

Infrastructure Manager: Provides infrastructure related configuration data, such as track topology.

Railway Undertaking: Provides Vehicle related configuration data, such as static train/vehicle characteristics used for the parametrisation of the CCS on-board.

Supplier: Delivers application specific configuration data, such as hardware configurations or software parameters for onboard or wayside components.

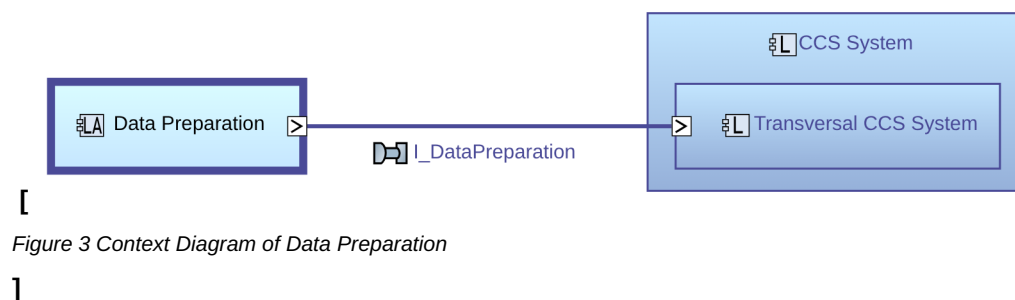


Figure 3 Context Diagram of Data Preparation

### SPMS-6526 - Infrastructure Management Diagnostic System

Is responsible for analysing and interpreting the collected diagnostic and monitoring data from the infrastructure management assets. It focuses on advanced processing of the data.



Figure 4 Context Diagram of Infrastructure Management Diagnostic System

### SPMS-2813 - Traffic Management System

Traffic Management System covers the management and the planning level.

Traffic Management is responsible for all planning activities including producing an operational plan, based upon the operational state and operational events. A conflict free operational plan would be sent to Traffic Control and Supervision usually at the beginning of a service day. Change of planning can be done for the next minutes up to the next year. A plan includes regular or incidence-related commands for infrastructure users (e.g. trains, construction sites), including measures to correct deviations or to stabilize the traffic flow in short term.

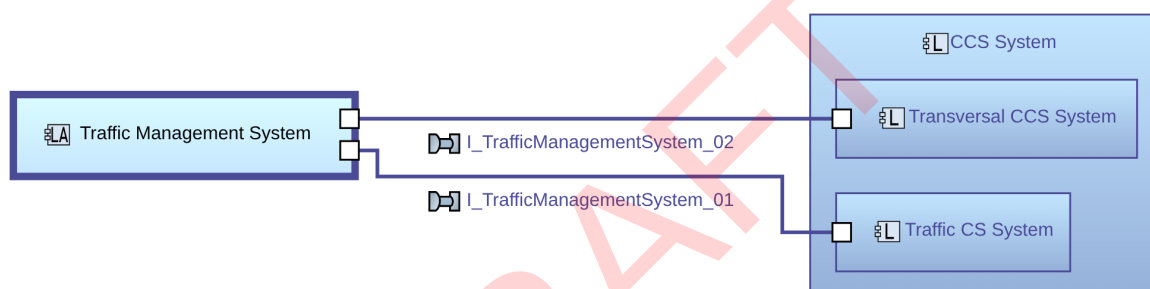


Figure 5 Context Diagram of Traffic Management System

### SPMS-6527 - Railway Undertaking Diagnostic System

Is responsible for analysing and interpreting the collected diagnostic and monitoring data from the railway undertaking assets. It focuses on advanced processing of the data.



Figure 6 Context Diagram of Railway Undertaking Diagnostic System

### SPMS-6528 - Asset Management System

Is responsible to track the condition, lifecycle, and maintenance activities of railway assets, supporting informed decisions and optimised maintenance planning based on diagnostic and monitoring data.

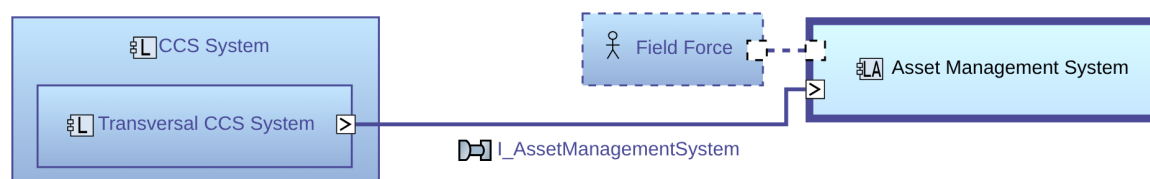
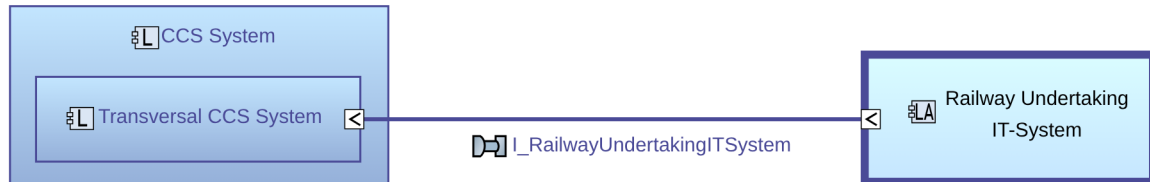


Figure 7 Context Diagram of Asset Management System

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### SPMS-5392 - Railway Undertaking IT-System

is responsible to provide information about railway undertaking planning times of vehicle configuration updates.



[

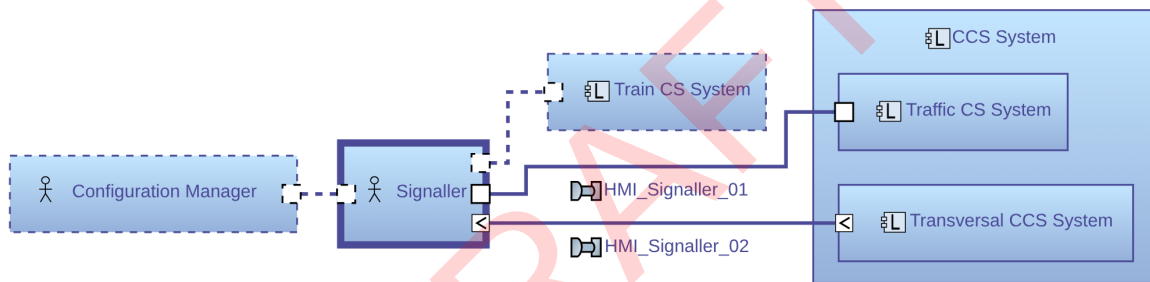
Figure 8 Context Diagram of Railway Undertaking IT-System

]

### 2.1.3 Human Actors

#### SPMS-2827 - Signaller

Staff in charge of authorising trains/shunting movements and of issuing instructions to train drivers to ensure safe train operation.



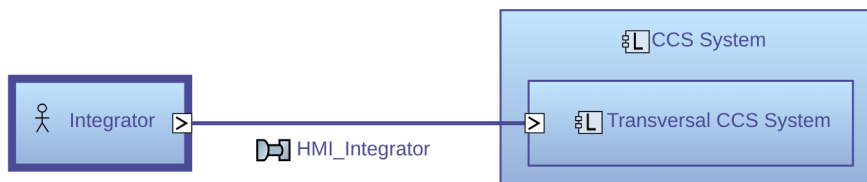
[

Figure 9 Context Diagram of Signaller

]

#### SPMS-6882 - Integrator

is responsible for the overall CCS Configuration of a specific instance Deployment of the CCS System including: Integration Testing, Verification, Validation, Approval (including assessment according to TSI CCS (if relevant) and CENELEC standards (if relevant)), Homologation (authorisation for vehicle or trackside instances).



[

Figure 10 Context Diagram of Integrator

]

#### SPMS-5389 - Configuration Manager

is responsible to manage and supervise distribution of configuration data published by Integrators for CCS system. This role is also responsible for producing the distribution-job defining the target and when to preload and activate Configuration data. In this context it is usually an Infrastructure Manager or Train

Operator/Owner.



