



EULYNX Initiative



Europe's Rail Joint Undertaking

Interface definition SCI

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| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
|------------|------|---|----------|--|
| Eu.SCI.6 | Head | 1 Introduction | | |
| Eu.SCI.7 | Head | 1.1 Release information | | |
| Eu.SCI.8 | Info | [Eu.Doc.92] Interface definition SCI CENELEC Phase: 5 Version: 4.3 (0.A) Approval date: 29.05.2024 | | Object Text: [Eu.Doc.92] Interface definition SCI CENELEC Phase: 5 Version: 4. 2 <u>3</u> (0.A) Approval date: 15 <u>29</u> . 06<u>05</u>.2023<u>2024</u> |
| Eu.SCI.9 | Info | Version history | | |
| Eu.SCI.245 | Info | version number: 4.0 (0.A) date: 17.05.2022 author: Nico Huurman, package 4 working group review: CCB changes: EUAR-508, EUAR-526, EUAR-530 | | |
| Eu.SCI.248 | Info | version number: 4.1 (0.A) date: 31.03.2023 author: Nico Huurman review: changes: EUAR-545, EUAR-564, EUAR-571, EUAR-575 | | |
| Eu.SCI.253 | Info | version number: 4.1 (1.A) date: 10.05.2023 author: Nico Huurman review: cluster changes: EUAR-589 | | |
| Eu.SCI.255 | Info | version number: 4.2 (0.A) date: 27.06.2023 author: Nico Huurman review: TACS Mirror Group changes: EUAR-594, EUAR-610, EUAR-612, EUAR-613 | | |
| Eu.SCI.256 | Info | version number: 4.2 (1.A) date: 29.04.2024 author: Nico Huurman review: changes: EUAR-681, EUAR-716 | | object created after baseline 4.2 (0.A) |
| Eu.SCI.258 | Info | version number: 4.3 (0.A) date: 19.06.2024 author: Nico Huurman review: TACS Mirror Group changes: EUAR-697, EUAR-740, EUAR-746, EUAR-751 | | object created after baseline 4.2 (0.A) |
| Eu.SCI.11 | Head | 1.2 Impressum | | |
| Eu.SCI.12 | Info | Publishers: Europe's Rail Joint Undertaking https://rail-research.europa.eu EULYNX Initiative https://eulynx.eu/ | EUAR-681 | Object Text: 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- https://eulynx.eu/index.php/members a_JIRA_BL4R3: EUAR-681 |

| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
|-----------|------|---|------------------------------|--|
| Eu.SCI.13 | Info | Responsible for this document: EU-Rail System Pillar Transversal CCS Components domain | | |
| Eu.SCI.14 | Info | <p>This document is drafted by and belongs to EU Rail.</p> <p>EU Rail encourages the distribution and re-use of this document, the technical specifications and the information it contains. EU Rail holds several intellectual property rights, such as copyright and trade mark rights, which need to be considered when this document is used.</p> <p>EU Rail authorizes you to re-publish, re-use, copy and store this document without changing it, provided that you indicate its source and include the following mention [EU Rail trade mark, title of the document, year of publication, version of document].</p> <p>EU Rail makes no representation or warranty as to the accuracy or completeness of the information contained within these documents. EU Rail shall have no liability to any party as a result of the use of the information contained herein. EU Rail will have no liability whatsoever for any indirect or consequential loss or damage, and any such liability is expressly excluded.</p> <p>You may study, research, implement, adapt, improve and otherwise use the information, the content and the models in this document for your own purposes. If you decide to publish or disclose any adapted, modified or improved version of this document, any amended implementation or derivative work, then you must indicate that you have modified this document, with a reference to the document name and the terms of use of this document. You may not use EU Rail's trade marks or name in any way that may state or suggest, directly or indirectly, that EU Rail is the author of your adaptations. EU Rail cannot be held responsible for your product, even if you have used this document and its content. It is your responsibility to verify the quality, completeness and the accuracy of the information you use, for your own purposes.</p> | <p>EUAR-681 EUAR-740</p> | <p>Object Text: Copyright<u>This EULYNX document Partners</u>is drafted by and belongs to EU Rail. At EU Rail encourages the distribution and re-use of this document, the technical specifications and the information includedit orcontains. disclosedEU inRail holds several intellectual property rights, such as copyright and trade mark rights, which need to be considered when this document is licensedused.</p> <p>EU underRail authorizes you to re-publish, re-use, copy and store this document without changing it, provided that you indicate its source and include the Europeanfollowing Unionmention Public[EU LicenceRail EUPLtrade mark, Version1of the document, year of publication, version of document].2</p> <p>EU Rail makes no representation or laterwarranty as to the accuracy or completeness of the information contained within these documents. EU Rail shall have no liability to any party as a result of the use of the information contained herein. EU Rail will have no liability whatsoever for any indirect or consequential loss or damage, and any such liability is expressly excluded.</p> <p>You may study, research, implement, adapt, improve and otherwise use the information, the content and the models in this document for your own purposes. If you decide to publish or disclose any adapted, modified or improved version of this document, any amended implementation or derivative work, then you must indicate that you have modified this document, with a reference to the document name and the terms of use of this document. You may not use EU Rail's trade marks or name in any way that may state or suggest, directly or indirectly, that EU Rail is the author of your adaptations. EU Rail cannot be held responsible for your product, even if you have used this document and its content. It is your responsibility to verify the quality, completeness and the accuracy of the information you use, for your own purposes.</p> <p>a_JIRA_BL4R3: <u>EUAR-681</u> <u>EUAR-740</u></p> |
| Eu.SCI.15 | Head | 1.3 Purpose | | |
| Eu.SCI.16 | Info | This document defines the protocol stack of the standardised interface for safe communication between the Subsystem - Electronic Interlocking and EULYNX field element subsystems or adjacent systems (SCI-XX). | | |
| Eu.SCI.17 | Info | This interface is designated as SCI-XX, where XX refers to the system type of the communication partner. | | |
| Eu.SCI.87 | Info | This document contains the general requirements for transport, redundancy, safety and retransmission, and application layer specified for SCI-XX. | | |

| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
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| Eu.SCI.18 | Info | This document is intended for the following users: <ul style="list-style-type: none">• safety authorities• infrastructure managers• safety assessors• signalling system suppliers• validators | | |
| Eu.SCI.254 | 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.SCI.19 | Head | 1.4 Applicable standards and regulations | | |
| Eu.SCI.90 | Info | The applicable standards and regulations used in EULYNX are listed in the EULYNX Reference Document List [Eu.Doc.12]. | | |
| Eu.SCI.20 | Info | The references listed in the EULYNX Reference Document List [Eu.Doc.12] shall be considered where they are indicated as being applicable to SCI in the “Applies to” column of the EULYNX Reference Document List [Eu.Doc.12]. | | |
| Eu.SCI.21 | Head | 1.5 Applicable documents | | |
| Eu.SCI.22 | 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]. | | |
| Eu.SCI.23 | Head | 1.6 Appendices | | |
| Eu.SCI.24 | Info | - <i>intentionally left blank</i> - | | |
| Eu.SCI.25 | Head | 1.7 Terms and abbreviations | | |
| Eu.SCI.26 | Info | The terms and abbreviations are listed in the EULYNX Glossary [Eu.Doc.9]. | | |
| Eu.SCI.27 | Head | 1.8 Variability management | | |
| Eu.SCI.28 | Info | This document describes harmonised requirements. Variability management is not applicable. The specific applicability of requirements is captured in individual interface specifications. | | |
| Eu.SCI.29 | Head | 1.9 Definition of object types | | |
| Eu.SCI.30 | Info | The following definition for object types is applied in this document: | | |
| Eu.SCI.31 | Info | <ul style="list-style-type: none">• "Req" - This denotes a mandatory requirement. | | |
| Eu.SCI.32 | 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.SCI.33 | Info | <ul style="list-style-type: none">• "Head" - This denotes chapter headings. | | |
| Eu.SCI.34 | Head | 2 Interface definition SCI-XX | | |
| Eu.SCI.35 | Info | SCI-XX is an interface based on telegrams and consists of a protocol stack according to Figure 1. In this document, requirements for transport, redundancy, safety and retransmission, and application layer (see yellow marked layers in Figure 1 below) are specified. | | |

| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
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| Eu.SCI.145 | Info | <p>Figure 1: SCI-XX protocol stack (yellow layers)</p> <p>Variant 1 Variant 2</p> <p>PDI PDI Application layer</p> <p>RaSTA RaSTA Safety/Retransmission and Redundancy layer</p> <p>UDP TLS over TCP Transport layer</p> <p>IP IP Network layer</p> <p>Ethernet Ethernet Data link and Physical layer</p> | | |
| Eu.SCI.37 | Info | The SCI-XX interface application layer shall be designated as SCI-XX.PDI (PDI Process Data Interface protocol). It defines the telegrams to be exchanged between communication partners. | | |
| Eu.SCI.38 | Req | The safety, retransmission and redundancy layer (safe communication according to EN 50159) in SCI-XX shall be realised with the RaSTA protocol [RaSTA]. | | |
| Eu.SCI.39 | Req | The transport layer in SCI-XX shall be realised as two variants. Both variants shall be supported. | | |
| Eu.SCI.147 | Req | In variant 1, the transport layer shall be realised with UDP. | | |
| Eu.SCI.148 | Req | In variant 2, the transport layer shall be realised with TLS over TCP. Note: There is no variant using TCP without TLS. | | |
| Eu.SCI.149 | Info | Which of the two variants is used in a concrete application is defined by configuration. | | |
| Eu.SCI.40 | Info | The lower layers (physical layer, data link layer and network layer) are defined by the Point of Service - Signalling, as defined in [Eu.Doc.100]. | | |
| Eu.SCI.41 | Head | 3 Protocol layers | | |
| Eu.SCI.42 | Head | 3.1 SCI-XX Process Data Interface protocol | | |
| Eu.SCI.43 | Req | The application layer uses the Process Data Interface protocol for communication between the Subsystem - Electronic Interlocking and EULYNX field element subsystem or adjacent systems as defined in the interface specification of the respective SCI-XX. | | |
| Eu.SCI.44 | Req | After a disconnection (in the lower layers of the protocol stack), Subsystem - Electronic Interlocking and EULYNX field element subsystem or adjacent system shall attempt to re-establish communication within the time $T_{\max} \leq X \leq T_{\max} + 20 \%$. | | |
| Eu.SCI.249 | Head | 3.1.1 Variable and byte order | EUAR-746 | Object Heading: Variable and bit byte order a_JIRA_BL4R3: EUAR-746 |
| Eu.SCI.250 | Req | The encoding of telegrams defined for the Process Data Interface protocol shall respect the order of content variables as defined in the respective interface specification, starting with transmission of byte 00 and counting upwards. | | |
| Eu.SCI.257 | Req | All data shall be transmitted in the little-endian format. Excluded from this rule are the data types string and byte array. | EUAR-716 EUAR-746 | object created after baseline 4.2 (0.A) |
| Eu.SCI.45 | Head | 3.2 RaSTA | | |
| Eu.SCI.46 | Req | For the application of the generic RaSTA protocol with SCI-XX, the following parameters shall be applied. For specific implementation projects, different values may be defined by national specifications. RaSTA consists of the Safety/Retransmission and Redundancy layers, the configuration parameters for each layer are defined separately. | | |

