TCCS - Data Model_00_Release Notes

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2 Terms

SPT2TS-2040 - The CCS/TMS Data Model defines the harmonised language to generate and transport the Domain Data at System Pillar interfaces. The Transversal CCS Subdomain 1 (SD1) is responsible for the specification of the CCS/TMS Data Model in collaboration with

- the System Pillar domains which apply the defined data structures in interface specifications
- the Innovation Pillar which proves the applicability of the data model by demonstrators.

[Content to be approved **]**

Engineering Data

The Engineering Data as part of the SPT2TS-2040 - CCS/TMS Data Model contains all the base data (i.e., track topology, track geometry, track asset configuration) for compiling the next version(s) of use case-specific Domain Data. The standardized Engineering Data comprehensively covers the data needs for the SERA in the scope of the System Pillar (i.e. radio-based ETCS only). Specific data needed for migration is out of the scope of SPT2TS-2040 - CCS/TMS Data Model.

Domain Data

Domain Data as part of the SPT2TS-2040 - CCS/TMS Data Model is a use-case-specific representation of information following the specific needs of affected systems and their functionalities implementing the use case. Domain data are a tailored and potentially transformed subset of Engineering Data.

3 Introduction CCS/TMS Data Model

SPT2TS-2037 - A harmonised digital CCS/TMS system requires a shared data language applied at all relevant interfaces with similar exchange items. Furthermore, it requires comprehensive engineering data for planning and building assets according to the System Pillar architecture (i.e. radio-based ETCS only). With the SPT2TS-2040 - CCS/TMS Data Model
the System Pillar provides a data structure for standardised engineering and to align a data structure for standardised interface specifications within CCS including CCS-TMS. This data structure shall be suitable across all relevant use cases of the System Pillar such as engineering and communication for traffic control or automated train operation.

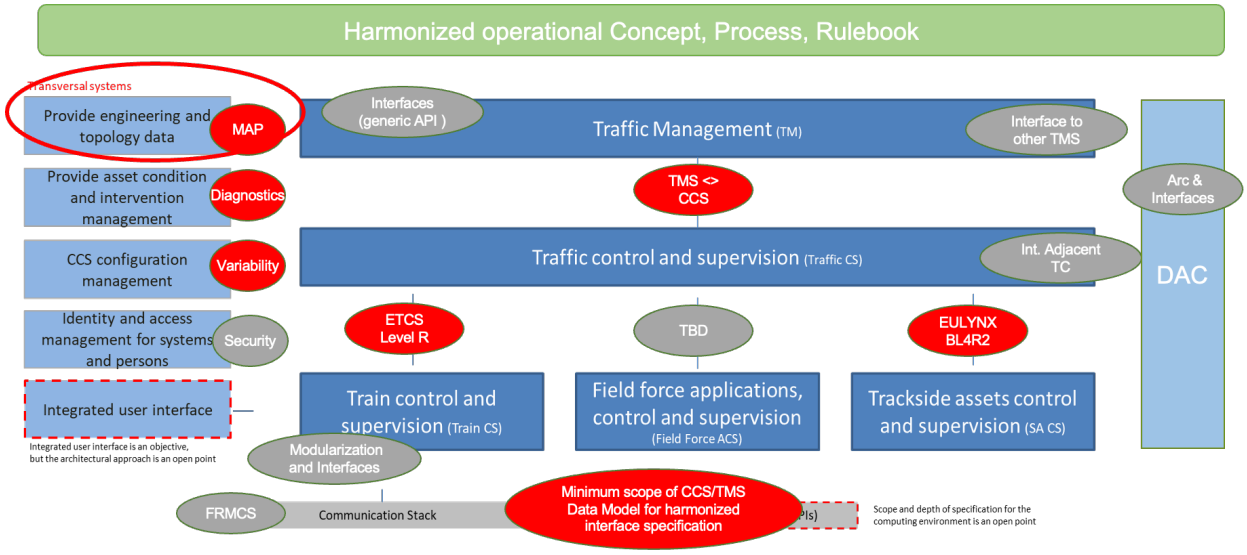

Figure 1 Interfaces between domains and minimum scope of CCS/TMS data model

The Data Model and interface specification must be comprehensive for SERA and therefore sufficiently detailed (not on a high conceptual level), at least on the Functional Interface Specifications (FIS) level within the System Pillar architecture. The development must be according to SEMP. The modelling approach is selected to support these goals.