Figure 11 Context Diagram of Configuration Manager

### SPMS-2808 - Field Force

The field force is the single point of contact when maintenance activity or construction work is carried out in the field, e.g. this actor is responsible for the safety of the staff in the field.

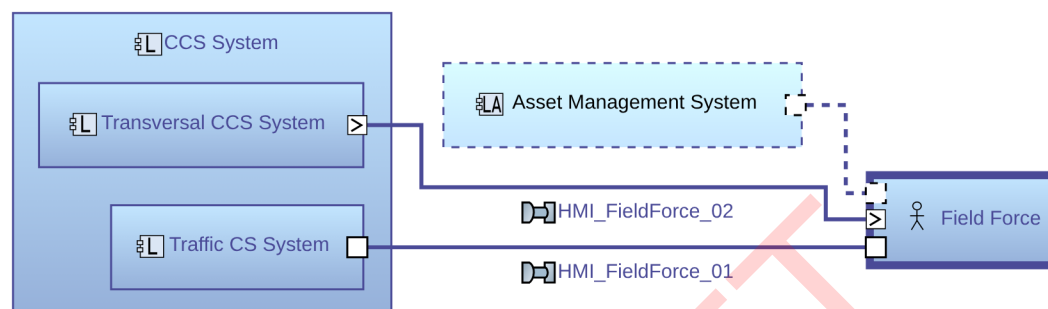


Figure 12 Context Diagram of Field Force

### SPMS-6268 - Time Reference

Represents an integral entity designed to supply precise time information. Serve as a reliable source for current time data across multiple regions and time zones. Maintain synchronisation with official global time standards, ensuring accurate and consistent time delivery.



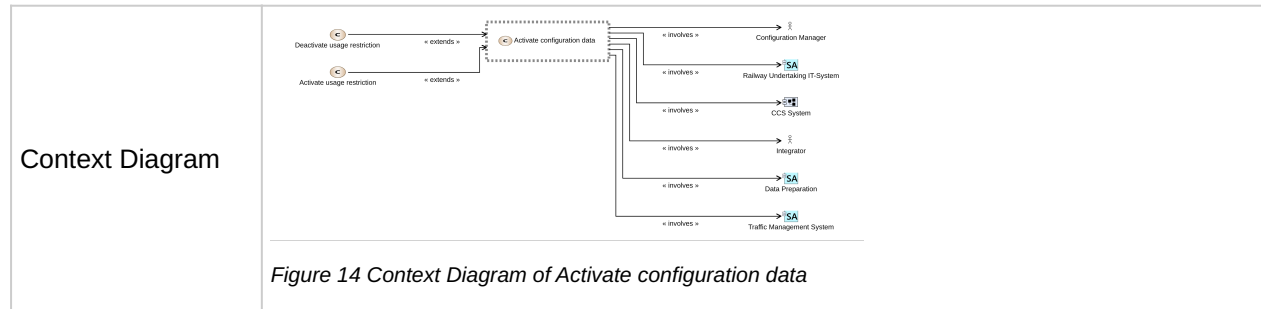
Figure 13 Context Diagram of Time Reference

## 2.1.4 System objectives

### SPMS-2428 - Activate configuration data

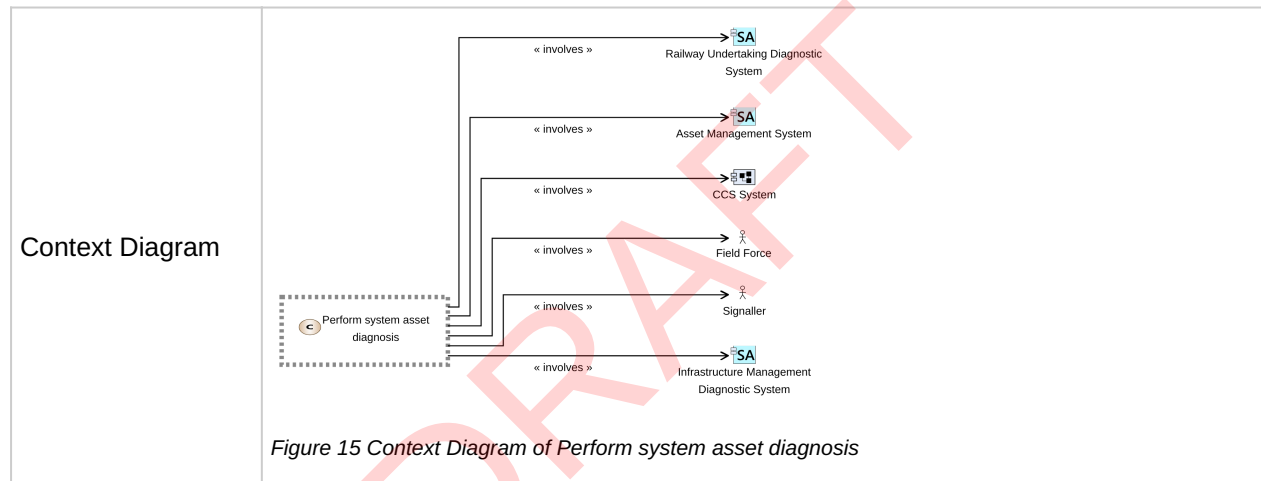
This capability enables the import and update SPT2TS-127779 - Configuration Data, including steps such as preloading, deactivation, and activation within the CCS system. In addition, it provides a mechanism to distribute new configuration data across different system levels in a consistent and controlled manner. This capability is extended by Activate usage restriction and Deactivate usage restriction capabilities when

handling configuration updates related to infrastructure side.



### SPMS-2435 - Perform system asset diagnosis

This capability enables the continuous monitoring and health assessment of assets within the CCS system. It involves supervision of asset conditions and performance to detect degradation, faults, or anomalies. The system evaluates diagnostic and monitoring data to determine asset health status and provides insights to relevant stakeholders.






## 2.1.5 Mission profiles

**SPT2TS-131263** - The TCCS system operates as a transversal layer across the CCS system. It supports CCS system by providing configuration (distribution of static configuration data) and diagnostics (system monitoring, fault detection, and reporting) for multiple CCS subsystems.

Two mission profiles are defined for operational context:

- High density traffic
- Low density traffic

For the TCCS, the functional behavior is identical in both profiles. The  SPMS-2428 - Activate configuration data and  SPMS-2435 - Perform system asset diagnosis capabilities follows the same procedures, activation conditions, and constraints regardless of traffic density. [ Normal]

### 2.1.5.1 Operating assumptions

See chapter  SPT2TS-100855 - System operating conditions and constraints


### SPT2TS-131264 -

- TCCS operates in similar way independent of traffic density.

- Configuration data activation is restricted to controlled conditions with operational systems in safe mode.
- Diagnostics can be performed during operation but is used solely as a support function, not for direct operational control.