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| | | Note: These parameters have been derived from existing small scale implementations. They have to be proven by further operational experience on larger scales. Deviating values can be used for specific interfaces. Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications. | | |
| Eu.SCI.223 | Info | For variant 1 of SCI-XX (UDP), there is 1 RaSTA configuration. | | |
| Eu.SCI.224 | Info | For variant 2 of SCI-XX (TLS/TCP), there are 3 RaSTA configuration profiles. a. Reduced heartbeat profile b. Fast timeout profile c. Backwards compatibility profile | | |
| Eu.SCI.225 | Req | Profile c. (backwards compatibility) shall be supported. | | |
| Eu.SCI.226 | Info | Support for profiles a. (reduced heartbeat) and b. (fast timeout) is optional. | | |
| Eu.SCI.150 | Info | Which of the three profiles is used in a concrete application is defined by configuration. | | |
| Eu.SCI.146 | Head | 3.2.1 RaSTA configuration for UDP | | |
| Eu.SCI.247 | Info | It is assumed that RaSTA parameters are related to T _{max} according to the following formula: T _{max} > 3*T _h + 2*(T _a + T _b) + T _{seq} plus sufficient margin. (T _a and T _b are transmission times) | | |
| Eu.SCI.47 | Head | 3.2.1.1 Safety/Retransmission layer configuration | | |
| Eu.SCI.48 | Head | 3.2.1.1.1 T_{max} | | |
| Eu.SCI.49 | Info | T _{max} is the maximum accepted age of a message. | | |
| Eu.SCI.50 | Req | T _{max} = 1800 ms | | |
| Eu.SCI.51 | Head | 3.2.1.1.2 T_h | | |
| Eu.SCI.52 | Info | T _h is the heartbeat interval. | | |
| Eu.SCI.53 | Req | T _h = 300 ms | | |
| Eu.SCI.54 | Head | 3.2.1.1.3 Safety Code | | |
| Eu.SCI.56 | Req | SafetyCode = option 2 (lower half of MD4) The initialisation value for MD4 is project specific. | | |
| Eu.SCI.57 | Head | 3.2.1.1.4 N_{sendmax} | | |
| Eu.SCI.58 | Info | A communication partner shall not send more than N _{sendmax} messages without an acknowledgement received (ReceiveBufferSize). This value is exchanged among communication partners during initialisation and can be interpreted as receive buffer minimum size. | | |
| Eu.SCI.59 | Req | N _{sendmax} = 20 | | |
| Eu.SCI.60 | Head | 3.2.1.1.5 MWA | | |
| Eu.SCI.61 | Info | A communication partner shall send an acknowledgement after receiving MWA messages (AcknowledgeWindow). MWA < N _{sendmax} | | |
| Eu.SCI.62 | Req | MWA = 10 | | |
| Eu.SCI.63 | Head | 3.2.1.1.6 N_{maxPaket} | | |
| Eu.SCI.64 | Info | N _{maxPaket} determines, how many user messages may be combined to a single Safety/Retransmission layer packet. | | |
| Eu.SCI.65 | Req | N _{maxPaket} = 1 | | |

| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
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| Eu.SCI.66 | Head | 3.2.1.1.7 NdiagWindow | | |
| Eu.SCI.67 | Info | NdiagWindow defines the channel quality measurement window. | | |
| Eu.SCI.68 | Info | The value of NdiagWindow shall be defined by national specifications. The recommended default value is NdiagWindow = 5000 Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications. | EUAR-746 | a_JIRA_BL4R3: EUAR-746 |
| Eu.SCI.69 | Head | 3.2.1.2 Redundancy layer configuration | | |
| Eu.SCI.70 | Head | 3.2.1.2.1 Amount of physical channels | | |
| Eu.SCI.71 | Info | Amount of channels used for communication in transport layer. One channel means no redundancy. | | |
| Eu.SCI.72 | Req | Amount of physical channels = 2 | | |
| Eu.SCI.73 | Head | 3.2.1.2.2 Check code | | |
| Eu.SCI.75 | Req | Check code = option a (no check code) | | |
| Eu.SCI.76 | Head | 3.2.1.2.3 Tseq | | |
| Eu.SCI.77 | Info | Tseq defines the amount of time a message, received off the channels sequence, is stored (DeferTime). | | |
| Eu.SCI.78 | Req | Tseq = 100 ms | | |
| Eu.SCI.79 | Head | 3.2.1.2.4 NDiagnose | | |
| Eu.SCI.80 | Info | NDiagnose defines the Redundancy layers diagnostic message window. | | |
| Eu.SCI.151 | Info | The value of Ndiagnose shall be defined by national specifications. The recommended default value is NDiagnose = 200 Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications. | EUAR-746 | Object Text: The value of Ndiagnose shall be defined by national specifications. The recommended default value is as NDiagnose follows: = 200 Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications. a_JIRA_BL4R3: EUAR-746 |
| Eu.SCI.82 | Head | 3.2.1.2.5 NdeferQueueSize | | |
| Eu.SCI.83 | Info | NdeferQueueSize defines the maximum number of entries in the deferQueue. | | |
| Eu.SCI.84 | Req | NdeferQueueSize = 4 | | |
| Eu.SCI.152 | Head | 3.2.2 RaSTA configuration for TLS over TCP | | |
| Eu.SCI.240 | Info | It is assumed that RaSTA parameters are related to Tmax according to the following formula: $T_{\max} \geq T_a + T_b + 2 \times T_h + T_{\text{tcpre}}$ $T_a, T_b = T_{\text{cpu}} + T_n$ Tcpu: processing time Tn: network latency Ttcpre: Time of retransmission on TCP layer | | |
| Eu.SCI.153 | Head | 3.2.2.1 Safety/Retransmission layer configuration | | |
| Eu.SCI.154 | Head | 3.2.2.1.1 Tmax | | |
| Eu.SCI.155 | Info | A message shall be received within Tmax after sending (MaxChannelDelay). | | |
| Eu.SCI.156 | Info | Reduced heartbeat profile: Tmax = 1800 ms | | |

