Update of S-147 for the limitation of the middle layer to TRDP as Ethernet technology for process data

Approval by approvers for March 2026 SP-STG

Type of Approval	✔ Document Approval
Approvals	Nicolas Ykman : Approved , MOTTOLA, Giuseppe Diodato : Approved , Domínguez Fernández, Silvia : Approved , Klose, Christoph (SMO RI R&D) : Approved , MARTA FERNANDEZ ORDAS : Approved , Ghielmetti Cirillo (I-NAT-GST-CCS) : Approved , BITS CH Friedemann : Approved , Rob Dijkman : Approved
Comments	**#1 Approval comment** by **MARTA FERNANDEZ ORDAS** on 2026-02-16 17:39 CR approved in my role as co-leader of TrainCS System Architecture subgroup, based on its alignment with the evolution of the CCS On-Board System Architecture.
Attachments	

Approval by approvers for October 2026 SP-STG

Type of Approval	✔ Document Approval
Approvals	MOTTOLA, Giuseppe Diodato : Approved , Nicolas Ykman : Approved , Ghielmetti Cirillo (I-NAT-GST-CCS) : Approved , Wischy, Markus Alexander (SMO RI R&D F IL) : Waiting , Oliver Knapp : Approved , Klose, Christoph (SMO RI R&D) : Waiting , Domínguez Fernández, Silvia : Approved , Rob Dijkman : Approved , BITSCH Friedemann : Approved , Schürch Stefan (I-NAT-GST-CCS-EXT - Extern) : Approved
Comments	**#1 Approval comment** by **Oliver Knapp** on 2026-10-02 16:50 The integration of cybersecurity in communication layers (probably in the middle layer) has to be worked on during the CR process and is currently not specifally described in the document. Approval in respect to the general architecture decision prepared by TrainCS.
Attachments	

SP Identification number

SP-CR 26831

Headline

Update of S-147 for the limitation of the middle layer to TRDP as Ethernet technology for process data

Impacted System

ETCS / ATO

Reference Baseline Release

ETCS B4R1 & ATO B1R1 & RMR B1R1 (TSI CCS annex A as per Regulation (EU) 2023/1695)

Documents and/or References

SUBSET-147, 1.0.0

SUBSET-119, 4.0.0

Error/Enhancement

Enhancement

Problem/Need description

A standardised communication technology on all OSI-Layers shall be established for each communication type to improve modularity, exchangeability and evolvability. Today the SUBSET-147 v1.0.0 defines a standard communication solution on the OSI-Layers 1 & 2 for some interfaces of new vehicles. With the update of the existing SUBSET-147 to a new release version 2.0.0 also the layers 3 to 6 and the safety layer shall be unambiguously standardised. Currently there are limited options for using TRDP, Profinet, SUBSET-143 and OPC-UA as Ethernet-based technologies on the middle layers for process data communication. The aim is to define one single protocol stack for each communication type. In a first step, SUBSET-147 needs to be updated to limit of the middle layer to TRDP as Ethernet technology for the use of process data communication. For the safe data transmission SUBSET-147 shall define safety layers for functions of different SIL levels. Together with the application layer specifications in other SUBSETs (e.g. SS-119 for

ETCS <> TCMS) a full standard communication stack is created. The standardised communication stack shall be used for any onboard CCS process data communication, on the interfaces internal to the CCS subsystem, among different applications (e.g. ETCS on-board, ATO on-board) and on the interfaces to the subsystem rolling stock. This will reduce the complexity, leading to cost-efficient solutions with lower total cost of ownership (TCO). It brings more flexibility for vehicle owners if they want to scale the on-board CCS subsystem or change to another supplier. Additionally, the flexible Ethernet-based communication solution paves the way for adding new functions (evolvability) in the future (e.g. software update, configuration, diagnostics etc.).

Supporting document(s) for problem/need description

None.

Solution Proposal by submitter

See solution proposal in ERJU_solution_proposal_for_SP-CR-26831_TRDP_clean_version.docx

For a version highlighting the changes since February 2026 see ERJU_solution_proposal_for_SP-CR-26831_TRDP_changes.docx

Supporting document(s) for solution proposal

ERJU_solution_proposal_for_SP-CR-26831_TRDP_clean_version.docx

SOLUTION PROPOSAL FOR SP-CR26831

Modifications to SUBSET-147 v1.0.0

Modifications to chapter 2:

2.6 Scope and purpose of the document

...

Modify clause 2.6.1.6 and 2.6.1.7 to read:

2.6.1.6 Secondly, this document provides the requirements for the Ethernet CCS Consist Network, which will be the future harmonised communication platform for the on-board CCS subsystem on basis of which functional building blocks of the on-board CCS subsystem (ETCS on-board, ATO on-board, FRMCS, etc.) will communicate~~d~~ with each other. ~~The first stage to t~~This communication platform ~~is~~ constitutes the definitions of ~~layers 1 and 2~~all OSI layers 1 to 6.~~ For the layers 3 to 6 it is specified which communication technologies are allowed to use. A specific definition of these layers will follow at a later stage.~~ (I)

2.6.1.7 This approach creates an abstraction of the application layer from the communication, which leads to more stable application layer specifications and to more stable implementation of the application layer. Furthermore, it fixes a set of optional legacy technology for the transition period at discretion of the system integrator (normally the vehicle manufacturer). This ~~removes~~ avoids the risk of introducing new technology which will become obsolete shortly with the target harmonised communication platform (Ethernet CCS Consist Network). The definition of ~~layers 1 and 2 of~~ the Ethernet CCS Consist Network will allow vehicle manufacturers to prepare newly developed vehicles ~~designs~~ for this future technology. (I)

Modify clause Figure 2-2 to read:

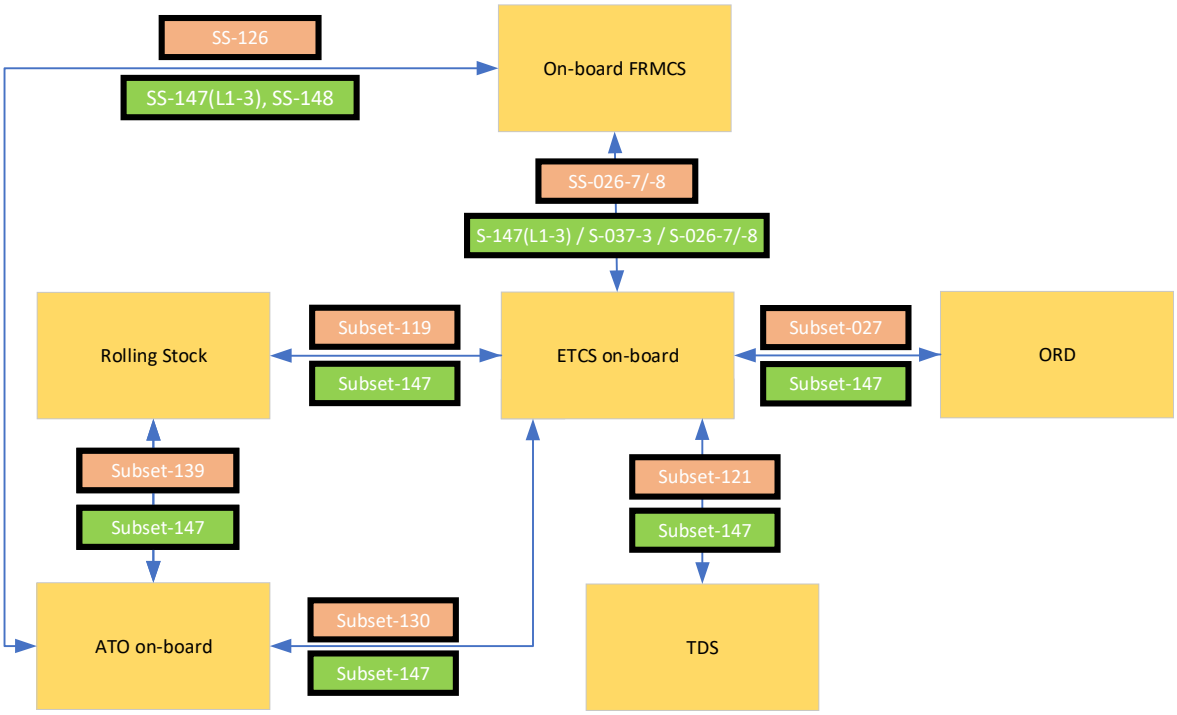


Figure 1~~2-2~~: Interfaces and related specifications for ETCS & ATO on-board and Rolling Stock