[ Normal ]


#### 2.1.5.2 Operating factors

See chapter  SPT2TS-100861 - Operating procedures


#### 2.1.5.3 Reference mission profile(s)

##### SPT2TS-131265 -

- High density traffic: No change to TCCS processes
- Low density traffic: No change to TCCS processes

[ Normal ]

#### 2.1.5.4 Long term maintenance strategy and conditions

See chapter  SPT2TS-100857 - System maintenance conditions

#### 2.1.6 System states

N/A

### 2.2 System Interfaces


#### 2.2.1 Interfaces and interactions with physical environment

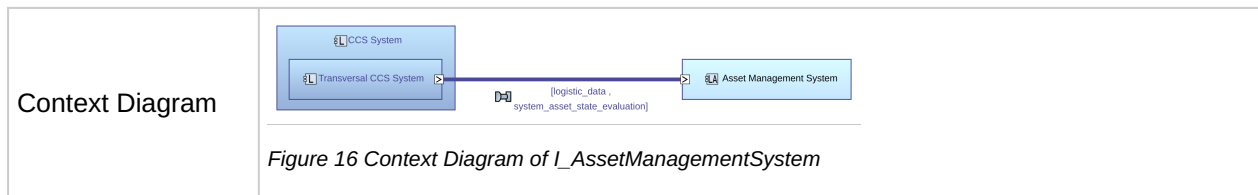
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#### 2.2.2 Interfaces and interactions with External systems




##### SPMS-6564 - I\_AssetManagementSystem

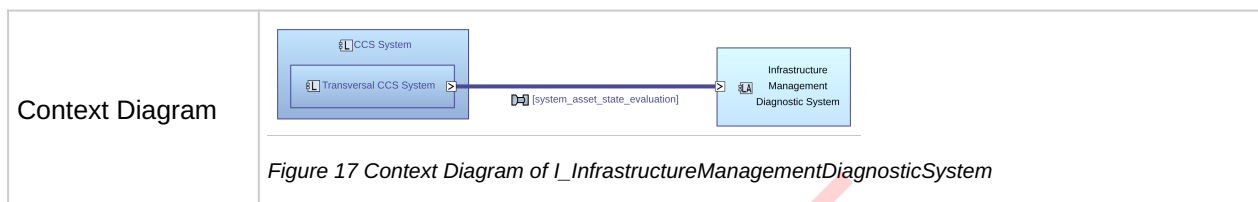
The interface  SPMS-6564 - I\_AssetManagementSystem connects  SPMS-2819 - Transversal CCS

System with  SPMS-6528 - Asset Management System.






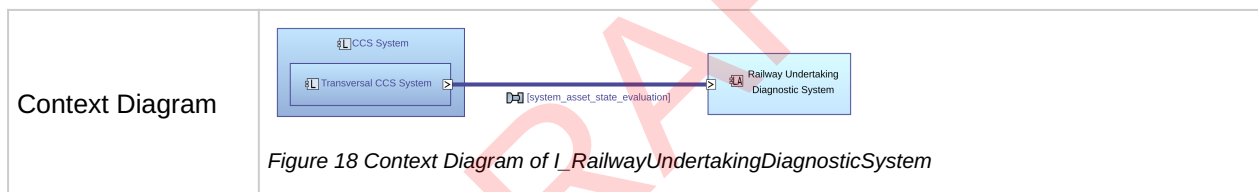
### SPMS-6565 - I\_InfrastructureManagementDiagnosticSystem

The interface  SPMS-6565 - I\_InfrastructureManagementDiagnosticSystem connects  SPMS-2819 - Transversal CCS System with  SPMS-6526 - Infrastructure Management Diagnostic System.






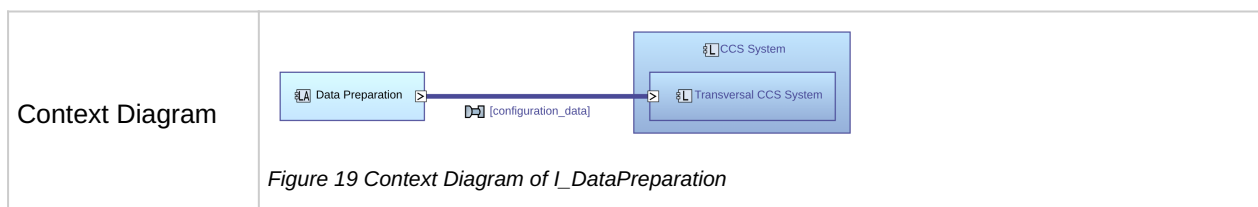
### SPMS-6566 - I\_RailwayUndertakingDiagnosticSystem

The interface  SPMS-6566 - I\_RailwayUndertakingDiagnosticSystem connects  SPMS-2819 - Transversal CCS System with  SPMS-6527 - Railway Undertaking Diagnostic System.



### SPMS-5404 - I\_DataPreparation

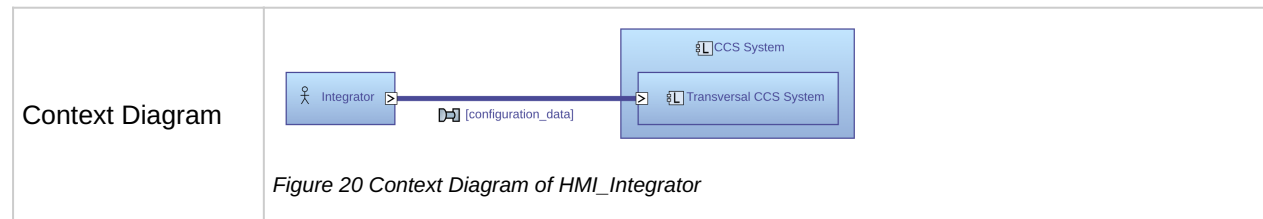
The interface  SPMS-5404 - I\_DataPreparation connects  SPMS-5390 - Data Preparation with  SPMS-2819 - Transversal CCS System.






### SPMS-6912 - HMI\_Integrator

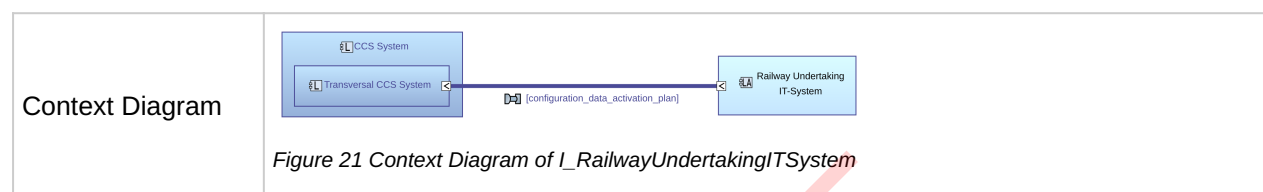
The interface  SPMS-6912 - HMI\_Integrator connects  SPMS-6882 - Integrator with  SPMS-2819 -

## Transversal CCS System.






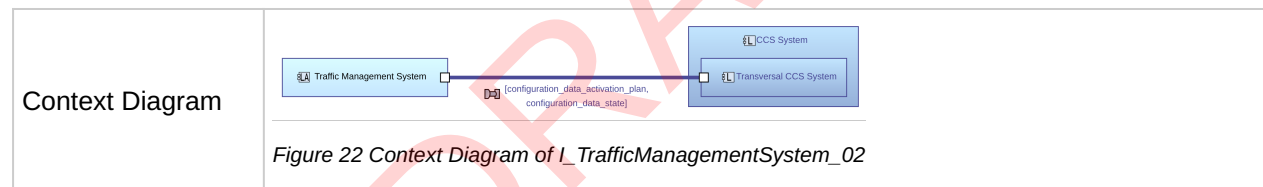
### SPMS-5405 - I\_RailwayUndertakingITSystem

The interface  SPMS-5405 - I\_RailwayUndertakingITSystem connects  SPMS-2819 - Transversal CCS System with  SPMS-5392 - Railway Undertaking IT-System.






### SPMS-6690 - I\_TrafficManagementSystem\_02

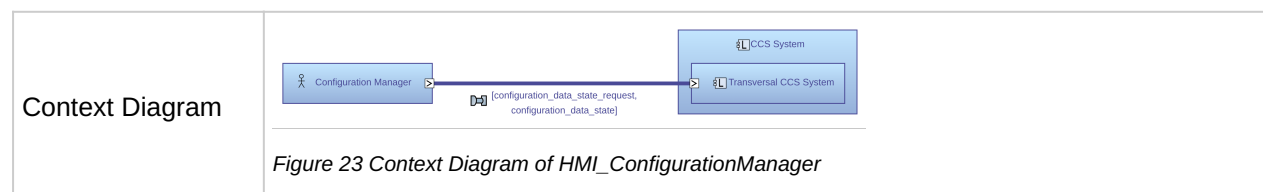
The interface  SPMS-6690 - I\_TrafficManagementSystem\_02 connects  SPMS-2813 - Traffic Management System with  SPMS-2819 - Transversal CCS System.