While the TCCS domain is located in Task 2 of the System Pillar, it offers the inclusion of other tasks with the same and consistently applied CCS/TMS Data Model, as it is already applied for the interface between Task 2 and Task 3 TM.

Besides the static aspects of a data model, the dynamic aspects related to the life cycle of the data are considered by TCCS. This includes the specification of an end-to-end process for data preparation and provisioning (configuration), starting from the required output from the engineering process (SPT2TS-2030 - Engineering Data) up to the compiling of use case-related data (SPT2TS-2031 - Domain Data) for distribution and configuration (e.g. functional use case of Maintenance/Diagnostics or ATO).

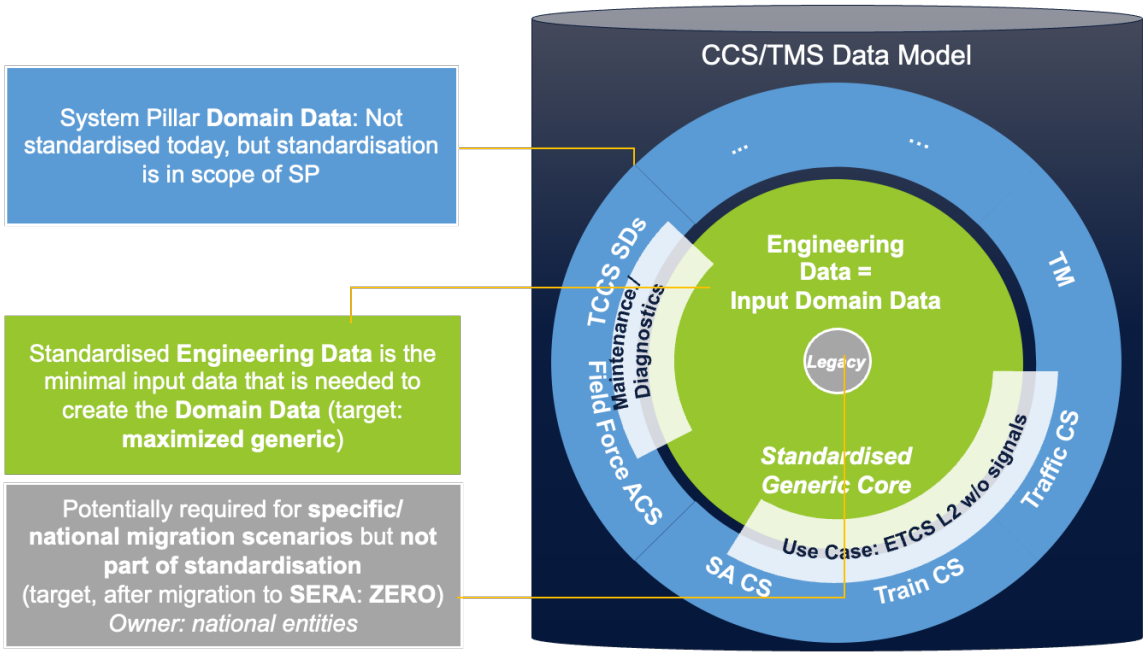

Figure 2 : Scope of harmonised CCS/TMS Data Model for the end-to-end process from preparation/distribution to application of data

[Content to be approved]

For more details, see CCS/TMS Data Model - Scope and Approach for Collaboration and Specification.

4 Structure of the Data Model

SPT2TS-122470 - The CCS/TMS data model follows a compositional tree structure, wherein the root of the model is a composition of several packages that constitute the CCS/TMS data model (e.g., Infrastructure, Restrictions, Rolling Stock, etc.), as shown in the figure below. Every package can be divided into sub-packages (e.g., TopologyArea, GeometryArea, etc.) depending on its needs. The figure below depicts the CCS/TMS model structure with the current included content:

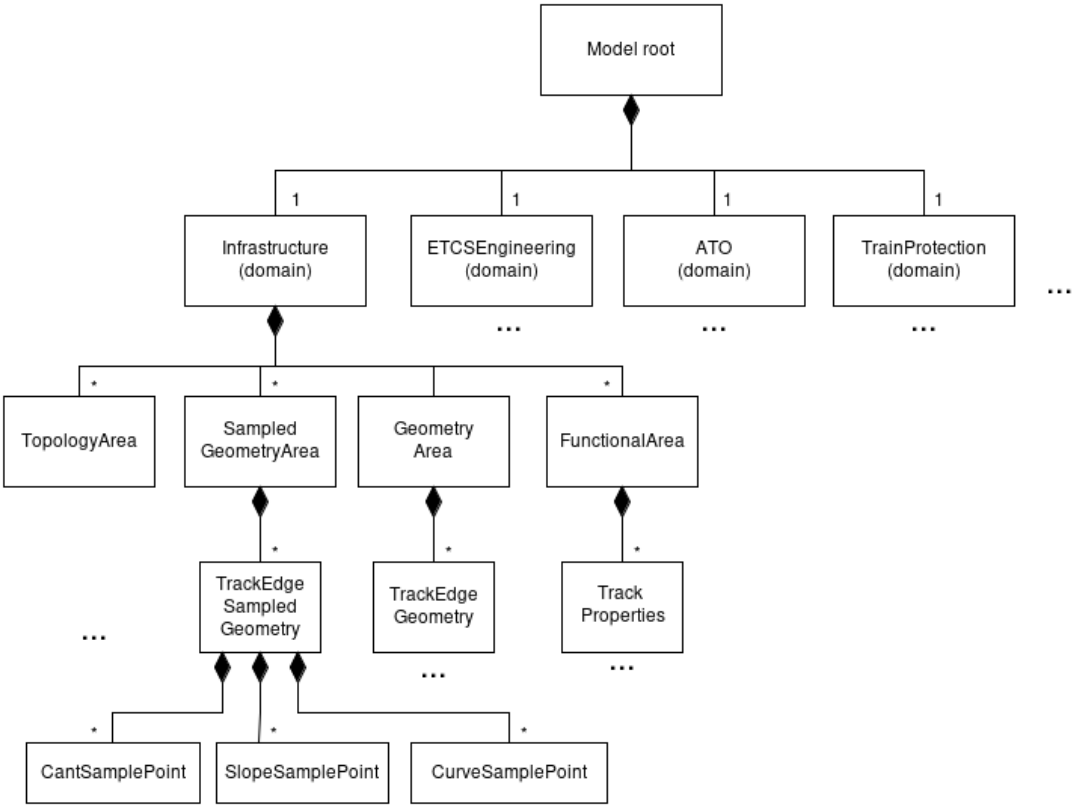

Figure 3 Overview of a compositional tree in data model.

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Regarding more details it is referred to TCCS - Data Model_01_Introduction.

5 Data Model History and Roadmap

SPT2TS-122465 - CCS/TMS Data Model Revisions

In the following table, the revision history of the SPT2TS-2040 - CCS/TMS Data Model developments is documented, containing details about the release notes and the review activities. The feedback for one release leads to improvements within the next iteration of the data model and its documentation. Also, schemas are added or extended to cover more use cases of ERJU System Pillar. Besides the history, the planned releases are listed to give an overview of the next steps.

Data Model Version	Release Date	Release Notes	Publish and Review

Data Model Version	Release Date	Release Notes	Publish and Review
0.1	31.03.2023	By the following documentation, we would like to inform you about the defined scope and mode of work of SP TCCS SD1, i.e. regarding the derived SPT2TS-2040 - CCS/TMS Data Model and the intended collaboration with the other domains/FAs: TCCS SD1 - Scope and Approach for Collaboration and Specification Attachments: TCCS SD1 - Data Model TCCS SD1 - Data Model Schema We kindly ask you to take note and provide comments in Polarion (or exported word file). Some additional contexts regarding the SPT2TS-2040 - CCS/TMS Data Model: The data model initially focuses on the first layers (topology, geometry) and shall demonstrate the SD1 approach in a practical way. This paves the way and defines a base for further extensions in collaboration with you. Besides just providing clarification about the scope and approach of SD1, we also encourage (i.e. the FAs) to give feedback based on their implementation experiences.	The release (Polarion, PDF, JSON) has been shared via email and presentation with: • All System Pillar Domain Leads for further distribution to responsible domain members • Innovation Pillar FA1 (incl. CDM) • Innovation Pillar FA2 (WP27) The documentation was used for general scope & approach alignment rather than detailed model content discussion. The received comments (written form, discussions) are used to improve the explanations and structure of documents.