Modify clause Table 2-2 to read:

2.6.1.9 **¡Error! No se encuentra el origen de la referencia.** gives an overview on the application of Subset-147. (I)

Entity 1	**Entity 2**	**Reference**	**Local Serial Communication**	**Service Class, see §**¡Error! No se encuentra el origen de la referencia.
ATO on-board	ETCS on-board	SS-130	SS-147~~3~~	5
ATO on-board	On-board FRMCS	SS-126	SS-147(L1-3~~2~~) and SS-148 5	5
…				
ETCS on-board	On-board FRMCS	SS-026-7/-8	SS-147(L1-3~~2~~), SS-037-3 and SS-026-7/-8	5
…	…	…	…	…

Modify clause 2.6.1.12 to read:

2.6.1.12 ~~In case of the interfaces of the ATO on-board it is possible to use Subset-143 [Ref 16] as alternative to Subset-147. But also in case of using Subset-143 the layers 1 and 2 as defined in chapter 8 and the time and location service as specified in chapter 9 shall be applied, see also 3.1.1.6. (R)~~Intentionally deleted.

2.7 Reference documents

Modify Table 2-3 to read:

Ref. N°	Title	Reference	Author
[Ref 9]	~~Serie Profinet~~Intentionally deleted.	~~IEC61158-1:2019 / 61158-5-10 :2020 / 61158-6-10:2019~~	~~International Electrotechnical Commission~~
[Ref 10]	Intentionally deleted.~~Profisafe~~	~~IEC61784-2:2019/ -3-3:2021~~	~~International Electrotechnical Commission~~
[Ref 12]	Intentionally deleted.~~Open Platform Communications Unified Architecture (OPC-UA)~~	~~IEC62541-1/-2:2016 / -3 – -14:2020 / -100:2015~~	~~International Electrotechnical Commission~~
[Ref 16]	~~ERTMS/ATO: Interface Specification Communication Layers for On-board Communication~~Intentionally deleted.	~~SUBSET-143~~	~~UNISIG~~
…	…	…	…
[Ref 31]	Internet Protocol Specification	RFC 791	Internet Engineering Task Force (IETF)

Table 2-3: Reference Documents

Modifications to chapter 3:

3. GENERAL REQUIREMENTS

...

Modify 3.1.1.6 to read:

3.1.1.6 For process data, ~~The~~ communication technology~~ies~~ ~~PROFINET [Ref 9] (incl. PROFIsafe [Ref 10]),~~ TRDP **¡Error! No se encuentra el origen de la referencia.**~~, OPC-UA [Ref 12], and Subset-143 [Ref 16] are~~is the~~a~~ mandatory supplementary protocol~~s~~ for the application of Ethernet. (R)

Modify 3.1.1.7 to read:

3.1.1.7 This document provides a precise specification of the communication principles (possible communication protocols) used for the communication between the ETCS on-board, the ATO on-board and other on-board equipment / subsystems during normal operation of a trainset. [Ref 4]

explains the architecture of the ETCS on-board and the interfaces to other equipment and [Ref 2] explains the architecture of ERTMS/ATO and the interfaces to other equipment. (I)

Modifications to chapter 6:

6. Rules to Application Layer Documents

6.1 Introduction

6.1.1.1 This chapter contains rules for the application layer in order to have a harmonised handling of variables and packets in the application layer documents. This chapter is applicable for process and event-based data communication only.(I)

6.2 Definition of the Variables

6.2.1.3 ~~Special values which are not spare, have always the highest values in a variable (e.g. 32767 = "unknown"). (R)~~Intentionally deleted.

6.2.1.4 ~~Spare values are located between the normal and special values in the variable range except where justified. (R)~~Intentionally deleted.

6.2.1.14 The names of the variables could be classified by prefixes. See also SS-026 §7.3.2.11. (I)

6.3 Definition of the Packets and Data Structures

6.3.1 General

6.3.1.3 ~~In case of application for ATO interfaces the following applies: For all Data Classes Message Data and Process Data the same header structure shall be used. They payload data consists of a header, followed by the application specific data. (R)~~Intentionally deleted.

6.3.1.4 The total size of user data shall not exceed 1432 bytes.

6.3.2 ~~ATO Header Definition~~ Intentionally deleted.

6.4 ~~User Data~~ Intentionally deleted.

Modifications to chapter 8:

8. ETHERNET CCS CONSIST NETWORK

8.4 Definition of requirements

...

Modify 8.4.9.1 and 8.4.9.3 and add new clauses 8.4.9.2.1 and 8.4.9.4 to read:

8.4.9 OSI layers 3 to 6

8.4.9.1 For the application of Ethernet CCS Consist Network the communication technology~~ies PROFINET (see IEC61158 [Ref 9]) (incl. PROFIsafe, see IEC61784-2/-3-3 [Ref 10]),~~ TRDP (see IEC61375-2-3 **¡Error! No se encuentra el origen de la referencia.**)~~, and OPC-UA [Ref 12] are allowed~~ shall be used~~. In case of the interface of the ATO on-board also the alternative described in clause 2.6.1.12 can be used for the application of Ethernet CCS Consist Network~~ shall be used for process data~~. (R)

8.4.9.2 The OSI layers 3 to 6 are implicitly defined by the chosen communication technology. (I)

8.4.9.2.1 The Ethernet CCS Consist Network (incl. onboard interfaces of FRMCS onboard gateway) shall support IPv4 according to RFC 791, [REF 31]. (R)

8.4.9.3 ~~The system integrator shall choose one of the communication technologies, to which he wants to comply. (R)~~Intentionally deleted.

8.4.9.4 For SIL2 data SDTv2 according to IEC 61375-2-3 ~~[5]~~[6] and for SIL4 data SDTv4 (see Shift2Rail's CONNECTA Drive-by-Data Architecture Specification **¡Error! No se encuentra el origen de la referencia.**[1]) shall be used on top of TRDP. (R)

Modifications to SUBSET-119 v4.0.0

Modifications to chapter 1:

1. INTRODUCTION

1.3 References

…

Modify the references [21], [22] and [23] to read:

[21]	~~IEC61158-Serie Profinet~~Intentionally deleted	~~2019~~
[22]	~~IEC61784-3-3 Profisafe~~Intentionally deleted	~~2016~~
[23]	~~CIP Networks Library from ODVA~~Intentionally deleted	~~2009~~

Modifications to chapter 4:

4. GENERAL REQUIREMENTS FOR THE SERIAL INTERFACE

4.1 General Requirements

Modify clauses 4.1.1.2.1 to read:

4.1.1.2.1 Note: The application communication protocol ~~s, e.g. PROFINET, CIP, and~~ TRDP is the only ~~are~~ supplementary protocol~~s~~ to be used for the application of ECN.

4.3 Coding

4.3.2 Serial Interface Signals

…

Modify clauses 4.3.2.3 to read:

[1] The specification of SDTv4 will become an integral part of the IEC/EN 61375-2-3 Annex B in the subsequent version of the standard.

4.3.2.3 ~~The safety protocol ProfiSafe according to IEC 61784-3-3 [22] requires the use of a limited range of data types and a specific order of signals in a packet depending on their data types. In order to fulfil IEC 61784-3-3 [23], the data structures (codings and packets) defined in the following chapters need to be re-arranged. The data structures applicable in this case are defined in Appendix A – Profinet Signal and Packet Definitions.~~Intentionally deleted.