## 2.2.3 Interfaces and interactions with human actors

### SPMS-5402 - HMI\_ConfigurationManager


The interface  SPMS-5402 - HMI\_ConfigurationManager connects  SPMS-5389 - Configuration Manager with  SPMS-2819 - Transversal CCS System.

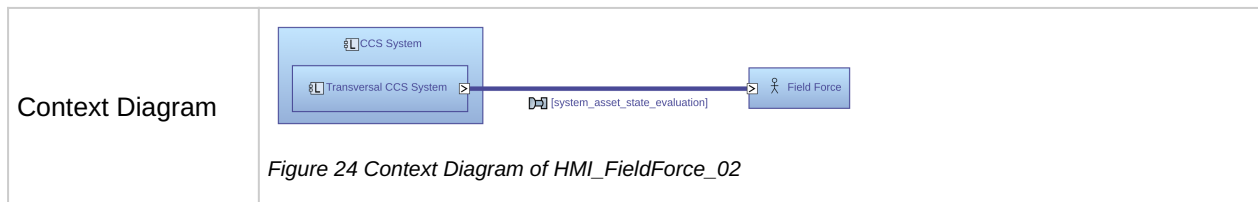


### SPMS-7320 - HMI\_FieldForce\_02




The interface  SPMS-7320 - HMI\_FieldForce\_02 connects  SPMS-2819 - Transversal CCS System

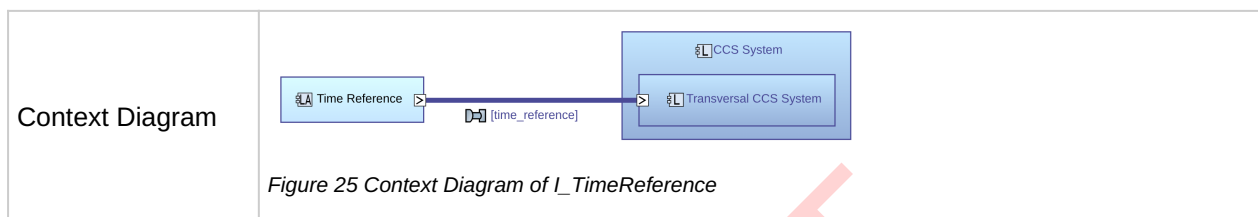


with  SPMS-2808 - Field Force.



### SPMS-6270 - I\_TimeReference

The interface  SPMS-6270 - I\_TimeReference connects  SPMS-6268 - Time Reference with  SPMS-2819 - Transversal CCS System.



### 3 System Functions

**SPT2TS-100825** - The Transversal CCS describes a set of System Functions that are defined in the SuC. The SuC here refers to the TCCS System. These functions have inputs and outputs that allow other functions in the SuC (or outside of this) to operate autonomously. This section describes the functions of the SuC and the border elements that participate in the activation of these functions (such as stakeholders involved in the operation of the SuC or elements that are subject to updating or maintenance).

[Normal]

#### 3.1 Functional Overview

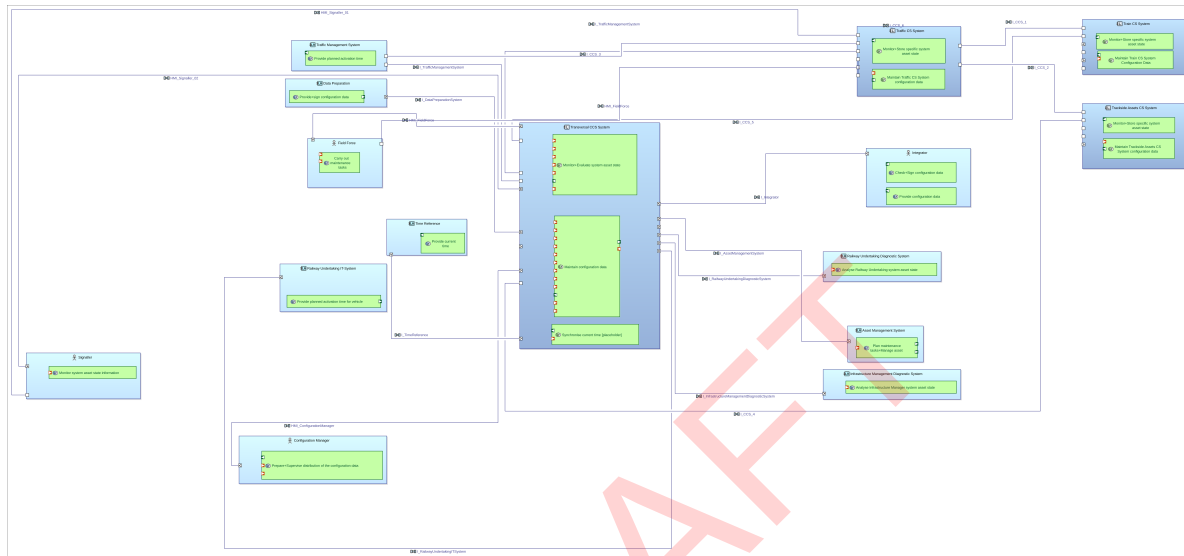


Figure 26 Diagram [LAB] Transversal CCS [Function allocation]

##### 3.1.1 Functions in the scope of System under Consideration

###### **SPMS-2834 - Maintain configuration data**

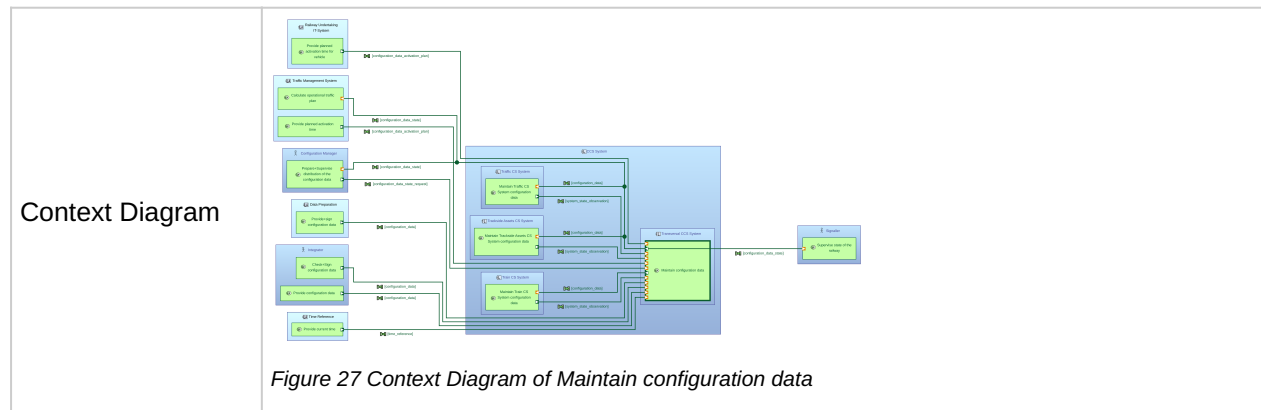
This function is allocated to **SPMS-2819 - Transversal CCS System**.

This function refers to the continuous process of managing, updating, and maintaining (including functionalities like preloading and activation) the configuration data of a system.

Furthermore this functions distributes new configuration data and its system version for all systems in TMS and CCS.

