



EULYNX

EULYNX Initiative



Europe's Rail Joint Undertaking

Interface definition SDI

Document number: Eu.Doc.77
Version: 3.0 (1.A)

Contents

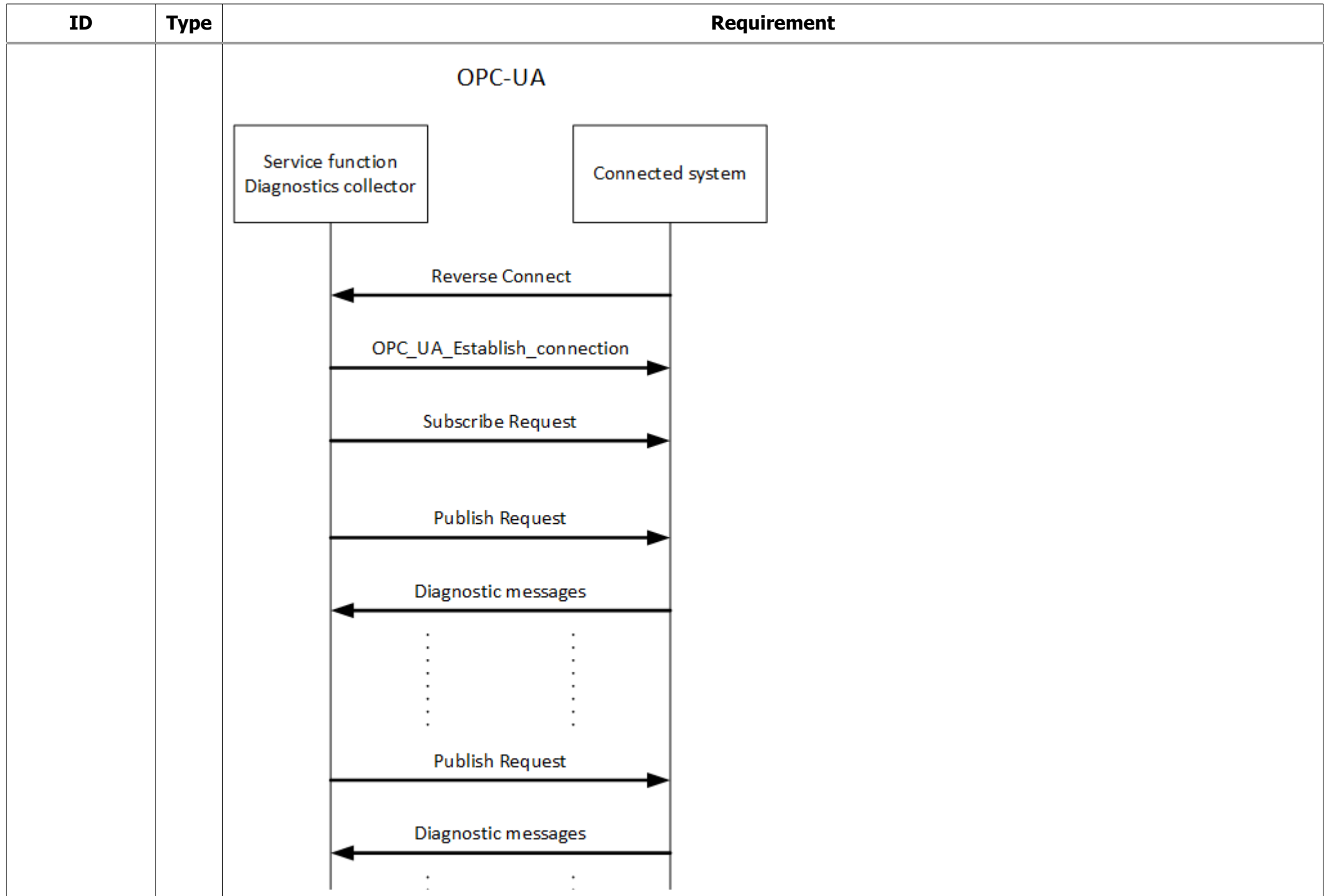
1	Introduction	1
1.1	Release information	1
1.2	Impressum	1
1.3	Purpose	2
1.4	Applicable standards and regulations	2
1.5	Applicable documents	2
1.6	Appendices	3
1.7	Terms and abbreviations	3
1.8	Variability management	3
1.9	Definition of object types	3
2	Requirements	3
2.1	Definition of the SDI	3
3	Service function Diagnostics collector	3
3.1	Overview	4
3.2	Communication requirements	4
3.3	Structure of OPC UA telegrams	6
3.4	Telegram definitions OPC UA	6
3.4.1	Configuring diagnostic messages	6
3.4.2	Requesting diagnostic messages	6
4	Time synchronisation	7
4.1	Overview	7
4.2	Communication requirements	7
4.3	Telegram structure	7