4.6 ECN

4.6.1 General

4.6.1.1 The lower communications layers are specified in [14].

Modify clause 4.6.1.2 to read:

4.6.1.2 In case of architecture b) (see 4.2.3) the safe data transmission shall be implemented in accordance with [14], section 8.4.9 ~~[17], Appendix B~~.

Modify clause 4.6.2 to read:

4.6.2 Data Properties and Application of the Safety Protocol

4.6.2.1 TR Packet 1

Properties:

ComId: configurable

Source device: TR

Sink device: OBU

Data class: Process data

Priority service class (PCP) according to [14]: 5

Maximum cycle time of source device: 100 ms

Dataset ID: configurable

…

4.6.2.2 TR Packet 2

Properties:

ComId: configurable

Source device: TR

Sink device: OBU

Data class: Process data

Priority service class (PCP) according to [14]: 5

Maximum cycle time of source device: 200 ms

Dataset ID: configurable

…

4.6.2.3 TR Packet 3

Properties:

ComId: configurable

Source device: TR

Sink device: OBU

Data class: Process data

Priority service class (PCP) according to [14]: 5

Maximum cycle time of source device: 200 ms

Dataset ID: configurable

…

4.6.2.4 OBU Packet 1

Properties:

ComId: configurable

Source device: OBU

Sink device: TR

Data class: Process data

Priority service class (PCP) according to [14]: 5

Maximum cycle time of source device: 100 ms

Dataset ID: configurable

…

4.6.2.5 OBU Station Platform Packet (OBU Packet 2)

Properties:

ComId: configurable

Source device: OBU

Sink device: TR

Data class: Process data

Priority service class (PCP) according to [14]: 5

Maximum cycle time of source device: 200 ms

Dataset ID: configurable

…

4.6.2.6 OBU Packet 3 to OBU Packet 7

Properties:

ComId: configurable

Source device: OBU

Sink device: TR

Data class: Process data

Priority service class (PCP) according to [14]: 5

Maximum cycle time of source device: 200 ms

Dataset ID: configurable

…

Modifications to chapter 7:

Modify headline of chapter 7 to read:

7 ~~Appendix A – Profinet Signal and Packet Definitions~~Intentionally deleted

Modifications to SUBSET-130 v1.0.0

Modify table 1 to read:

Ref. N°	Title	Reference
[Ref 1]	ERTMS/ATO System Requirements Specification	SUBSET-125
[Ref 2]	ATO-OB / ATO-TS FFFIS Application Layer	SUBSET-126
[Ref 3]	ERTMS/ATO Glossary	13E154
[Ref 4]	ERTMS/ETCS System Requirements Specification	SUBSET-026
[Ref 5]	FIS Juridical Recording	SUBSET-027

Ref. N°	Title	Reference
[Ref 6]	Dimensioning and Engineering rules	SUBSET-040
[Ref 7]	IEEE 802.3 Ethernet Standard	NA
[Ref 8]	FFFIS STM Application Layer	SUBSET-058
[Ref 9]	Glossary of Terms and Abbreviations	SUBSET-023
[Ref 10]	FFFIS part: CCS Consist Network Communication Layers~~Interface Specification Communication Layers for On-board Communication~~	SUBSET-1473

Table 1~~1~~ Reference Documents

Modify chapter 5:

5. PRINCIPLES

5.1 Intentionally deleted.~~Definition of the Variables~~

5.1.1.1 Intentionally deleted.~~All variables defined within this document shall comply with [Ref 10].~~

5.1.1.2 Intentionally deleted.~~The variables already defined in ETCS are used in this interface by using the same name and giving the corresponding reference in its description and resolution/formula.~~

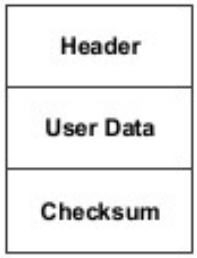
5.1.1.3 ~~In the case that the length of an ETCS variable is not aligned with any of the data types defined in [Ref 10] and is not part of a BITSET, the needed amount of "0" values will be added in the most significant bits of the variable, to align it with the data type defined in the corresponding column of the packet description table.~~Intentionally deleted.

~~Move Subset-143, v1.0.0, section 8.1 to this chapter.~~

5.2 Definition of the Packets

5.2.1.1 Intentionally deleted.~~The following chapters will describe the user data only. All details on the way how User Data are transformed to packets can be found in [Ref 10]. Packets are multiple variables grouped into a single unit, with a defined internal structure.~~

5.2.1.2 For all Data Classes Message Data and Process Data the same header structure shall be used. They payload data consists of a header, followed by the application specific data and terminated by a CRC. The following figure depicts the structure.



5.2.2 ATO header Definition

The following table defines the packet header.

Payload Header				
Item	**Variable Name**	**Description**	**Data Type**	**Resolution/Formula**
1	NID_PACKET	ATO Packet number.	UINT8	Numbers 0 .. 30: Slot 1 31 .. 60: Slot 2 61 .. 90: Slot 3 91 .. 120: Slot 4 121 .. 150: Slot 5 151 .. 180: Slot 6 181 .. 210: Slot 7 211 .. 240: Slot 8 241 .. 255: reserved Each application layer interface shall select one slot only. It needs to be made sure that the slots are not reused elsewhere.
2	L_PACKET	Length of Header + User Data length.	UINT16	**Minimum:** 7 **Maximum:** Process Data: ~~1400~~ 1421 Message Data: 65524 **Resolution:** 1 byte
3	T_TIMESTAMP	Timestamp in milliseconds since start-up. The timestamp will be set at the moment the telegram is issued.	UINT32	**Resolution:** 1 ms

Table 2: ATO Header Structure used on Application Layer

5.2.3 User Data

5.2.3.1 The definition of User Data is further in this document.

5.2.4 Checksum

5.2.4.1 For error detection, the cyclic redundancy check mechanism CRC32, based on the IEEE 802.3 (Ethernet) specification, shall be used with the following parameters:

Parameter	Value
Name	CRC-32/BZIP2
Width	32 bits
Generator-Polynomial	0x{1}04C11DB7
Init	0xFFFFFFFF (-1)
RefIn	False
RefOut	False
Final XOR value (Inversion of CRC)	0xFFFFFFFF (-1)
Check value	0xFC891918

Table 3: CRC Parameters

5.2.4.2 The byte order of the CRC is MSB first, LSB last.

5.2.4.3 The CRC value shall be computed over Header and User Data.

~~Move Subset-143, v1.0.0, section 8.2 to this chapter.~~

Modify Table 2 and chapter 6.1.1.2:

6. PACKET DESCRIPTION

6.1 List of Packets

Packet Number	Packet Name	Source	Sink	Max. Transmitting cycle [ms]	Data Class [Ref 10]	Priority Service Class [Ref 10]	Timeout [ms]
0	ATO_ETCS_Status	ATO	ETCS	100	TRDP Process Data	5	1000
1	ATO_ETCS_DMI	ATO	ETCS	100	TRDP Process Data	5	1000
2	ATO_ETCS_Data_Entry_Need	ATO	ETCS	NA	TRDP Message Data	<see CR on message data>	-
3	ATO_ETCS_Data_Entry_Request	ATO	ETCS	NA	TRDP Message Data	<see CR on message data>	-
4	ATO_ETCS_Data_View_Values	ATO	ETCS	NA	TRDP Message Data	<see CR on message data>	-
5	ETCS_ATO_Static	ETCS	ATO	1000	TRDP Process Data	5	3000
6	ETCS_ATO_Dynamic	ETCS	ATO	200	TRDP Process Data	5	1000
7	ETCS_ATO_Driver_Inputs	ETCS	ATO	100..200	TRDP Process Data	5	1000
8	ETCS_ATO_Data_Entry_Values	ETCS	ATO	NA	TRDP Message Data	<see CR on message data>	-
9	ETCS_ATO_Data_Entry_Flag	ETCS	ATO	NA	TRDP Message Data	<see CR on message data>	-
10	ETCS_ATO_Data_View_Values_Request	ETCS	ATO	NA	TRDP Message Data	<see CR on message data>	-
11	ETCS_ATO_BRAKE_DECELERATIONS	ETCS	ATO	200	TRDP Process Data	5	1000

Table -2~~2~~ Packet summary

…

6.1.1.2 The packet numbers defined in Table 2 correspond to NID_PACKET definition given in [Ref 10]. This interface uses Slot 1 (see chapter 5.2.2 ~~[Ref 10]~~).