This functions also request to preload or request to activate a specific system configuration and system version. This function enables safe configuration state (e.g. stop system operation) for activation of system configuration and requests to restart the operation of the subsystem after successful new system

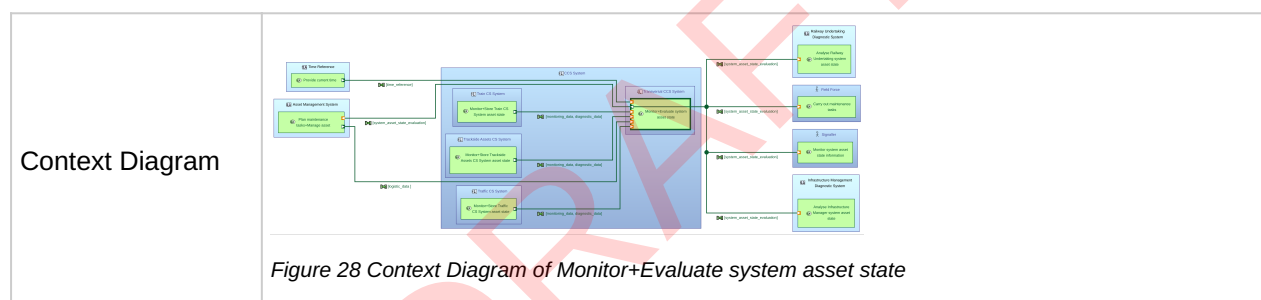
configuration activation.



**SPMS-4502 - Monitor+Evaluate system asset state**

This function is allocated to  SPMS-2819 - Transversal CCS System.

This function monitors the CCS System assets, evaluates and displays the actual state of these assets based on the aggregated data for maintenance.



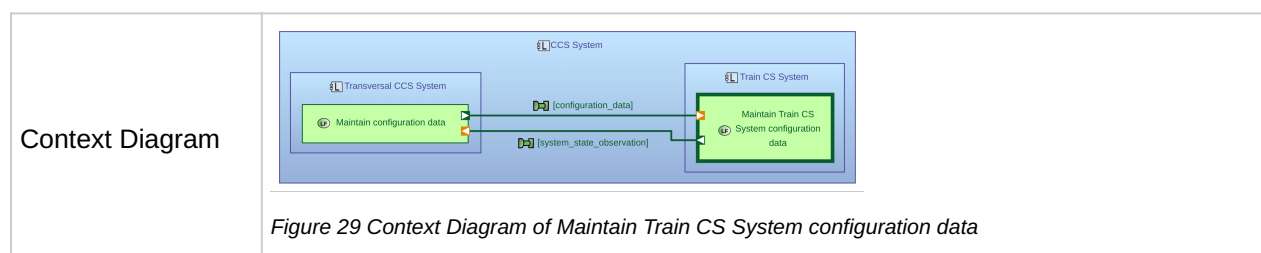
### 3.1.2 Function outside scope of System under Consideration

**SPMS-7248 - Maintain Train CS System configuration data**

This function is allocated to  SPMS-2807 - Train CS System.

This function is allocated to the **OS** and **MS** 2001 Train OS System.

This functions preloads, and activates preloaded system configuration version. For configuration changes that have an implication on the operation or safety, this function also stops the operation of the system for system configuration purposes before the activation, and restarts the operation of the system for system configuration purposes after the activation of the new system configuration. Finally, this function distributes the new active system configuration data.



## SPMS-2840 - Maintain Traffic CS System configuration data

This function is allocated to  SPMS-2823 - Traffic CS System.

This functions preloads, and activates preloaded system configuration version. For configuration changes

that have an implication on the operation or safety, this function also stops the operation of the system for system configuration purposes before the activation, and restarts the operation of the system for system configuration purposes after the activation of the new system configuration. Finally, this function distributes the new active system configuration data.

This function stores, updates and delivers static trackside attribute data. The data is synchronised downstream from the Transversal CCS data storage and no changes are provided upstream from this function. As the function does not manipulate the data in any way, the input is the same as the output.

Context Diagram

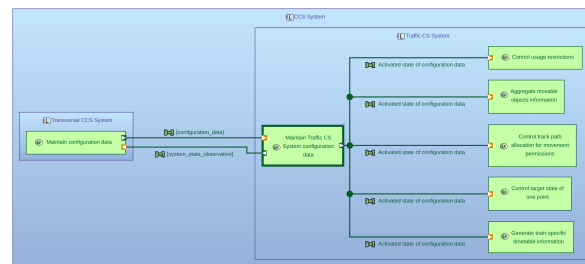


Figure 30 Context Diagram of Maintain Traffic CS System configuration data

### SPMS-6534 - Maintain Trackside Assets CS System configuration data

This function is allocated to SPMS-2818 - Trackside Assets CS System.

This function refers to the continuous process of managing, updating, and maintaining (including functionalities like preloading and activation) the configuration data of Trackside Assets CS.

Context Diagram

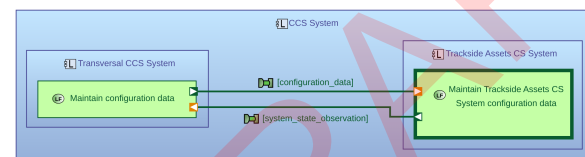


Figure 31 Context Diagram of Maintain Trackside Assets CS System configuration data

### SPMS-6884 - Monitor+Store Train CS System asset state

This function is allocated to SPMS-2807 - Train CS System.

This function monitors and stores the state of Train CS System, in order to provide asset conditions continuously.

Context Diagram

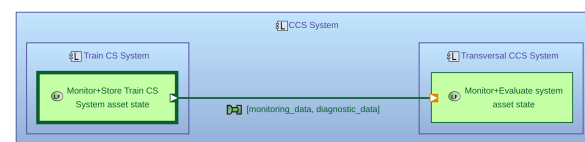


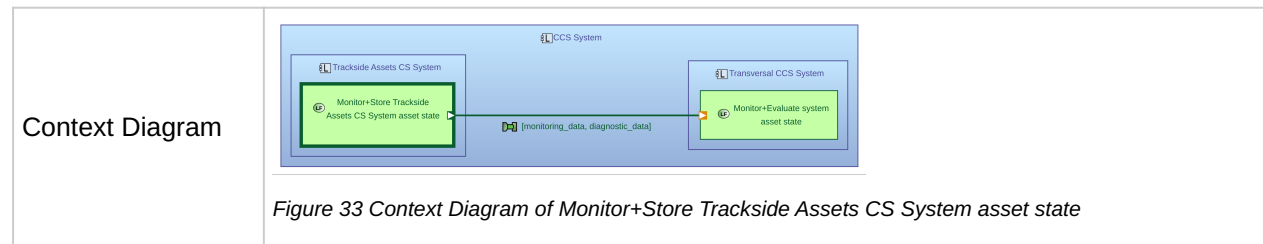
Figure 32 Context Diagram of Monitor+Store Train CS System asset state

### SPMS-6533 - Monitor+Store Trackside Assets CS System asset state

This function is allocated to SPMS-2818 - Trackside Assets CS System.

This function monitors and stores the state of SPMS-2818 - Trackside Assets CS System, in order to

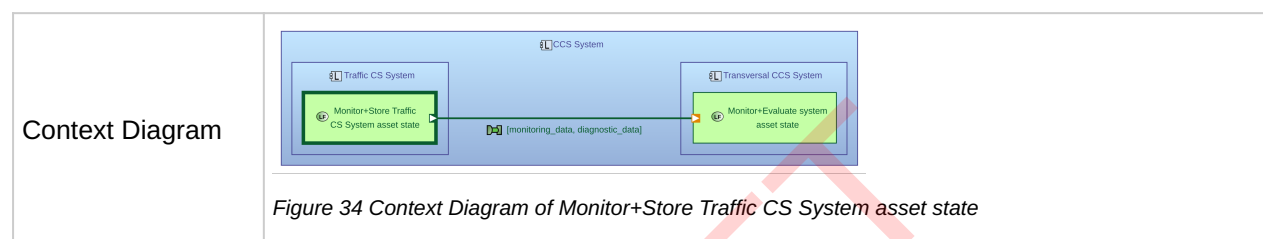
provide asset conditions continuously.



### SPMS-2895 - Monitor+Store Traffic CS System asset state

This function is allocated to SPMS-2823 - Traffic CS System.