ID	Type	Requirement
Eu.SDI.1	Head	1 Introduction
Eu.SDI.2	Head	1.1 Release information
Eu.SDI.13	Info	[Eu.Doc.77] Interface definition SDI CENELEC Phase: 5 Version: 3.0 (1.A) Approval date: 15.06.2023
Eu.SDI.3	Info	Version history
Eu.SDI.202	Info	version number: 3.0 (0.A) date: 17.05.2022 author: Nico Hurman review: CCB changes: -
Eu.SDI.203	Info	version number: 3.0 (1.A) date: 27.06.2023 author: Nico Hurman review: TCCS+TACS Mirror Group changes: EUAR-564, EUAR-584, EUAR-589, EUAR-594, EUAR-610, EUAR-612, EUAR-613
Eu.SDI.14	Head	1.2 Impressum
Eu.SDI.15	Info	Publishers: Europe's Rail Joint Undertaking https://rail-research.europa.eu/ EULYNX Initiative A full list of the EULYNX Partners can be found on www.eulynx.eu/index.php/members
Eu.SDI.16	Info	Responsible for this document: EU-Rail System Pillar Transversal CCS Components domain
Eu.SDI.141	Info	Copyright EULYNX Partners All information included or disclosed in this document is licensed under the European Union Public Licence EUPL, Version 1.2 or later.

ID	Type	Requirement
Eu.SDI.17	Head	1.3 Purpose
Eu.SDI.18	Info	The document defines the Standard Diagnostic Interface for communication between the service functions Diagnostics collector and Time synchronisation and the EULYNX field element subsystems.
Eu.SDI.19	Info	The service function Diagnostics collector is designed to receive and store diagnostic data from the EULYNX field element subsystems and adjacent systems in the network, and forward this data to the central diagnostics system.
Eu.SDI.20	Info	The document defines the general requirements for communication and the technical specification (e.g. protocols and telegram definition) for the SDI interface. The diagnostic messages (data point IDs and values) relevant to each EULYNX field element subsystem or adjacent system are defined in the generic and specific interface specifications SDI.
Eu.SDI.21	Info	<p>This specification does not define the detailed behaviour of the communication partners (e.g. the system reaction in the event of a communication failure), nor the situations in which the defined telegrams are sent. This behaviour is the subject of the individual system specifications or national specifications.</p> <p>Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications.</p>
Eu.SDI.22	Info	<p>This document is intended for the following users:</p> <ul style="list-style-type: none"> • safety authorities • infrastructure managers • safety assessors • signalling system suppliers • validators
Eu.SDI.204	Info	This document is applicable for both the EU-Rail System Pillar target architecture and the EULYNX architecture. The document is delivered as a single specification fitting both the System Pillar documentation sets and the EULYNX documentation sets. EU-Rail System Pillar is the technical authority for this document.
Eu.SDI.24	Head	1.4 Applicable standards and regulations
Eu.SDI.12	Info	The applicable standards and regulations used in EULYNX are listed in the EULYNX Reference Document List [Eu.Doc.12].
Eu.SDI.25	Info	The references listed in the EULYNX Reference Document List [Eu.Doc.12] shall be considered where they are indicated as being applicable to SDI in the "Applies to" column of the EULYNX Reference Document List [Eu.Doc.12].
Eu.SDI.26	Head	1.5 Applicable documents
Eu.SDI.27	Info	The current versions of documents used as input or related to this document are listed in the EULYNX Documentation Plan [Eu.Doc.11]. The relationships between the documents are displayed in the Appendix A1 Documentation plan and structure [Eu.Doc.11_A1].