6.2 User Data

6.2.1 Packets: ATO-OB to ETCS-OB

6.2.1.2 Packet Number 1: ATO_ETCS_DMI

Packet Number	*1*				
Item	**Variable Name**		**Description**	**Data Type**	**Resolution/Formula**
	Bit	ATO_DMI_INFO	DMI Indicators BITSET	BITSET16	
…					
13	L_TEXT_STP		Length of text string in bytes for the name of the next Stopping Point or Stopping Points to be skipped.	UINT8	**Special values:** 0 = No information to display
(L_TEXT_STP) 255- times 14	X_TEXT_STP (k)		Name of the next Stopping Point or Stopping Points to be skipped to be displayed.	UINT8	See [Ref 8], Section §8.1.120.
15	N_STPDISTANCE_ITER		Number of "distance to the next Stopping Point or Stopping Point to be skipped" elements.	UINT8	**Special values:** 0 = No information to display
(N_STPDISTANCE_ITER)255 - times 16	D_STPDISTANCE (l)		Distance to the Stopping Point or Stopping Point to be skipped to be displayed.	UINT32	**Resolution:** 1 cm

Table 4 Packet Number 1: ATO_ETCS_DMI

6.2.2 Packets: ETCS-OB to ATO_OB

6.2.2.1 Packet Number 5: ETCS_ATO_Static

Packet Number	*5*				
Item	**Variable Name**		**Description**	**Data Type**	**Resolution/Formula**
	Bit	ETCS_DATA	ETCS valid data qualifiers set	BITSET8	
…					
7	N_ANTENNA_ITER		Number of additional antennas installed on-board	UINT8	**Values:** 0 .. 3 **Special Values:** 4 .. 255
(N_ANTENNA_ITER)3 - times 8	NID_ANTENNA(i)		Identification of the additional antenna	UINT8	**Values:** 0 = antenna 1 1 = antenna 2 2 = antenna 3 3 = antenna 4 **Special Values:** 4 .. 255

Packet Number	5			
Item	Variable Name	Description	Data Type	Resolution/Formula
9	D_ANTENNA(i)	Distance from additional antenna to the train front end.	UINT16	**Resolution:** 1 cm

Table 3 Packet Number 5: ETCS_ATO_Static

6.2.2.2 Packet Number 6: ETCS_ATO_Dynamic

Packet Number	6			
Item	Variable Name	Description	Data Type	Resolution/Formula
…				
27	N_GRAD_ITER	[If M_MODE is equal to FS, AD or OS] Number of gradient changes.	UINT8	**Special values:** 0 = no gradient information available 52 - 255 = spare
28	N_LOC_GRADCHANGE (k)	[If M_MODE is equal to FS, AD or OS] Estimated value of the position counter at the A_GRADIENT change.	INT32	**Resolution:** 1 cm **Special value:** (2^{31}-1) = not allowed
29	A_GRADIENT (k)	[If M_MODE is equal to FS, AD or OS] Applicable value of acceleration/deceleration due to the gradient from the estimated value of the position counter at the A_GRADIENT change.	INT16	**Resolution:** 1 mm/s^2 **Values:** -2500 … +2500 = Acceleration (negative, declining section) /Deceleration (positive, inclining section) due to gradient **Special values:** -32768 … -2501 = spare 2501 – 32766 = spare 32767 = close the gradient profile
…				
31	N_ADHE_ITER	[If M_MODE is equal to FS, AD or OS] Number of A_MAXREDADH changes.	UINT8	**Special values:** 0 = no reduced adhesion conditions announced 22 - 255 = spare
32	N_LOC_ADHCHANGE (l)	[If M_MODE is equal to FS, AD or OS] Estimated value of the position counter at the A_MAXREDADH change.	INT32	**Resolution:** 1 cm **Special value:** (2^{31}-1) = not allowed

(N_GRAD_ITER)61 - times

(N_ADHE_ITER)21 - times

Packet Number	6				
Item		Variable Name	Description	Data Type	Resolution/Formula
	33	A_MAXREDADH (l)	[If M_MODE is equal to FS, AD or OS] Maximum deceleration due to reduced adhesion conditions from the estimated value of the position counter at the A_MAXREDADH change..	UINT16	**Resolution:** 1 mm/s2 **Special value**: 65534 = close the adhesion profile 65535 = no maximum deceleration
…					
	35	N_MRSP_ITER	[If M_MODE is equal to FS, AD or OS] Number of MRSP iterations. See [Ref 4] §3.13.7.2	UINT8	**Special values:** 51 - 255 = spare
(N_MRSP_ITER) 50- times	36	N_LOC_MRSP (p)	[If M_MODE is equal to FS, AD or OS] Estimated value of the position counter at the MRSP change including train length compensation.	INT32	**Resolution:** 1 cm **Special values:** (2^{31}-1) = not allowed
	37	V_MRSP (p)	[If M_MODE is equal to FS, AD or OS] Speed from the estimated value of the position counter at the MRSP change.	UINT16	**Resolution:** 1 cm/s **Special values:** 16668 - 65534 = spare 65535 = Non numerical value telling that the MRSP ends at N_LOC_MRSP(n).
…					
Linking Information					
	52	N_LINK_ITER	Number of next linked Balise Groups announced.	UINT8	**Special values:** 31 - 255 = spare (See [Ref 6] §4.3.2.1.1 i)).
(N_LINK_ITER) 30- times	53	N_LOC_LINKNBG (q)	Estimated value of the position counter at the linked Balise Group. The position is referenced to the balise with the N_PIG = 0.	INT32	**Resolution:** 1 cm **Special values:** (2^{31}-1) = spare
	54	NID_LINKNBG (q)	Identification of the linked Balise Group. N_PIG is always 0.	BITSET32	**Values:** Bit00 to bit02 = N_PIG as defined in [Ref 4] § 7.5.1.81 Bit03 to bit16 = NID_BG as defined in [Ref 4] § 7.5.1.85 Bit17 to bit26 = NID_C as defined in [Ref 4] § 7.5.1.86 Bit27 to bit31 = not relevant **Special values:** (2^{32}-1) = unknown

Table 4 Packet Number 6: ETCS_ATO_Dynamic

6.2.2.7 Packet Number 11: ETCS_ATO_BRAKE_DECELERATIONS

Packet Number	11			
Item	**Variable Name**	**Description**	**Data Type**	**Resolution/Formula**
…				
4	N_BRAKE_SAFE_ITER	Number of A_BRAKE_SAFE changes related to the brake model applicable from the maximum safe front end of the train.	UINT8	**Special values:** 0 = no A_BRAKE_SAFE changes available 10 - 255 = spare
5	V_CHANGE_BRAKE (m)	Value of the speed from which (and excluding) the value of A_BRAKE_SAFE (m) is applicable.	UINT16	**Resolution:** 1 cm/s **Special values:** 16668 – 65535 = spare
6	A_BRAKE_SAFE (m)	Applicable value of A_BRAKE_SAFE.	UINT16	**Resolution:** 1 mm/s^2
7	N_SEBDM_ITER	Number of location changes of safe emergency brake deceleration models (e.g. inhibition of special brakes).	UINT8	**Special values:** 0 = no changes in brake model 41 - 255 = spare
8	N_LOC_SEBDM_CHANGE (n)	Estimated value of the position counter from which the safe emergency brake deceleration model is applicable.	INT32	**Resolution:** 1 cm **Special value:** (2^{31}-1) = not allowed
9	A_BRAKE_SAFE (n)	A_BRAKE_SAFE value applicable from zero speed, related to the brake model applicable from N_LOC_SEBDM_CHANGE (n)	UINT16	**Resolution:** 1 mm/s^2
10	N_BRAKE_SAFE_ITER (n)	Number of A_BRAKE_SAFE changes for the brake model applicable from N_LOC_SEBDM_CHANGE (n).	UINT8	**Special values:** 0 = no A_BRAKE_SAFE changes available 10 - 255 = spare
11	V_CHANGE_BRAKE (n, o)	Value of the speed from which (and excluding) the value of A_BRAKE_SAFE (n,o) is applicable.	UINT16	**Resolution:** 1 cm/s **Special values:** 16668 – 65535 = spare
12	A_BRAKE_SAFE (n, o)	Applicable value of A_BRAKE_SAFE.	UINT16	**Resolution:** 1 mm/s^2