Data Model Version	Release Date	Release Notes	Publish and Review
0.2	05.07.2023	Version 0.2 of the SPT2TS-2040 - CCS/TMS Data Model has been updated with incoming needs from first use cases like ETCS, ATO, and Train Protection. In addition, the document structure has been modified to provide data model separation between different domains with sufficient linking between the domains. The SPT2TS-2040 - CCS/TMS Data Model version 0.2 contains the following set of documents: TCCS SD1 - Scope and Approach for Collaboration and Specification (for additional information) TCCS SD1 - Data Model_00_Release Notes (this document) TCCS SD1 - Data Model_01_Introduction TCCS SD1 - Data Model_02_Schema TCCS SD1 - Data Model_10_INFRA TCCS SD1 - Data Model_11_ATO TCCS SD1 - Data Model_11_ENG TCCS SD1 - Data Model_11_TP We ask you to take note and provide comments in Polarion (or exported word file).	The release (Polarion, PDF, JSON, XML) has been shared with: • All System Pillar Domain Leads for further distribution to responsible domain members • Innovation Pillar FA1 (incl. CDM) • Innovation Pillar FA2 (i.e. WP27, WP13, WP44) Amongst others, the release with extended model content was used for the following collaborations: • Discussion and model improvement together with FA2 WP13 and WP27 experts regarding data model needs for Moving Block demonstrator (TP, INFRA schema) • Discussion of needs regarding the onboard system (e.g. localisation) data needs with FA2 WP27 experts (INFRA Schema) • Discussion with engineering and tool development experts regarding data and model needs, i.e. for ETCS, Interlocking, and Infrastructure; including practical feedback from tool development supporting the data model for import/export. All feedback comments are used for model improvement (ENG/INFRA schema) to ensure applicability for implementation. • Check of ATO schema against actual ATO configuration data (i.e. Segment Profiles) All relevant data model schemata have been commented on within Polarion (or by PDF comments).

Data Model Version	Release Date	Release Notes	Publish and Review
0.3	31.08.23	Correction release based on all comments of previous release. In addition, more clarification is given in the TCCS - Data Model_01_Introduction document regarding the structure and linking of data model schemas, identification and referencing (between data model parts and between instances). The SPT2TS-2040 - CCS/TMS Data Model version 0.3 contains the following set of documents: CCS/TMS Data Model - Scope and Approach for Collaboration and Specification: updated i.e. regarding top-down / bottom-up development process TCCS SD1 - Data Model_00_Release Notes : this document TCCS SD1 - Data Model_01_Introduction: more details regarding modelling language, structure, linking, identification TCCS SD1 - Data Model_02_Schema : error corrections TCCS SD1 - Data Model_10_INFRA : processed feedback from model usage and review TCCS SD1 - Data Model_11_ATO: processed feedback from model usage and review) TCCS SD1 - Data Model_11_ENG: processed feedback from model usage and review TCCS SD1 - Data Model_11_TP: processed feedback from model review In addition to the documentation, the data model for implementation in the formats JSON, XML and the JSON Schema will be published. The following use cases are in the focus of this release regarding test case scenarios (e.g. in collaboration with Innovation Pillar) - ETCS/Balise Engineering - ATO Engineering	The release was used for SP Steering Group information in Sep 23, which led to an official sharing of the data model to Innovation Pillar for specification and demonstration purposes. In addition, the release was shared and discussed with ERA to clarify the connection to ERA vocabulary.
0.4	22.12.2023	The SPT2TS-2040 - CCS/TMS Data Model is now extended with Data Model for CCS - TMS	Besides the release of documents (Polarion and PDF in SP Open Share), the automatically created

		Interface (SCI-OP) and semantic linking for ERA. In addition, corrections based on all comments of the previous release were performed. The SPT2TS-2040 - CCS/TMS Data Model version 0.4 contains the following set of documents: CCS/TMS Data Model - Scope and Approach for Collaboration and Specification: processed feedback from model review TCCS - Data Model_00_Release Notes:this document TCCS - Data Model_01_Introduction: processed feedback from model review TCCS - Data Model_02_Schema: processed feedback from model review TCCS - Data Model_10_INFRA: processed feedback from model usage and review; added ERA Linking TCCS - Data Model_11_OI: processed feedback from model usage and review TCCS - Data Model_11_ENG: processed feedback from practical model usage, comparison against other engineering model, and review; added Fouling Point and other details required for engineering phase. TCCS - Data Model_11_TP: processed feedback from model review ; added Field Object Controller with first details as required by fist demonstrators TCCS - Data Model_11_OPP : new schema to cover needs of CCS-TMS interface. The current state is aligned with Concept_Interface_TMS_CCS_V1_2 and will be further developed in collaboaration with TMS (and Traffic CS) in 2024 TCCS - Data Model_11_MAP: Map data model (coordinates) has been extracted out of INFRA as a new domain. Not included: the connection to the diagnostic data model as developed by the responsible taskforce has not been included yet due to needed alignment with other model parts. The plan is to include it in the next release.	data model files (json, xml/xsd,..) are provided for further review and usage within specification and demonstration. Links to SP Open Share: • Data Model Files (json) • JSON Schemata • UML diagrams / UML pdf version • XSD Files In addition, based on the alignment process started with ERA, a semantic version (TTL files) of SPT2TS-2040 - CCS/TMS Data Model is provided for this release, including linking to ERA vocabulary: • CCS TMS Data Model Semantic (ttl) The model will further evolve during the further collaboration with ERA.