ID	Type	Requirement
Eu.SDI.34	Head	1.6 Appendices
Eu.SDI.35	Info	<i>- intentionally left blank -</i>
Eu.SDI.38	Head	1.7 Terms and abbreviations
Eu.SDI.39	Info	The terms and abbreviations are listed in the EULYNX Glossary [Eu.Doc.9].
Eu.SDI.36	Head	1.8 Variability management
Eu.SDI.37	Info	This document describes harmonised requirements. Variability management is not applicable. The specific applicability of requirements is captured in individual interface specifications.
Eu.SDI.40	Head	1.9 Definition of object types
Eu.SDI.41	Info	The following definition for object types is applied in this document:
Eu.SDI.42	Info	<ul style="list-style-type: none"> • "Req" - This denotes a mandatory requirement.
Eu.SDI.45	Info	<ul style="list-style-type: none"> • "Info" - This denotes additional information to help understand the specification. These objects do not specify any additional requirements.
Eu.SDI.46	Info	<ul style="list-style-type: none"> • "Head" - This denotes chapter headings.
Eu.SDI.52	Head	2 Requirements
Eu.SDI.53	Head	2.1 Definition of the SDI
Eu.SDI.51	Info	The Standard Diagnostic Interface (SDI) is a telegram based interface. It is composed of the transport layer and the application layer.
Eu.SDI.152	Info	The application protocols and the application-related functional requirements associated with it are described in detail in the following chapters titled "Diagnostics collector" and "Time synchronisation".
Eu.SDI.153	Info	The transport layer of the SDI required in line with the application is specified in the chapters titled "Diagnostics collector" and "Time synchronisation".
Eu.SDI.154	Info	The lower layers (network layer, data link layer and physical layer) are defined by the PoS-Signalling [Eu.Doc.100].
Eu.SDI.55	Info	The Standard Diagnostic Interface (SDI) is identical for all connected systems in terms of functionality.
Eu.SDI.54	Head	3 Service function Diagnostics collector

ID	Type	Requirement
Eu.SDI.155	Head	3.1 Overview
Eu.SDI.156	Info	The service function Diagnostics collector supports collecting and processing event-based and preventive diagnostic data of the connected systems.
Eu.SDI.148	Info	<p>The service function Diagnostics collector may be realised in the Subsystem – Maintenance and Data Management or in a system defined by national requirements.</p> <p>Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications.</p>
Eu.SDI.56	Head	3.2 Communication requirements
Eu.SDI.57	Req	The OPC UA protocol with binary binding via OPC UA Secure Connection [OPC] via TCP shall be used to transfer diagnostic data from the connected systems to the service function Diagnostics collector.
Eu.SDI.62	Req	The device-specific configuration with the diagnostic messages (OPC UA notifications) of the respective connected system shall be provided by the manufacturer of the connected system.
Eu.SDI.63	Req	The device-specific diagnostic model (the assignment of data point IDs to sub-objects of the connected system) shall be provided by the manufacturer of the connected system.
Eu.SDI.64	Info	The specification (XML scheme) is created by the infrastructure manager.
Eu.SDI.196	Info	The data point IDs represent a hierarchical structure. Hierarchical level are separated by full stops '.' in the data point IDs. This hierarchy can be used as a basis for the XML scheme created by the infrastructure manager.
Eu.SDI.65	Info	In future versions, it should also be possible to create the device-specific diagnostic models directly on the connected system and forward this to the diagnostic system via the service function Diagnostics collector.
Eu.SDI.67	Req	The diagnostic messages shall be gathered on the connected system in an event-driven manner and stored. The service function Diagnostics collector shall request the diagnostic messages from the connected system on a regular cycle.
Eu.SDI.143	Info	