(5, 6): (N_BRAKE_SAFE_ITER)9 - times

(8, 9, 10, 11, 12): (N_SEBDM_ITER)40 - times

(11, 12): (N_BRAKE_SAFE_ITER)9 - times

Table 13 Packet Number 11: ETCS_ATO_BRAKE_DECELERATIONS

Modifications to SUBSET-139 v1.0.0

Modify chapter 7 to read:

7.2 Definition of Packets

7.2.1.2 Due to limits of TRDP communication, the total size of user data shall not exceed ~~1461~~ 1432 bytes

Modify Table 14 item 2 with maximum size of ~~1461~~ 1432 bytes.

7.3 List of Packets

7.3.1.1 Following packets are used for communication between ATO-OB a Rolling stock (RST):

Modify Table 16:

Packet Name	Packet identificator	Source	Sink	Transmitting cycle [ms] (max)	Data Class [Ref 8]	Priority Service Class [Ref 10]	Timeout [ms]
ATO_RST_data	31	ATO	RST	50	TRDP Process Data	5	250
RST_ATO_data fast	32	RST	ATO	50	TRDP Process Data	5	250
RST_ATO_data slow	33	RST	ATO	500	TRDP Process Data	5	2500

Table -5~~16~~: Packet summary

Introduction of new communication types (e.g. bulk and event-based communication) in addition to process data communication

Approval by approvers for March 2026 SP-STG

Type of Approval	
Approvals	Nicolas Ykman : Approved , MOTTOLA, Giuseppe Diodato : Waiting , Domínguez Fernández, Silvia : Approved , Klose, Christoph (SMO RI R&D) : Approved , MARTA FERNANDEZ ORDAS : Approved , Ghielmetti Cirillo (I-NAT-GST-CCS) : Approved , BITS CH Friedemann : Approved , Rob Dijkman : Approved
Comments	**#1 Approval comment** by **MARTA FERNANDEZ ORDAS** on 2026-02-16 17:42 CR approved in my role as co-leader of TrainCS System Architecture subgroup, based on its alignment with the evolution of the CCS On-Board System Architecture. **#2 Approval comment** by **BITSCH Friedemann** on 2026-02-16 19:03 The approval of Christoph and Giuseppe is in the headline.
Attachments	

Approval by approvers for October 2026 SP-STG

Type of Approval	✔ Document Approval
Approvals	MOTTOLA, Giuseppe Diodato : Approved , Nicolas Ykman : Approved , Ghielmetti Cirillo (I-NAT-GST-CCS) : Approved , Wischy, Markus Alexander (SMO RI R&D F IL) : Waiting , Oliver Knapp : Approved , Klose, Christoph (SMO RI R&D) : Waiting , Domínguez Fernández, Silvia : Approved , Rob Dijkman : Approved , BITSCH Friedemann : Approved , Schürch Stefan (I-NAT-GST-CCS-EXT - Extern) : Approved
Comments	
Attachments	

SP Identification number

SP-CR-26860

Headline

Introduction of new communication types (e.g. bulk and event-based communication) in addition to process data communication

Impacted System

ETCS / ATO

Reference Baseline Release

ETCS B4R1 & ATO B1R1 & RMR B1R1 (TSI CCS annex A as per Regulation (EU) 2023/1695)

Documents and/or References

SUBSET-147, 1.0.0

Error/Enhancement

Enhancement

Problem/Need description

The current SUBSET-147 specifies process data communication only as current application layer SUBSETs only specify process data communication. For new functions in the future (e.g. software update, configuration, diagnostics etc.) SUBSET-147 needs to be extended for other communication types as:

- Message data
- Event based communication
- Remote Procedure Calls (RPC)
- Bulk data communication

Supporting document(s) for problem/need description

None.

Solution Proposal by submitter

See solution proposal in ERJU_solution_proposal_for_SP-CR-26860_Message_Event_Bulk_RPC_clean_version.docx

For a version highlighting the changes since February 2026 see ERJU_solution_proposal_for_SP-CR-26860_Message_Event_Bulk_RPC_changes.docx

Supporting document(s) for solution proposal

ERJU_solution_proposal_for_SP-CR-26860_Message_Event_Bulk_RPC_clean_version.docx

SOLUTION PROPOSAL FOR SP-CR26860

Modifications to SUBSET-147 v1.0.0

Modifications to chapter 3:

Add clause 3.1.1.10 to read:

3.1.1.10 This specification includes the solutions with different data types and corresponding protocols for layers 3 to 6. (I)

Modifications to chapter 8:

8. ETHERNET CCS CONSIST NETWORK

8.4 Definition of requirements

...

Modify 8.4.9 to read:

8.4.9 ~~OSI layers 3 to 6~~Network Layer (OSI layers 3)

…

Add a new chapter 8.4.11 to read:

8.4.11 Middle Layers (OSI layers 4 to 6)

8.4.11.1 The middle layers specifications are divided into the following different communication types of the onboard communication:

- Process Data Communication
- Event based Communication
- Remote Procedure Calls (RPC) also called Request/Reply or Remote Method Invocations (RMI)
- Bulk Data Communication

8.4.11.2 There is no generic security solution for all communication types suitable on lower layers (OSI layer 2 or 3). Therefore, the topic of security is addressed for each communication type separately on the middle layers (OSI layers 4 to 6). (I)

8.4.11.3 The same is applicable for the aspect of safety. Also, safety is addressed for each communication type separately as part of the middle layers (OSI layers 4 to 6). (I)

8.4.11.4 In the following subchapters each communication type is introduced and the main requirements and open points are noted. (I)

8.4.11.5 The requirements for a specific communication type are applicable only in case the communication type is used.

C2 - Intern

Add a new chapter 8.5 to read:

8.5 Process Data Communication

8.5.1 Informative Introduction

Large portions of communication needs for on-train applications are the cyclic communication of so-called process data. Process data refer to the information generated during the operation of a system, process or application. Process data is typically time-critical and includes data related to the inputs, outputs, and operational parameters of a system, process or application. (I)

Typically, safety requirements from applications are associated, where the discovery of unintended changes on the data needs to be reliably discovered. (I)

For process data communication, the Train Real-Time Data Protocol (TRDP) will be used. It is a specialized communication standard tailored for the railway industry, focusing on the effective transmission of real-time data among various systems and devices within a train environment. Its primary goal is to enhance operational efficiency, safety, and interoperability across different railway applications. For safety-related data, the special protocols SDTv2 and SDTv4 are defined on top of TRDP. (I)

8.5.2 Requirements on Process Data Communication

8.5.2.1 For process data communication TRDP according to IEC 61375-2-3 **¡Error! No se encuentra el origen de la referencia.** process data (PD) shall be used. (R)

8.5.2.2 For safety-related process data SDTv2 according to IEC 61375-2-3 **¡Error! No se encuentra el origen de la referencia.** and SDTv4 according to Shift2Rail's CONNECTA Drive-by-Data Architecture Specification **¡Error! No se encuentra el origen de la referencia.**[1] shall be used on top of TRDP process data. (R)

Add a new chapter 8.6 to read:

8.6 EVENT BASED COMMUNICATION

8.6.1 Informative Introduction

8.6.1.1 In addition to cyclic process data, which represents a state, sporadic data messages or events are also present in vehicle communication. Common integration services must therefore provide a mechanism for event communication. (I)

8.6.1.2 Applications for event data may include:

- Diagnostic messages (operational, maintenance, protocol)
- Data change events
- Process-oriented but spontaneous / acyclic messages (I)

[1] The specification of SDTv4 will become an integral part of the IEC/EN 61375-2-3 Annex B in the subsequent version of the standard.