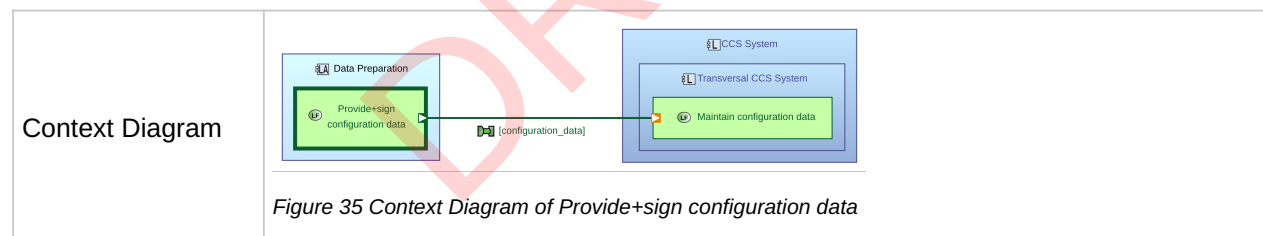
This function monitors and stores the state of SPMS-2823 - Traffic CS System, in order to provide asset conditions continuously.



### SPMS-5395 - Provide+sign configuration data

This function is allocated to SPMS-5390 - Data Preparation.

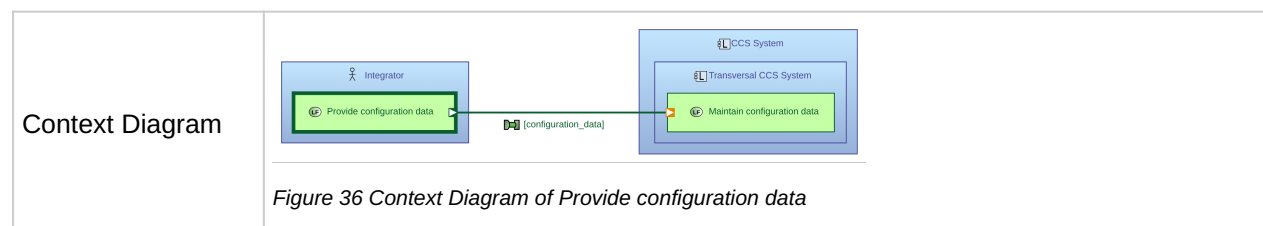
This function prepares and provides the infrastructure data required for CCS system configuration.



### SPMS-6885 - Provide configuration data

This function is allocated to SPMS-6882 - Integrator.

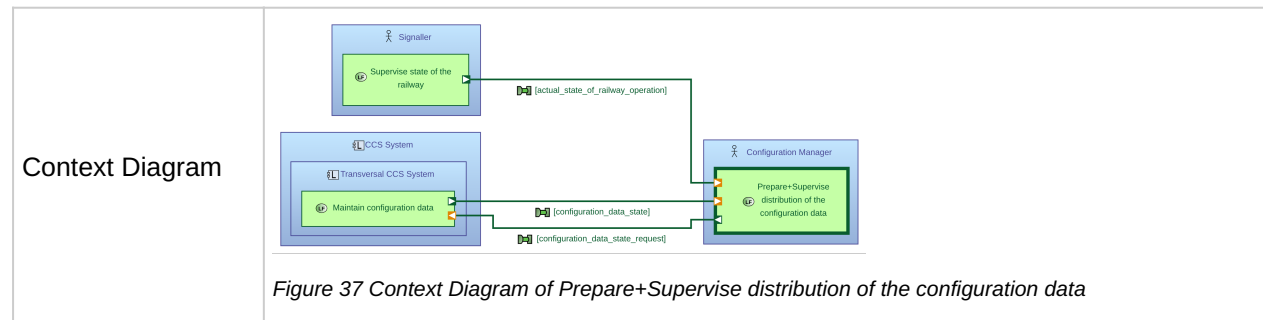
This function enables the Integrator to prepare and structure configuration data based on system dependencies.




### SPMS-5400 - Prepare+Supervise distribution of the configuration data

This function is allocated to SPMS-5389 - Configuration Manager.

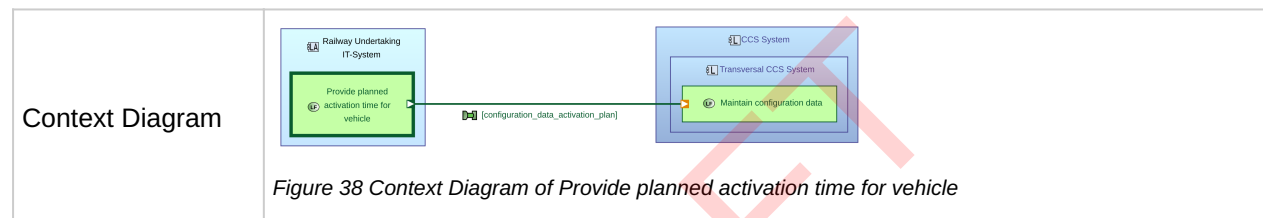
This function assists the configuration data preparation and activation.




### SPMS-6886 - Provide planned activation time for vehicle

This function is allocated to  SPMS-5392 - Railway Undertaking IT-System.

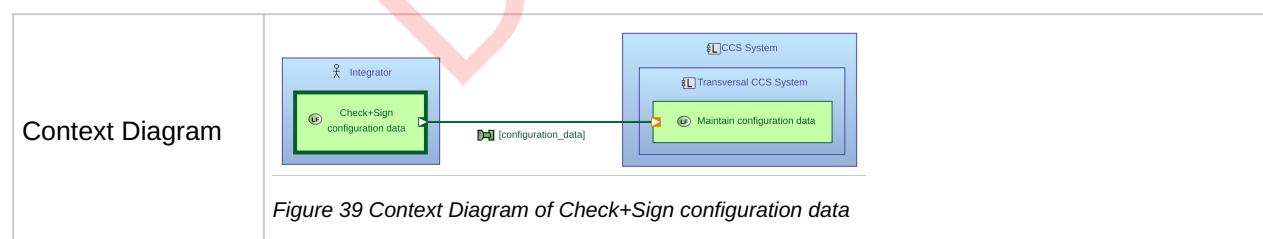
This function manages the update of configuration data for vehicle which includes also the provision of the best point in time for the update.




### SPMS-6883 - Check+Sign configuration data

This function is allocated to  SPMS-6882 - Integrator.

This function enables the Integrator to verify the completeness and consistency of configuration data before it is released. It ensures that all dependencies are correctly resolved. Upon successful checking, the configuration data is formally approved and signed as valid for distribution and use in the CCS system.

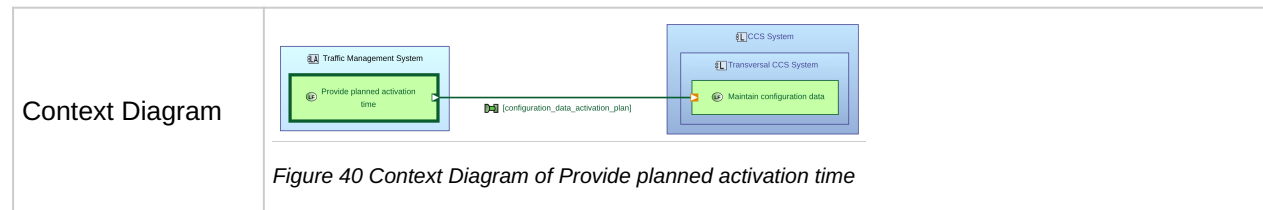


### SPMS-5399 - Provide planned activation time

This function is allocated to  SPMS-2813 - Traffic Management System.

This function manages the update of configuration data which includes also the provision of the best point

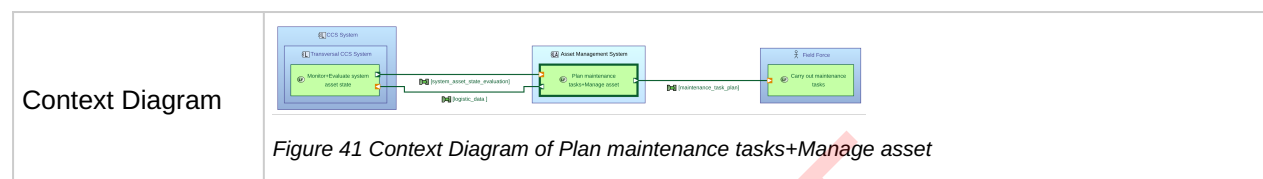
in time for the update.