ID	Type	Requirement
Eu.SDI.118	Head	3.3 Structure of OPC UA telegrams
Eu.SDI.119	Info	The notification mechanism of OPC UA is used for diagnostic messages of the connected systems.
Eu.SDI.120	Info	OPC UA uses a strict client server model. The server runs on the connected system. The client is contained in the service function Diagnostics collector. It is recommended to integrate a COTS OPC UA client into the service function Diagnostics Collector.
Eu.SDI.121	Req	The OPC UA server on the connected system shall trigger the opening of the OPC UA connection by the client via reverse connect.
Eu.SDI.122	Info	The OPC UA server is passive and stores diagnostic messages until they are retrieved by the client.
Eu.SDI.192	Info	If two network channels are used for the service function Diagnostics collector:
Eu.SDI.125	Req	<ul style="list-style-type: none"> • it shall be possible to establish the connection to the service function Diagnostics collector via both network channels
Eu.SDI.126	Req	<ul style="list-style-type: none"> • the establishment of the connection shall first be tried via the first address of the service function Diagnostics collector configured on the connected system
Eu.SDI.127	Req	<ul style="list-style-type: none"> • if the first address cannot be reached, the establishment shall be tried via the second address configured on the connected system
Eu.SDI.129	Head	3.4 Telegram definitions OPC UA
Eu.SDI.130	Info	The communication between the OPC UA client and the OPC UA server is session-oriented. For OPC UA, a "telegram" consists of a communication session in which several OPC UA-specific messages are exchanged between the client and the server. The individual messages follow the OPC UA standard and are not described here.
Eu.SDI.131	Head	3.4.1 Configuring diagnostic messages
Eu.SDI.132	Info	With this telegram, the service function Diagnostics collector informs the connected system which individual diagnostic messages are registered by the connected system and communicated upon request.
Eu.SDI.133	Req	The service function Diagnostics collector shall send a "Subscribe Request" via the OPC UA protocol, together with the list of diagnostic messages to be registered.
Eu.SDI.134	Info	The list of diagnostic messages to be registered is part of the manufacturer-specific diagnostic models.
Eu.SDI.135	Head	3.4.2 Requesting diagnostic messages
Eu.SDI.136	Info	With this telegram, the service function Diagnostics collector informs the connected system that the diagnostic messages stored since the last request should be sent.

ID	Type	Requirement
Eu.SDI.137	Req	The service function Diagnostics collector shall send a "Publish Request" via the OPC UA protocol.
Eu.SDI.138	Req	The connected system shall respond to the telegram "Publish request" with the stored diagnostic messages.
Eu.SDI.157	Head	4 Time synchronisation
Eu.SDI.158	Head	4.1 Overview
Eu.SDI.159	Info	The service function Time synchronisation provides the time for all connected systems.
Eu.SDI.190	Info	<p>If configured as using the diagnostics interface, the service function Time synchronisation may be realised in the Subsystem – Maintenance and Data Management or in a system defined by national requirements.</p> <p>Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications.</p>
Eu.SDI.160	Head	4.2 Communication requirements
Eu.SDI.161	Req	The connected systems shall use one or both PoS-Signalling network channels to synchronise times.
Eu.SDI.162	Req	NTP version 4 shall be used in the Time synchronisation service function and the connected systems to synchronise the time, as described in [NTP].
Eu.SDI.163	Req	The UDP transport protocol shall be used via port 123 by the sender and the receiver to synchronise times.
Eu.SDI.164	Req	The Time synchronisation service function shall run in "server mode", i.e. it makes the local time available to the connected systems.
Eu.SDI.165	Info	<p>The Time synchronisation service function has access to a precise local time base. The timers to use are subject to national requirements.</p> <p>Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications.</p>
Eu.SDI.166	Req	The connected systems shall run in "client mode", i.e. they synchronise their local time with the time provided by the Time synchronisation service function.
Eu.SDI.167	Req	The NTP client shall be configured on the connected system accordingly so that the Time synchronisation service function is used as a timer.
Eu.SDI.168	Info	<p>Example entry in ntp.conf:</p> <pre>server <IP-Adresse-SF_ZS_Kanal_A> (<IP address TS_SF_channel_A>) prefer server <IP-Adresse-SF_ZS_Kanal_B> (<IP address TS_SF_channel_B>)</pre>
Eu.SDI.169	Head	4.3 Telegram structure

Interface definition SDI

ID	Type	Requirement
Eu.SDI.195	Info	Telegrams for the Time synchronisation service function are structured in accordance with the [NTP].