8.6.1.3 The publish/subscribe pattern will be used here, in contrast to the request/response pattern, which is commonly employed in other services, for example the bulk data transfer. Communication patterns can be connected to one-to-one and one-to-many communication scenarios in general. Event-driven communication is often connected to one-to-many scenarios without explicit need for an acknowledgement. This is in contrast to other application fields (e.g., remote procedure call scenarios), where one might specifically require a direct feedback from a specific recipient of a request / datagram / message. (I)

8.6.1.4 Another typical property of event communication is that the sender of an event is not interested in the actual receivers. Event receivers may dynamically come and go without interfering with the sender. The publish/subscribe pattern exactly serves this need. Using message brokers in between the sender and the receivers complete the decoupling of both sides. (I)

8.6.1.5 The architectural pattern chosen here is the publish/subscribe pattern, the chosen technology is AMQP:

8.6.1.5.1 The Advanced Message Queuing Protocol (AMQP) is an open and standardised binary network protocol designed for the exchange of messages across distributed networks, supporting various broker architectures. It enables asynchronous communication and both point-to-point and publish-subscribe messaging patterns. (I)

8.6.1.5.2 AMQP is implemented on a standard TCP/IP protocol stack. The core components of AMQP include the Message Broker, which routes messages between senders and receivers; the Queue, where messages wait for consumption; the Exchange, which directs messages to queues based on rules; and the Binding, which defines the routing relationship. These elements work together to enable flexible and interoperable messaging. AMQP supports message-oriented communication with message-delivery guarantees such as at-most-once, at-least-once and exactly once. Furthermore, it ensures the authentication and encryption of messages based on Transport Layer Security (TLS). Topic-based access control is also typically available in modern AMQP broker implementations in contrast to non-broker-based (e.g. HTTP-based) approaches. (I)

8.6.1.5.3 While AMQP is the preferred solution for the future, there might exist scenarios (e.g. retrofit) where already existing TRDP Message Data (MD) use would be beneficial to be maintained. For those cases, and only those cases, TRDP MD could be continued to be used. (I)

8.6.2 Requirements on Event based Communication

8.6.2.1 For event-based communication, AMQP according to ISO/IEC 19464 **¡Error! No se encuentra el origen de la referencia.** with TLS shall be used. (R)

8.6.2.2 The TLS endpoints for AMQP communication shall be compliant to SUBSET-146. (R)

8.2.2.1 The TLS endpoints shall use the ONCC profile for the X.509 certificates with following field settings:

8.2.2.1.1 Subject CN shall be set to the AMQP server-name (in case of AMQP server) or to AMQP client name (in case of AMQP client)

8.2.2.1.2 Subject Alternative Name ipAddress shall be set to the IP address of the AMQP endpoint

8.6.2.3 Configuration and concrete architecture / setup of an AMQP broker service are beyond this specification. (I)

8.6.2.4 For existing functionality and scenarios where existing End Devices using TRDP Message Data (MD) for event-based communication will be integrated without modification, TRDP Message Data

according to IEC 61375-2-3 [5] may still be used for event-based communication instead of AMQP (R)

8.6.2.5 Being a legacy technology from the perspective of this specification, TRDP MD for event communication is deprecated and will be removed in a future version of the specification (I)

8.6.2.6 This specification intentionally does not specify a safety layer for AMQP. It is left for the user to decide if AMQP fulfils the safety needs of a specific application context. As an alternative, TRDP process (with its safety layers) may be used (I)

Add a new chapter 8.7 to read:

8.7 REMOTE PROCEDURE CALLS (RPC)

8.7.1 Informative Introduction

8.7.1.1 In addition to cyclic process data and acyclic event-based data exchange, Remote Procedure Calls (RPC) – also called Request/Reply or Remote Method Invocations (RMI) – represent a communication paradigm that is also present in vehicle communication. Consequently, it is necessary for common integration services to provide a mechanism for RPC/RMI communication. (I)

8.7.1.2 Typical IT and OT use cases for RPCs may include:

- Asynchronous command execution,
- Client-server communication,
- Communication between microservices,
- Inter-process communication,
- Remote administration. (I)

8.7.1.3 A resemblance to or a combination with bulk data transfer solutions is often observed in RPC/RMI applications, such as the combination of an RPC-driven upload trigger with the subsequent data transfer. (I)

8.7.1.4 A distinction can be made between the use cases of RPC and those of event-driven communication. This distinction is rooted in the underlying communication paradigm. Event-driven communication is often employed in scenarios involving one-to-many communication, whereas RPC use cases, at least in railway applications, rely on a one-to-one communication paradigm. This is because procedure calls are directed to a specific receiver, who is typically responsible for confirming the call's receipt and execution. For further information regarding technologies that specifically tackle one-to-many communication use cases, please refer to chapter 8.5 on event-based communication. (I)

8.7.1.5 RPC will be realised with HTTP/1.x or HTTP/2 plus TLS 1.3 as the underlying transport protocol and RESTful designed APIs to employ standard HTTP methods (e.g., GET, POST, PUT, DELETE) to perform CRUD (i.e., Create, Read, Update, Delete) operations on resources, which are represented in formats such as JSON or XML. Specific HTTP requests are hence mapped to remote methods or procedures. Each API endpoint is associated with a method call, with the HTTP methods representing different operations on these calls. The Representational State Transfer (REST) design principle describes that method information are not encoded in the Unified Resource Identifier (URI), as the

URI specifies the location and name of the resource, but not the functionality that the (web) service offers for the resource. (I)

8.7.1.6 While HTTP/1.x and HTTP/2 both rely on TCP as transport layer, HTTP/3 introduces QUIC as a new transport layer. As QUIC is not yet very commonly used today, and HTTP/1.x and HTTP/2 already fulfil our requirements quite well, HTTP/3 is intentionally not part of the current specification. It might be added in a later version. (I)

8.7.2 Requirements on Remote Procedure Calls (RPC)

8.7.2.1 For RPC communication HTTP over TLS according to according to IETF RFC 2616 or RFC 7540/7541 shall be used. (R)

8.7.2.2 The endpoints of RPC services shall be implemented in a RESTful designed API. (R)

8.7.2.3 The TLS (HTTPS) endpoints shall be compliant with SUBSET-146. (R)

8.7.2.4 The minimum version a client or a server shall support is HTTP/1.1 according to IETF RFC 2616. (R)

8.7.2.5 Optionally HTTP/2 according to IETF RFC 7540/7541 can be supported and used on mutual handshake. (R)

8.2.2.2 The TLS endpoints shall use the ONCC profile for the X.509 certificates with following field settings:

8.2.2.2.1 Subject CN shall be set to the HTTP server-name (in case of HTTP server) or to HTTP client name (in case of HTTP client)

8.2.2.2.2 Subject Alternative Name ipAddress shall be set to the IP address of the HTTP endpoint

Add a new chapter 8.8 to read:

8.8 Bulk Data Communication

8.8.1 Informative Introduction

8.8.1.1 In addition to cyclic process data, acyclic event-based data exchange and RPC, bulk data communication is another fundamental communication paradigm for vehicle communication differentiated by its application specifics. Consequently, it is necessary for common integration services to provide a (transport) mechanism for bulk data transfer/communication. (I)

8.8.1.2 Typical IT and OT use cases for bulk data communication may include:

- Data warehousing (i.e., loading large volumes of data into internal or external data storages),
- Backup and restore (e.g., of system images),
- Software updates (e.g., for firmware images or containers),
- Data replication and synchronization,
- Management and diagnosis (i.e., log file transfer). (I)