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| Eu.SCI.227 | Info | Fast timeout profile: $T_{\max} = 1000$ ms | | |
| Eu.SCI.241 | Info | Eu.SCI.227 assumes: $T_h = 300$ ms, network latency $T_n = 50$ ms, processing time $T_{\text{cpu}} = 100$ ms and $T_{\text{tcpre}} = 100$ ms | | |
| Eu.SCI.242 | Info | The value in Eu.SCI.227 will be validated and might be updated in a future release. The aim is reducing T_{\max} . The effects on SMI, SDI and SSI will be considered. | | |
| Eu.SCI.228 | Req | Backwards compatibility profile: $T_{\max} = 1800$ ms | | |
| Eu.SCI.157 | Head | 3.2.2.1.2 T_h | | |
| Eu.SCI.158 | Info | T_h is the heartbeat interval. | | |
| Eu.SCI.159 | Info | Reduced heartbeat profile: $T_h = 600$ ms | | |
| Eu.SCI.243 | Info | Eu.SCI.159 assumes: $T_{\max} = 1800$ ms, network latency $T_n = 50$ ms, processing time $T_{\text{cpu}} = 100$ ms and $T_{\text{tcpre}} = 300$ ms | | |
| Eu.SCI.244 | Info | The value in Eu.SCI.159 will be validated and might be updated in a future release. The aim is processing load by reducing the heartbeat frequency. The effects on SMI, SDI and SSI will be considered. | | |
| Eu.SCI.229 | Info | Fast timeout profile: $T_h = 300$ ms | | |
| Eu.SCI.230 | Req | Backwards compatibility profile: $T_h = 300$ ms | | |
| Eu.SCI.160 | Head | 3.2.2.1.3 Safety Code | | |
| Eu.SCI.161 | Req | SafetyCode = option 2 (lower half of MD4) The initialisation value for MD4 is project specific. | | |
| Eu.SCI.162 | Head | 3.2.2.1.4 N_{sendmax} | | |
| Eu.SCI.163 | Info | A communication partner shall not send more than N_{sendmax} messages without an acknowledgement received (ReceiveBufferSize). This value is exchanged among communication partners during initialisation and can be interpreted as receive buffer minimum size. | | |
| Eu.SCI.164 | Req | $N_{\text{sendmax}} = 20$ | | |
| Eu.SCI.165 | Head | 3.2.2.1.5 MWA | | |
| Eu.SCI.166 | Info | A communication partner shall send an acknowledgement after receiving MWA messages (AcknowledgeWindow). $MWA < N_{\text{sendmax}}$ | | |
| Eu.SCI.167 | Req | $MWA = 10$ | | |
| Eu.SCI.168 | Head | 3.2.2.1.6 N_{maxPaket} | | |
| Eu.SCI.169 | Info | N_{maxPaket} determines, how many user messages may be combined to a single Safety/Retransmission layer packet. | | |
| Eu.SCI.170 | Req | $N_{\text{maxPaket}} = 1$ | | |
| Eu.SCI.171 | Head | 3.2.2.1.7 $N_{\text{diagWindow}}$ | | |
| Eu.SCI.172 | Info | $N_{\text{diagWindow}}$ defines the channel quality measurement window. | | |
| Eu.SCI.173 | Info | The value of $N_{\text{diagWindow}}$ shall be defined by national specifications. The recommended default value is $N_{\text{diagWindow}} = 5000$ Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications. | | |
| Eu.SCI.174 | Head | 3.2.2.2 Redundancy layer configuration | | |
| Eu.SCI.175 | Head | 3.2.2.2.1 Amount of physical channels | | |
| Eu.SCI.176 | Info | Amount of channels used for communication in transport layer. One channel means no redundancy. | | |
| Eu.SCI.177 | Req | Amount of physical channels = 2 | | |

| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
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| Eu.SCI.178 | Head | 3.2.2.2.2 Check code | | |
| Eu.SCI.179 | Req | Check code = option a (no check code) | | |
| Eu.SCI.180 | Head | 3.2.2.2.3 Tseq | | |
| Eu.SCI.181 | Info | T _{seq} defines the amount of time a message, received off the channels sequence, is stored (DeferTime). | | |
| Eu.SCI.182 | Info | Reduced heartbeat profile: T _{seq} = 50 ms | | |
| Eu.SCI.231 | Info | Fast timeout profile: T _{seq} = 50 ms | | |
| Eu.SCI.232 | Req | Backwards compatibility profile: T _{seq} = 100 ms | | |
| Eu.SCI.183 | Head | 3.2.2.2.4 NDiagnose | | |
| Eu.SCI.184 | Info | N _{Diagnose} defines the Redundancy layers diagnose message window. | | |
| Eu.SCI.185 | Info | The value of N _{diagnose} shall be defined by national specifications. The recommended default value is N _{diagnose} = 200 Note: In future phases of the System Pillar, national specifications will be replaced by harmonised specifications. | EUAR-746 | a_JIRA_BL4R3: EUAR-746 |
| Eu.SCI.186 | Head | 3.2.2.2.5 NdeferQueueSize | | |
| Eu.SCI.187 | Info | N _{deferQueueSize} defines the maximum number of entries in the deferQueue. | | |
| Eu.SCI.188 | Req | N _{deferQueueSize} = 4 | | |
| Eu.SCI.85 | Head | 3.3 UDP | | |
| Eu.SCI.86 | Info | - <i>intentionally left blank</i> - | | |
| Eu.SCI.189 | Head | 3.4 TLS over TCP | | |
| Eu.SCI.190 | Req | The transport layer in variant 2 is a secure transport layer, consisting of two sub-layers. The security layer shall be realised with TLS. The transport layer shall be realised with TCP. | | |
| Eu.SCI.191 | Head | 3.4.1 TLS | | |
| Eu.SCI.192 | Info | The parameters for the security layer are defined in the EULYNX Security specification [Eu.Doc.114] and the EULYNX Security Parameter specification [Eu.Doc.115]. Note: In future phases, the EULYNX security specifications will be replaced by harmonised specifications published by the EU-Rail System Pillar Cyber Security domain. | EUAR-697 | Object Text: The parameters for the security layer are defined in the EULYNX Security specification [Eu.Doc.114] and the EULYNX Security Parameter specification [Eu.Doc.115]. Note: In future phases, the EULYNX security specifications will be replaced by harmonised specifications published by the EU-Rail System Pillar Cyber Security domain. a_JIRA_BL4R3: EUAR-697 |
| Eu.SCI.193 | Head | 3.4.2 TCP | | |
| Eu.SCI.233 | Info | The values of certain TCP parameters depends on the RaSTA configuration profile. | | |
| Eu.SCI.194 | Req | The following parameters shall be applied: | | |
| Eu.SCI.195 | Head | 3.4.2.1 Nagle Algorithm (tcp_nodelay) | | |
| Eu.SCI.196 | Req | tcp_nodelay = true | | |
| Eu.SCI.197 | Info | Explanation: The Nagle's algorithm is disabled to avoid buffering and combining multiple packets into one TCP-packet. | | |

| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
|------------|------|--|----------|---|
| Eu.SCI.198 | Head | 3.4.2.2 TCP Fast Retransmit (tcp_quickack) | | |
| Eu.SCI.199 | Req | tcp_quickack = on | | |
| Eu.SCI.200 | Info | Explanation: To immediately acknowledge packets instead of waiting a bit to acknowledge multiple packets. | | |
| Eu.SCI.201 | Head | 3.4.2.3 Selective Acknowledge (tcp_sack) | | |
| Eu.SCI.202 | Req | tcp_sack = enable | | |
| Eu.SCI.203 | Info | Explanation: To reduce the number of retransmissions if multiple packets are lost. | | |
| Eu.SCI.207 | Head | 3.4.2.4 Linear timeouts (tcp_thin_linear_timeouts) | | |
| Eu.SCI.208 | Req | tcp_thin_linear_timeouts = false | | |
| Eu.SCI.209 | Info | Explanation: Usage of exponential backoff is useful but should be well controlled to avoid too large timeouts (controlled by proper RTO-values, see Eu.SCI.212). | | |
| Eu.SCI.210 | Head | 3.4.2.5 Buffers (tcp_cork) | | |
| Eu.SCI.211 | Req | tcp_cork = off | | |
| Eu.SCI.246 | Info | Explanation: tcp_cork parameter delays sending out partial frames. | | |
| Eu.SCI.212 | Head | 3.4.2.6 Retransmission timeout (tcp_rto_min, tcp_rto_max) | | |
| Eu.SCI.213 | Info | Reduced heartbeat profile: tcp_rto_min = 50 ms | | |
| Eu.SCI.214 | Info | Reduced heartbeat profile: Recommended value tcp_rto_max = 400 ms Note: The use of this value is optional, depending on the implementation. | EUAR-751 | Object Text: Reduced heartbeat profile: Recommended value tcp_rto_max = 400 ms Note: The use of this value is optional, depending on the implementation. a_JIRA_BL4R3: EUAR-751 |
| Eu.SCI.215 | Info | Reduced heartbeat profile: tcp_rto_init = 200 ms | | |
| Eu.SCI.234 | Info | Fast timeout profile: tcp_rto_min = 10 ms | | |
| Eu.SCI.235 | Info | Fast timeout profile: Recommended value tcp_rto_max = 150 ms Note: The use of this value is optional, depending on the implementation. | EUAR-751 | Object Text: Fast timeout profile: Recommended value tcp_rto_max = 150 ms Note: The use of this value is optional, depending on the implementation. a_JIRA_BL4R3: EUAR-751 |
| Eu.SCI.236 | Info | Fast timeout profile: tcp_rto_init = 200 ms | EUAR-751 | Object Text: Fast timeout profile: tcp_rto_init = 50 200 ms a_JIRA_BL4R3: EUAR-751 |
| Eu.SCI.237 | Req | Backwards compatibility profile: tcp_rto_min = 50 ms | | |

| ID | Type | Requirement | JIRA | V 4.3 (0.A) > V 4.2 (0.A) |
|------------|------|---|----------|--|
| Eu.SCI.238 | Info | Backwards compatibility profile: Recommended value tcp_rto_max = 400 ms Note: The use of this value is optional, depending on the implementation. | EUAR-751 | a_Object_Type: Req Info Object Text: Backwards compatibility profile: Recommended value tcp_rto_max = 400 ms Note: The use of this value is optional, depending on the implementation. a_JIRA_BL4R3: EUAR-751 |
| Eu.SCI.239 | Req | Backwards compatibility profile: tcp_rto_init = 200 ms | | |
| Eu.SCI.216 | Info | Explanation: Retransmission Time Out (RTO) will dynamically adapt to the actual round-trip-time (network delay + processing time). | | |
| Eu.SCI.217 | Head | 3.4.2.7 RTT-accuracy (tcp_timestamp) | | |
| Eu.SCI.218 | Req | tcp_timestamp = on | | |
| Eu.SCI.219 | Info | Explanation: Use of TCP-timestamps according to RFC7323 for more accurate round-trip-time calculations. | | |
| Eu.SCI.220 | Head | 3.4.2.8 Number of retries (tcp_retries2) | | |
| Eu.SCI.221 | Req | tcp_retries2 = 15 | | |
| Eu.SCI.222 | Info | Explanation: TCP-stack should keep trying to retransmit, in case of problems RaSTA will break the connection (the value 15 is the default for TCP). This value defines the time when TCP detects a connection loss based on effective Retransmission Time Out and is between tcp_retries2 * tcp_rto_min and tcp_retries2 * tcp_rto_max. | | |