### SPMS-4503 - Plan maintenance tasks+Manage asset

This function is allocated to  SPMS-6528 - Asset Management System.

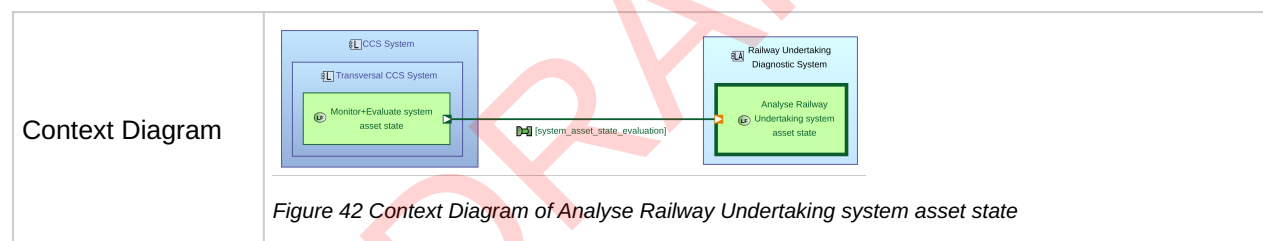
This function organises schedules and assigns tasks to maintenance team based on the evaluated diagnostic data.




### SPMS-6530 - Analyse Railway Undertaking system asset state

This function is allocated to  SPMS-6527 - Railway Undertaking Diagnostic System.

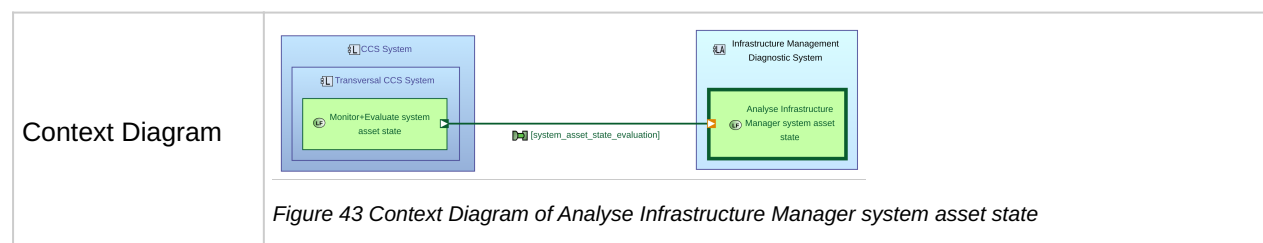
This function analyses the diagnostics and monitoring data for advanced processing/interpretation in cases of condition based maintenance for example.



### SPMS-6529 - Analyse Infrastructure Manager system asset state

This function is allocated to  SPMS-6526 - Infrastructure Management Diagnostic System.

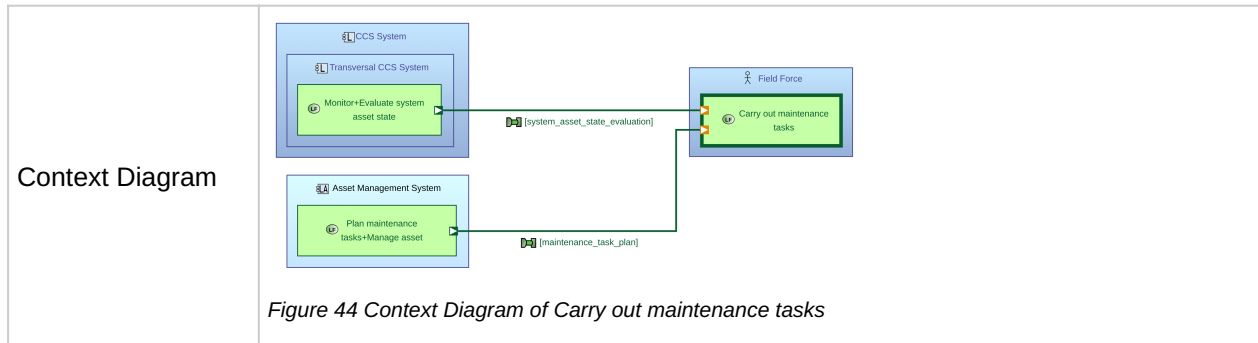
This function analyses the diagnostics and monitoring data for advanced processing/interpretation in cases of condition based maintenance for example.



### SPMS-7319 - Carry out maintenance tasks

This function is allocated to  SPMS-2808 - Field Force.

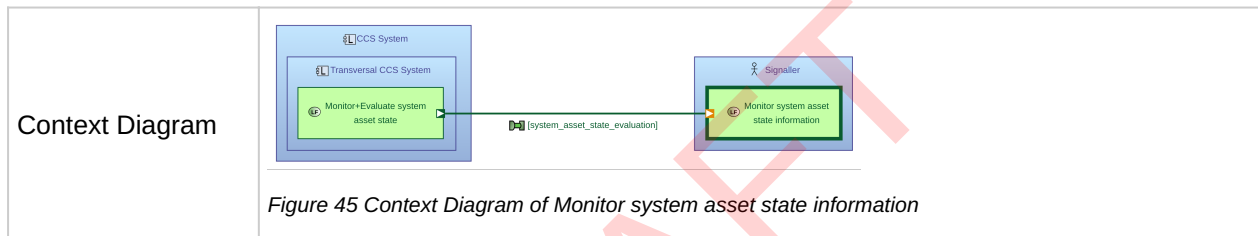
This function executes the maintenance schedule and tasks.



### SPMS-6532 - Monitor system asset state information

This function is allocated to SPMS-2827 - Signaller.

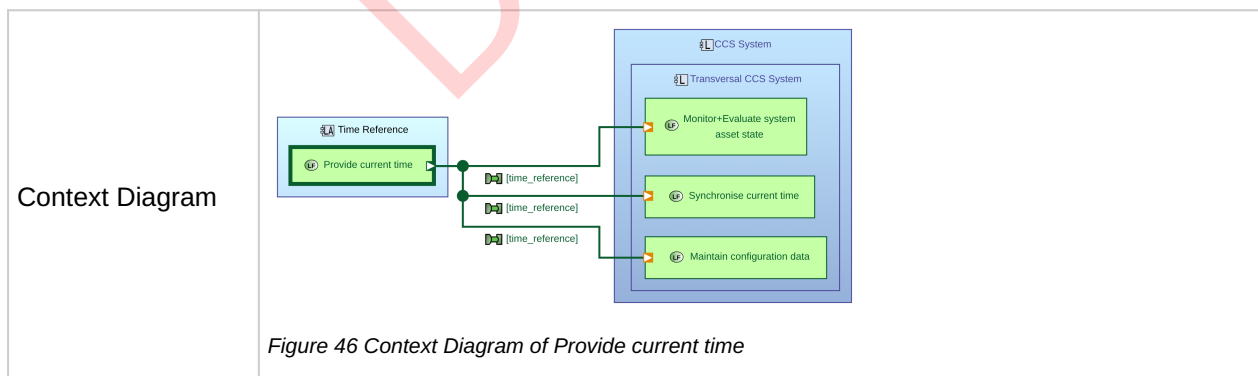
This function enables the signaller to monitor the state of system assets through high-level diagnostic and monitoring data supporting awareness and decision-making without requiring technical analysis.



### SPMS-6269 - Provide current time

This function is allocated to SPMS-6268 - Time Reference.

This function provides time updates in multiple formats to suit diverse requirements.