8.8.1.3 A resemblance to or a combination with Remote Procedure Calls (RPC) solutions is often observed in bulk data applications, such as the triggering of a data upload process via a separate procedure call. We therefore direct the reader to the separate chapter 0 on the RPC technologies for further information. (I)

8.8.1.4 The chosen technology here is the Hyper Text Transfer Protocol (HTTP) over TLS and the Representational State Transfer (REST) architectural concept. (I)

8.8.1.5 This pair represents a standardised and well-known approach in the contemporary Internet, facilitating the web-based transfer of data. HTTP versions 1 and 2 are deployed with the Transmission Control Protocol (TCP) as the underlying transport layer, whereas security is provided by using HTTP over TLS (HTTPS). The handshake to establish a secure connection is performed on top of the separate TCP handshake, which results in communication overhead for secured connections. In comparison with HTTP/1.x, HTTP/2 is the more complex and extensive protocol, leading to more extensive implementations and more load on client/server side. An upgrade path between different HTTP versions is available as common libraries and client/server implementations typically support both HTTP/1.x and HTTP/2 nowadays. (I)

8.8.1.6 While HTTP/1.x and HTTP/2 both rely on TCP as transport layer, HTTP/3 introduces QUIC as a new transport layer. As QUIC is not yet very commonly used today, and HTTP/1.x and HTTP/2 already fulfil our requirements quiet well, HTTP/3 is intentionally not part of the current specification. It might be added in a later version. (I)

8.8.1.7 For bulk data applications, standard HTTP methods (e.g., GET, POST, PUT, DELETE) are employed to perform operations on resources, which are identified by Uniform Resource Locators (URLs). RESTful Application Programming Interfaces (APIs) are stateless, meaning that each client request contains all the information necessary to process the request. This improves scalability since services can be offered and implemented in a distributed fashion. For bulk data transfers, a REST API can support endpoints that accept large payloads, typically in formats like JSON or XML, using POST or PUT methods to create or update multiple records at once. Furthermore, custom implementations of pagination, filtering, and batching mechanisms enable the efficient handling of large datasets, ensuring manageable request sizes and reducing server load. Additionally, the use of HTTP headers and status codes provides control over data transfer processes, allowing for reliable and standardised communication between clients and servers. Different HTTP versions can provide different features to simplify such implementations. (I)

8.8.2 Requirements on Bulk Data Communication

8.8.2.1 For bulk data transfer, HTTP over TLS according to according to IETF RFC 2616 or RFC 7540/7541 shall be used. (R)

8.8.2.2 The endpoints of bulk data transfer services shall be implemented in a RESTful designed API. (R)

8.8.2.3 The TLS (HTTPS) endpoints shall be compliant to SUBSET-146 . (R)

8.8.2.4 The minimum version a client or a server shall support is HTTP/1.1 according to IETF RFC 2616. (R)

8.8.2.5 Optionally and only in addition to 8.7.2.1, HTTP/2 according to IETF RFC 7540/7541 can be supported and used on mutual handshake. (R)

8.8.2.6 During Commissioning also other supplier specific protocols are allowed as the scope of this specification is limited to the normal operation of a trainset. (I)

8.2.2.3 The TLS endpoints shall use the ONCC profile for the X.509 certificates with following field settings:

8.2.2.3.1 Subject CN shall be set to the HTTP server-name (in case of HTTP server) or to HTTP client name (in case of HTTP client)

8.2.2.3.2 Subject Alternative Name ipAddress shall be set to the IP address of the HTTP endpoint

Modifications to SUBSET-130 v1.0.0

Modify table 1 to read:

Ref. N°	Title	Reference
1.	ERTMS/ATO System Requirements Specification	SUBSET-125
2.	ATO-OB / ATO-TS FFFIS Application Layer	SUBSET-126
3.	ERTMS/ATO Glossary	13E154
4.	ERTMS/ETCS System Requirements Specification	SUBSET-026
5.	FIS Juridical Recording	SUBSET-027
6.	Dimensioning and Engineering rules	SUBSET-040
7.	IEEE 802.3 Ethernet Standard	NA
8.	FFFIS STM Application Layer	SUBSET-058
9.	Glossary of Terms and Abbreviations	SUBSET-023
10.	FFFIS part: CCS Consist Network Communication Layers~~Interface Specification Communication Layers for On-board Communication~~	SUBSET-1473~~3~~

Table 1 Reference Documents

Modify chapter 5:

5. PRINCIPLES

5.1 Definition of the Variables

5.1.1.1 Intentionally deleted.~~All variables defined within this document shall comply with [Ref 10].~~

5.1.1.2 Intentionally deleted.~~The variables already defined in ETCS are used in this interface by using the same name and giving the corresponding reference in its description and resolution/formula.~~

5.1.1.3 ~~In the case that the length of an ETCS variable is not aligned with any of the data types defined in [Ref 10] and is not part of a BITSET, the needed amount of "0" values will be added in the most significant bits of the variable, to align it with the data type defined in the corresponding column of the packet description table.~~Intentionally deleted.

Move Subset-143, v1.0.0, section 8.1 to this chapter.

5.2 Definition of the Packets

5.2.1.1 Intentionally deleted.~~The following chapters will describe the user data only. All details on the way how User Data are transformed to packets can be found in [Ref 10]. Packets are multiple variables grouped into a single unit, with a defined internal structure.~~

Move Subset-143, v1.0.0, section 8.2 to this chapter.

Modify Table 2 and clause 6.1.1.2 and add a new clause 6.1.1.3:

6. PACKET DESCRIPTION

6.1 List of Packets

Packet Number	Packet Name	Source	Sink	Transmitting cycle [ms]	**Data Class** ¡Error! No se encuentra el origen de la referencia.	Priority Service Class [Ref 10]	Timeout [ms]
0	ATO_ETCS_Status	ATO	ETCS	100	TRDP Process Data	<see CR on process data>	1000
1	ATO_ETCS_DMI	ATO	ETCS	100	TRDP Process Data	<see CR on process data>	1000
2	ATO_ETCS_Data_Entry_Need	ATO	ETCS	NA	TRDP Message Data	3	-
3	ATO_ETCS_Data_Entry_Request	ATO	ETCS	NA	TRDP Message Data	3	-
4	ATO_ETCS_Data_View_Values	ATO	ETCS	NA	TRDP Message Data	3	-
5	ETCS_ATO_Static	ETCS	ATO	1000	TRDP Process Data	<see CR on process data>	3000
6	ETCS_ATO_Dynamic	ETCS	ATO	200	TRDP Process Data	<see CR on process data>	1000
7	ETCS_ATO_Driver_Inputs	ETCS	ATO	100..200	TRDP Process Data	<see CR on process data>	1000
8	ETCS_ATO_Data_Entry_Values	ETCS	ATO	NA	TRDP Message Data	3	-
9	ETCS_ATO_Data_Entry_Flag	ETCS	ATO	NA	TRDP Message Data	3	-
10	ETCS_ATO_Data_View_Values_ Request	ETCS	ATO	NA	TRDP Message Data	3	-

Packet Number	Packet Name	Source	Sink	Transmitting cycle [ms]	**Data Class** ¡Error! No se encuentra el origen de la referencia.	Priority Service Class [Ref 10]	Timeout [ms]
11	ETCS_ATO_BRAKE_DECELERATIONS	ETCS	ATO	200	TRDP Process Data	<see CR on process data>	1000

Table 1 Packet summary

…

6.1.1.2 The packet numbers defined in Table 2 correspond to NID_PACKET definition given in [Ref 10]. This interface uses Slot 1 (see chapter 5 ~~[Ref 10]~~).

6.1.1.3 The packets sent by message data will be sent as TRDP Message Data ~~over TCP~~ via point-to-point push communication with priority service class (PCP) 3 according to [Ref 10].