Data Model Version	Release Date	Release Notes	Publish and Review
0.4.1	04.04.2024	This is a minor release of the SPT2TS-2040 - CCS/TMS Data Model with an update of the data model for CCS - TMS Interface as well as further improvements based on inputs from Innovation Pillar FA2 Demonstrators. Updated documents: TCCS - Data Model_10_INFRA: integrated feedback from IP FA2 Moving Block Demonstrator TCCS - Data Model_11_OI: minor changes to the data model TCCS - Data Model_11_ENG: Replace mileage by Km-Signs. TCCS - Data Model_11_TP: integrated feedback from IP FA2 Moving Block Demonstrator TCCS - Data Model_11_OPP : integrated feedback from Task 3 CMS/TMS and added upstream data model objects.	Besides the release of documents (Polarion and PDF in SP Open Share), the automatically created data model files (json, xml/xsd,..) are provided for further review and usage within specifications and demonstrators (IP FA1, FA2, FA3, FA5, and FA6). Links to SP Open Share for XML, UML, JSON, and PlantUML exports: results
0.4.2	28.06.2024	This is a minor release of the SPT2TS-2040 - CCS/TMS Data Model with following changes: TCCS - Data Model_11_OPP : integrated feedback from Task 3 CMS/TMS and IP FA2 Moving Block Demonstrator TCCS - Data Model_11_TP: integrated feedback from IP FA2 Moving Block Demonstrator Amended certain naming conventions in the data model to make the data model compatible for ERA integration.	Besides the release of documents (Polarion and PDF in SP Open Share), the automatically created data model files (json, xml/xsd,..) are provided for further review and usage within specifications and demonstrators (IP FA1, FA2, FA3, FA5, and FA6). In addition the ontology version for ERA integration is published. Links to SP Open Share for Ontology, XML, UML, JSON, and PlantUML exports: https://eeigertms.sharepoint.com/sites/SPOpenShare/Gedeelde%20documenten/Forms/AllItems.aspx?FolderCTID=0x012000975943C5D980E4786FE7B845BBBAF5A&id=%2Fsites%2FSPOpenShare%2FGedeelde%20documenten%2FGeneral%2F24%2D06%2D28%20TCCS%20CCS%20TMS%20Data%20Model%20v0%2E4%2E2&viewid=7d2094bc%2D4ed7%2D4bd4%2D8055%2Dcda6a753bac3

Data Model Version	Release Date	Release Notes	Publish and Review
1.0	04.09.2024	Final release of CCS/TMS Data Model for remit period SC2.3 • Improvements based on Innovation Pillar demonstrator feedback • Alignment with domains and already defined interfaces - including feedback from domain approval • Improvements after Mirror Group Approval • added schema TCCS - Data Model_20_SDI_Generic, imported from already approved Equipment Model from EULYNX (partial transfer based on needs, to be extended by other aspects according user needs during next remit period, i.e. for OC configuration and diagnosis)	As usual, all model files are created for this release. The files are published on ERJU GitHub and Polarion.
1.1	21.03.2025	Minor release of the CCS/TMS Data Model in framework of remit SC2.4 • Includes naming changes to all domains keeping the naming consistent with ERA Vocabulary. • New Domain On-Board Infrastructure (OI) has been introduced. OI now the static on-board infrastructure data needs for systems like Perception, ASTP, ATO, etc. • Includes updates data model classes in TP and OI domain based on needs coming Innovation Pillar • First data model release that is aligned with ERA Ontology Extension, see extended-era-ontology	As usual, all model files are created for this release. The files are published on ERJU GitHub and Polarion.

[Open]