## 4 Scope of operational requirements influencing the system

**SPT2TS-100849** - The TCCS domain shall check for potential operational context information that will have an impact on the SuC development. They can be issued from legacy systems/projects or from new official documents (e.g. European directive, RU/IM internal documentation). [📄 Normal]

**SPT2TS-131173** - The operational requirements for the SuC were defined as a part of

1. *SPT2TS/SD1 Operational Analysis/TCCS SD1 ORS - Operational Requirement Specification : 723561*
2. 📄 TCCS SD2 - Operational Epics
3. 📄 TCCS Configuration - Operational Epics

Note: There is a planned activity to add a full CONEMP Operational Analysis to the mentioned documents, which will be integrated. [📄 Normal]

### 4.1 Review of past experience data for similar systems

**SPT2TS-100851** - This section shall identify and list all legacy data from the system(s) having the same (or partially same) scope of functionalities that could be useful to define the SuC. This section is not applicable for SuC deploying new functionalities where no similar system exist (e.g. ATO GoA3/4). [📄 Normal]

Today, regarding the capabilities of TCCS, some IM and supplier-specific processes and tools/systems exist without available data that can be applied or shared in the harmonised context of this SuC. However, the configuration and diagnostic services will build up on existing OCORA and EULYNX specifications (SMI, SDI), so potential experiences from the past are considered here.

### 4.2 Constraints imposed by existing infrastructure

**SPT2TS-100853** - This section shall identify and list all existing constraints which shall be taken into account when designing the SuC. [📄 Normal]

**SPT2TS-100854** -

- Existing track topology (e.g. passing track lengths),
- Existing interfaces (e.g. from outside facilities),
- Existing safety facilities (e.g. for train system),
- Removal of previously installed systems (e.g. axles counters when migrating to ETCSLR)

[📄 Normal]

The following constraints must be taken into account during the design of SuC:

- it must be able to import existing data of the infrastructure or other asset information
- it must be compatible with introduced OCORA and EULYNX interfaces (SMI, SDI)

### 4.3 System operating conditions and constraints

**SPT2TS-100856** - This section shall identify and list all existing operational conditions and constraints which shall be considered when designing the SuC. [📄 Normal]

The activation functionality in 📄 SPMS-2428 - Activate configuration data will be performed only when the critical production system goes into a safe configuration mode (e.g., Shut down for operation).

### 4.4 System maintenance conditions

**SPT2TS-100858** - The section shall describe what restrictions and/or circumstances have to be taken into account in relation to maintenance activities to build the SuC. For example, the SuC design is facilitating

maintenance activities with easy access to equipment, proper protections for maintenance staff, and remote diagnostic and update mechanisms. [🟡 Normal]

There are no specific maintenance conditions for the SuC of TCCS.

#### 4.5 Logistic support considerations

**SPT2TS-100860** - The section shall describe which measures of the SuC should be taken into account with regard to obsolescence and packaging, transport, and storage. This is strongly linked to the manufacturing and management of produced SuC. At this step of development, this is not within the scope of ERJU as it is fully linked to each manufacturer's own processes.

The proposal is made to leave the section as "not applicable" with the above justification. [🟡 Normal]

Not applicable to SuC.

#### 4.6 Operating procedures

**SPT2TS-100862** - This section shall describe all operational procedures applicable to the SuC design. This section is not applicable to generic products unless operating procedures are coming from a European directive.


While the functionality provided by SuC supports the railway operation with transversal services like configuration, data provisioning or maintenance, it is not part of the operational procedures. Therefore, no specific procedures are defined for the SuC. As a basis, there will be an operational requirement supplied by each subdomain:

1. *SPT2TS/SD1 Operational Analysis/TCCS SD1 ORS - Operational Requirement Specification : 723561*
2. 📄 TCCS SD2 - Operational Epics
3. 📄 TCCS Configuration - Operational Epics


Note: There is a planned activity to add a full CONEMP Operational Analysis to the mentioned documents, which will be integrated. [🟡 Normal]

## 5 Existing Safety Measures

**SPT2TS-100864** - This sections shall define the existing safety measures or functions that affect the safety of the SuC design. This is to ensure that they are not re-analysed and not forgotten in the future safety analyses (i.e. Phase 3 to Phase 5).


The chapter is closely linked to the definition of functions that are outside the SuC (refer to chapter  SPT2TS-131135 - Function outside scope of System under Consideration). However, the focus of this chapter is exclusively on safety barriers.

This chapter is not intended to capture (new) details of the security measures or functions, but to reference the relevant information from the other chapters and describe their effect.

Finally, all information provided in this section aim at determining the limits for the risk assessment. [ Normal ]

### **SPT2TS-127214** -

Since at least part of the TCCS functionality is considered safety-related (i.e. due to safety-related data or reliable data), existing safety measures, which serve as barriers against hazards in today's processes, are listed.


Note: It is worth mentioning that the safety measures set out below are not strictly those that exist, but rather those that are expected to exist and of course are subject to the corresponding RAMS analyses. [ Normal ]


**SPT2TS-127215** - From the point of view of data entry by the IM, it is considered a formal data preparation process. This data preparation is composed of the following:

- Data preparation plan
- Procedures and checklist
- Tools and tool validation processes

The combination of all of them makes up a data preparation process that responds to a secure introduction of the input information. Hence, the data can be used for system functions up to SIL4. The procedures have safety mechanisms, such as introducing data in a double chain (for example, when entering topological data, it can be inserted by two different engineers at different times and environments). The results of this double chain will be compared and analysed to determine if they have been carried out in the same way.

Additionally, the data preparation tools that take these data as input have a double data quality assurance mechanism (a generation path and a data verification/validation path). If potential tool errors have a direct impact on safety-related data, which are not revealed by other measures (e.g. verification by other tools or humans), the validation and certification of relevant tools are applied (according to EN 5012x). Additionally, the introduction of data, together with the application of the aforementioned procedures, culminates with agreement tests (at the end of the loading process on target devices).


[ Normal ]


**SPT2TS-127216** - From the point of view of activating and loading new software or configuration, various mechanisms can be available that guarantee the loading process. In particular, the charging mode of a target device may be based on activation through mechanical mechanisms that require the action of an operator. When this mechanism is active, and the target equipment is restarted (or the change to load mode is simply requested), only the application to serve loads will be started and not the application that corresponds to the target equipment (for example, an interlock is not started in its normal cycle, nor is it possible to execute commands or read field statuses). This behaviour can be guaranteed by safe SIL-4 (safe design) procedure. At the end of the loading process, the target device must verify that the application and configuration received are complete and compatible. Otherwise, it will be left in a safe (inhibited) state. Additionally, when the equipment is started in normal operating mode, it will send for diagnosis the checksum of the loaded components that maintenance operators can compare concerning the loading report. [ Normal ]

**SPT2TS-124330** - The parametrisation data preparation for ETCS on-board equipment is composed of the following:

- Data definition and preparation at Integrator
- Preparation, procedures and checklist at Supplier of ETCS on-board equipment
- Tools and validation processes at Supplier of ETCS on-board equipment

The ETCS on-board equipment Suppliers have their own process, tools and means to provide the evidence that the parametrisation data used in the ETCS on-board safety related equipment is fit for purpose.

The Suppliers have safety mechanisms in place to ensure that the correct values for each parametrisation variable are being used. [  Normal ]

**SPT2TS-124344** - From the point of view of distributing and activating new software or parametrisation, various mechanisms can be available that guarantee the installation process. In particular, the loading and triggering mode of a target device may be based on activation through mechanical mechanisms that require the action of an operator. When this mechanism is active, and the target equipment is restarted (or the request for loading mode is initiated), possibly only the application to serve loading will be started and not the main application dedicated to the target equipment (for instance, an EVC is not started in its normal operational mode, nor is it possible to execute commands or read field statuses). This behaviour is ensured by up to SIL-4 functions (safe design). At the end of the loading process, the target device must verify that the received application and parametrisation are complete and compatible. Otherwise, it will be left in a safe (inhibited) state. Additionally, when the equipment is started in normal operating mode, it will send for diagnosis the checksum of the loaded components allowing maintenance operators comparison with the loading report. [  Normal ]

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