Adaptation of Application Layer Subsets to an XML-based description of the communication packets

Approval by approvers for March 2026 SP-STG

Type of Approval	✔ Document Approval
Approvals	Nicolas Ykman : Approved , MOTTOLA, Giuseppe Diodato : Approved , Domínguez Fernández, Silvia : Approved , Klose, Christoph (SMO RI R&D) : Approved , MARTA FERNANDEZ ORDAS : Approved , Ghielmetti Cirillo (I-NAT-GST-CCS) : Approved , BITS CH Friedemann : Approved , Rob Dijkman : Approved
Comments	**#2 Approval comment** by **BITSCH Friedemann** on 2026-02-14 07:29 the approval of Nicoals is available via e-mail **#3 Approval comment** by **MARTA FERNANDEZ ORDAS** on 2026-02-16 19:22 CR approved in my role as co-leader of TrainCS System Architecture subgroup, based on its alignment with the evolution of the CCS On-Board System Architecture.
Attachments	

Approval by approvers for October 2026 SP-STG

Type of Approval	✔ Document Approval
Approvals	MOTTOLA, Giuseppe Diodato : Approved , Nicolas Ykman : Approved , Ghielmetti Cirillo (I-NAT-GST-CCS) : Approved , Wischy, Markus Alexander (SMO RI R&D F IL) : Waiting , Oliver Knapp : Approved , Klose, Christoph (SMO RI R&D) : Waiting , Domínguez Fernández, Silvia : Approved , Rob Dijkman : Approved , BITSCH Friedemann : Approved , Schürch Stefan (I-NAT-GST-CCS-EXT - Extern) : Approved
Comments	
Attachments	

SP Identification number

SP-CR 26889

Headline

Adaptation of Application Layer Subsets to an XML-based description of the communication packets

Impacted System

ETCS / ATO

Reference Baseline Release

ETCS B4R1 & ATO B1R1 & RMR B1R1 (TSI CCS annex A as per Regulation (EU) 2023/1695)

Documents and/or References

- SUBSET-119, V4.0.0: Train Interface FFFIS
- SUBSET-130, V1.0.0: ATO-OB / ETCS-OB FFFIS Application Layer
- SUBSET-139, V1.0.0: ATO-OB / Rolling Stock FFFIS Application Layer
- SUBSET-143, V1.0.0: ERTMS/ATO On-board Interface Specifications Communication Layers

Error/Enhancement

Enhancement

Problem/Need description

The next version 2.0.0 of the SUBSET-147 will establish a standardised communication backbone in order to improve modularity, exchangeability and evolvability. The standardised communication stack shall be used for the onboard CCS communication, on the interfaces internal to the CCS subsystem, among different applications (e.g. ETCS on-board, ATO on-board) and on the interfaces to the subsystem rolling stock.

The current application layer SUBSETs specifications are based on process data communication. These SUBSETs shall be updated according to the new version 2.0.0 of the SUBSET-147 based on TRDP process data communication. For the definition of process data the XML data format

according IEC 61375-2-3 Annex C shall be used. Thereby, the variables and processes on application layer should generally remain. Beside the the data itself also communication parameters like e.g. cycle time or priority shall be defined in the XML-Files. This allows to directly configure the communication entities in projects.

The concerned mandatory application layer specifications are (the list is not exhaustive):

- SUBSET-119: Train Interface FFFIS
- SUBSET-130: ATO-OB / ETCS-OB FFFIS Application Layer
- SUBSET-139: ATO-OB / Rolling Stock FFFIS Application Layer

With the update of SUBSET-130 the following specification will be obsolete:

- SUBSET-143: ERTMS/ATO On-board Interface Specifications Communication Layers

With the new way of application layer data specification a new data-centric approach in contrast to the current point-to-point interface specification shall be established. All application layer data shall be published to any subscriber who is interested in the information. The data is only published by the original source of information. This approach stimulates innovation and allows to quickly introduce new features or deploy updates in the future. Overall, standardised interfaces on all communication layers in a machine readable format facilitate the integration of ETCS onboard and ATO onboard into vehicles, allowing exchangeability.

Supporting document(s) for problem/need description

None

Solution Proposal by submitter

See solution proposal in: ERJU_solution_proposal_for_SP-CR-26889_Application_Layer_2026-08-19_clean.docx

Changes in comparison with the former presentation to the SP-STG of March are highlighted with revision marks in ERJU_solution_proposal_for_SP-CR-26889_Application_Layer_2026-08-19.docx

Supporting document(s) for solution proposal

ERJU_solution_proposal_for_SP-CR-26889_Application_Layer_2026-08-19_clean.docx

SOLUTION PROPOSAL FOR SP-CR26889

Modifications to SUBSET-119 v4.0.0 and SUBSET-139 v1.0.0

The packet specifications of the concerned application layer SUBSETs (e.g. SUBSET-119 and SUBSET-139) and any new Application Layer FFFIS of the next CCS TSI shall be complemented with additional XML files for direct use of these configuration files in projects.

The format shall follow EN 61375-2-3, Annex C.

Example for Subset-119 v4.0.0, 4.3.5, TR packet 3:

TR Packet 3			
Data name	**Type**	**Description (as a complement to** ¡Error! No se encuentra el origen de la referencia.**)**	**Byte.Bit Offset**
TR_OBU_ L_CONSISTFRONTCABAMAX	UNSIGNED16		0.0
TR_OBU_ L_CONSISTFRONTCABAMIN	UNSIGNED16		2.0
TR_OBU_ L_CONSISTFRONTCABANOM	UNSIGNED16		4.0
TR_OBU_ L_CONSISTREARCABAMAX	UNSIGNED16		6.0
TR_OBU_ L_CONSISTREARCABAMIN	UNSIGNED16		8.0
TR_OBU_ L_CONSISTREARCABANOM	UNSIGNED16		10.0
Spare1	UNSIGNED16		12.0
Spare2	UNSIGNED16		14.0
Spare3	UNSIGNED16		16.0
Spare4	UNSIGNED16		18.0
Spare5	UNSIGNED16		20.0
Spare6	UNSIGNED16		22.0
Validity	UNSIGNED16	Validity of value of variables contained in bytes 0 to 11 of the packet. The	24.0

TR Packet 3			
Data name	**Type**	**Description (as a complement to** ¡Error! No se encuentra el origen de la referencia.**)**	**Byte.Bit Offset**
		validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 22.0 is in bit 11.	

This shall be complemented with an XML file containing:

```
<device>
    <data-set-list>
        <data-set id="3" name="TR packet 3" >
            <element type="UINT16" name="TR_OBU_L_CONSISTFRONTCABAMAX" />
            <element type="UINT16" name="TR_OBU_L_CONSISTFRONTCABAMIN" />
            <element type="UINT16" name="TR_OBU_L_CONSISTFRONTCABANOM" />
            <element type="UINT16" name="TR_OBU_L_CONSISTREARCABAMAX" />
            <element type="UINT16" name="TR_OBU_L_CONSISTREARCABAMIN" />
            <element type="UINT16" name="TR_OBU_L_CONSISTREARCABANOM" />
            <element type="UINT16" name="Spare1" />
            <element type="UINT16" name="Spare2" />
            <element type="UINT16" name="Spare3" />
            <element type="UINT16" name="Spare4" />
            <element type="UINT16" name="Spare5" />
            <element type="UINT16" name="Spare6" />
            <element type="UINT16" name="Validity" />
        </data-set>
    </data-set-list>
</device>
```

The application of the XML files shall be optional.

Proposal of XML files for the three Subsets:

Modifications to SUBSET-119 v4.0.0:

Add a new appendix:

8. Appendix B – XML file for the packets

8.1.1.1 The application of the XML file is optional.

8.1.1.2 The format follows EN 61375-2-3, Annex C.



subset-119_v04.xml

Modifications to SUBSET-139 v1.0.0:

Add a new appendix:

Appendix 3: XML file for the packets

The application of the XML file is optional.

The format follows EN 61375-2-3, Annex C.



subset-139_v02.xml