Introduction

Europe’s Rail Joint Undertaking (EU-Rail) is established by Council Regulation (EU) 2021/2085 of 19 November 2021. It is the new European partnership on rail research and innovation established under the Horizon Europe programme (2020-2027) and the universal successor of the Shift2Rail Joint Undertaking. The vision of EU-Rail is to deliver, via an integrated system approach, a high capacity, flexible, multi-modal and reliable integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, for European citizens and cargo.

The EULYNX Consortium (EULYNX) is an initiative of 15 European infrastructure managers, started in 2014 with a common goal for standardisation of signalling systems. Aiming for defining and standardising CCS interfaces, the goal is a significant reduction of the lifecycle cost for signalling systems. EULYNX regularly publishes specification documents as Baseline Sets.

EU-Rail and EULYNX have published a common documentation release EULYNX Baseline Set 4 Release 2. This release has been prepared in close collaboration with the European rail control-command and signalling (CCS) sector under the organisation of EU-Rail System Pillar, bringing a part of the EULYNX development under technical authority of the EU-Rail System Pillar.

The EULYNX Baseline Set 4 Release 2 is a documentation update release within the EULYNX Baseline Set 4, continuing the development based on previous releases. The primary focus of this release is to address the feedback from the industry and integration into the EU-Rail System Pillar. All specifications related to trackside assets and transversal functions are applicable for both the current EULYNX architecture and the future rail target architecture, agreed in the framework of the EU-Rail System Pillar, therefore published as a single set of specifications under a common publication by EULYNX and EU-Rail, delivering in total 24 specification documents. The EU-Rail System Pillar takes the role of the technical authority for the documents of the common publication and will ensure their maintenance.

In addition to the common documentation release, EULYNX published also additional specifications and supporting documents for the current EULYNX architecture, which are integrated in the EULYNX part of Baseline Set 4 Release 2, delivering additional 30 documents.

All deliverables are available in PDF format. In addition to the PDF documents, the following supporting artefacts are delivered:

- For all deliverables originating from DOORS, the requirements interchange format ReqIF is available.
- For all model-based deliverables, the underlying models are available as an export from the EULYNX model.
• For all EULYNX field element subsystem specifications, the simulators developed by EULYNX for verification and validation of requirements are available.

**Known limitations**

A few of the specification documents of Baseline Set 4 Release 2 contain limitations of the specifications that could not be resolved before the publication of the release. Known limitations are present in the following documents:

• Requirements specification for subsystem Point [Eu.Doc.36]
  - The interpretation of the 4-wire patterns as defined in the tables in section 3.4.7.1 (Eu.P.6797) reflects the current state of discussion and may be further developed for a future release.

• Interface definition and specification SMI [Eu.Doc.76]
  - The specification of the service function Loading Procedure will be reviewed in respect to robustness, error handling, security, scalability and version management.

• Interface specifications SDI
  - The specification of the generic and specific diagnostic data points will be further refined in a future release.

• Interface specification SDI-TDS [Eu.Doc.81]
  - The specification of the diagnostic data points for the Subsystem TDS working with track circuits and train detection points needs to be extended.

• Interface specification SDI-LC [Eu.Doc.110]
  - The specification of the diagnostic data points for the Subsystem Level Crossing needs to be extended.

• Security specifications will serve as relevant input to the future revision of the TSI. For tender activities running until the TSI revision is complete, the EULYNX BL4R2 security specifications may be used. Applying the EULYNX security specifications requires an Infrastructure Manager to establish specific requirements, as indicated by column “valid for IM” in the respective security documents.

**Next release**

The next update of Baseline Set 4 in form of Release 3 is planned for publication in June 2024. The release will address known limitations and pending change requests.
The System Pillar / EULYNX Baseline Set 4 Release 2 includes the following documents:

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Document Name</th>
<th>Document Version</th>
<th>CENELEC Phase</th>
<th>Release</th>
</tr>
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<tbody>
<tr>
<td>Eu.Doc.18</td>
<td>Maintenance and data management specification</td>
<td>4.0 (2.A)</td>
<td>4</td>
<td>06/2023</td>
</tr>
<tr>
<td>Eu.Doc.20</td>
<td>Generic interface and subsystem requirements</td>
<td>4.0 (3.A)</td>
<td>4</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.119</td>
<td>Generic interface and subsystem requirements for SCI</td>
<td>1.0 (3.A)</td>
<td>4</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.120</td>
<td>Generic interface and subsystem requirements for SMI</td>
<td>1.0 (3.A)</td>
<td>4</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.92</td>
<td>Interface definition SCI</td>
<td>4.2 (0.A)</td>
<td>5</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.93</td>
<td>Interface specification SCI Generic</td>
<td>3.2 (0.A)</td>
<td>5</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.77</td>
<td>Interface definition SDI</td>
<td>3.0 (1.A)</td>
<td>5</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.94</td>
<td>Interface specification SDI Generic</td>
<td>4.0 (0.A)</td>
<td>5</td>
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<tr>
<td>Eu.Doc.76</td>
<td>Interface definition and specification SMI</td>
<td>2.0 (1.A)</td>
<td>5</td>
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<tr>
<td>Eu.Doc.32</td>
<td>Requirements specification for subsystem Light Signal</td>
<td>4.2 (0.A)</td>
<td>4</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.33</td>
<td>Interface specification SCI-LS</td>
<td>4.2 (0.A)</td>
<td>5</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.78</td>
<td>Interface specification SDI-LS</td>
<td>4.0 (0.A)</td>
<td>5</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.36</td>
<td>Requirements specification for subsystem Point</td>
<td>4.3 (0.A)</td>
<td>4</td>
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<tr>
<td>Eu.Doc.38</td>
<td>Interface specification SCI-P</td>
<td>4.2 (0.A)</td>
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<td>06/2023</td>
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<tr>
<td>Eu.Doc.80</td>
<td>Interface specification SDI-P</td>
<td>4.0 (0.A)</td>
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<td>06/2023</td>
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<tr>
<td>Eu.Doc.45</td>
<td>Requirements specification for subsystem Generic IO</td>
<td>4.2 (0.A)</td>
<td>4</td>
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<tr>
<td>Eu.Doc.46</td>
<td>Interface specification SCI-IO</td>
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<td>Eu.Doc.82</td>
<td>Interface specification SDI-IO</td>
<td>4.0 (0.A)</td>
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<td>06/2023</td>
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<tr>
<td>Eu.Doc.43</td>
<td>Requirements specification for subsystem TDS</td>
<td>4.1 (0.A)</td>
<td>4</td>
<td>06/2023</td>
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<tr>
<td>Eu.Doc.44</td>
<td>Interface specification SCI-TDS</td>
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<td>06/2023</td>
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<tr>
<td>Eu.Doc.81</td>
<td>Interface specification SDI-TDS</td>
<td>4.0 (0.A)</td>
<td>5</td>
<td>06/2023</td>
</tr>
<tr>
<td>Eu.Doc.108</td>
<td>Requirements specification for subsystem Level Crossing</td>
<td>2.2 (0.A)</td>
<td>4</td>
<td>06/2023</td>
</tr>
<tr>
<td>Eu.Doc.109</td>
<td>Interface specification SCI-LC</td>
<td>2.1 (0.A)</td>
<td>5</td>
<td>06/2023</td>
</tr>
<tr>
<td>Eu.Doc.110</td>
<td>Interface specification SDI-LC</td>
<td>3.0 (0.A)</td>
<td>5</td>
<td>06/2023</td>
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</tbody>
</table>
The following Change Requests describe error corrections that shall be considered when applying the documents of Baseline Set 4 Release 2:

<table>
<thead>
<tr>
<th>CR ID</th>
<th>CR Description</th>
<th>IDs of impacted documents</th>
<th>CR date</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUP-516</td>
<td>Req. Spec. P: Incorrect IO Flow on SD 2.1.2.4.9 (Eu.P.5804) and 2.1.2.4.10 (Eu.P.5374)</td>
<td>Eu.Doc.36</td>
<td>08/2023</td>
</tr>
<tr>
<td>EULS-427</td>
<td>Req spec; Correct Signal Aspect reporting after booted again</td>
<td>Eu.Doc.32</td>
<td>09/2023</td>
</tr>
<tr>
<td>EUAR-679</td>
<td>Status Report Completed Correction</td>
<td>Eu.Doc.93, Eu.Doc.119</td>
<td>01/2024</td>
</tr>
<tr>
<td>EUTDS-499</td>
<td>Correction and simplification of reporting POM and power failures</td>
<td>Eu.Doc.43</td>
<td>01/2024</td>
</tr>
<tr>
<td>EULS-475</td>
<td>Req spec LS: Correct multiplicity of the Indicator, Eurobalise and Legacy ATP</td>
<td>Eu.Doc.32</td>
<td>05/2024</td>
</tr>
<tr>
<td>EULX-634</td>
<td>Req spec LC: Follow up - Correct cardinality of LC5 in Logical Context</td>
<td>Eu.Doc.108</td>
<td>05/2024</td>
</tr>
<tr>
<td>EUAR-751</td>
<td>TCP parameters for SCI-XX</td>
<td>Eu.Doc.92</td>
<td>06/2024</td>
</tr>
</tbody>
</table>

The listed Change Requests can be found in Annex 1.
Functional packages

Documents related to the EULYNX field element subsystems (Light Signal, Generic IO, Point, TDS, Level Crossing) are divided into functional packages. These packages define coherent blocks of capabilities that can be implemented in a product. The packages can be used to delimit the required scope of the functionality of a product, either in the context of tenders for specific implementation projects or in the context of generic product testing and/or certification.

There are two types of packages related to the product capabilities:

- 'Basic packages': One or more packages, at least one of them must be implemented. It is optionally allowed to combine and implement more than one 'basic package' in a product.
- Optional package': One or more packages that can be optionally implemented in addition to (one of) the basic package(s).

Backwards compatibility

The specifications documents of Baseline Set 4 do not include automatic backwards compatibility. Products developed according to the EULYNX specifications of BL4 can't communicate with products developed according to earlier baselines of the EULYNX specifications. Products that must support communication with other products of both BL4 and the previous EULYNX baseline, e.g. because of migration scenarios, must be developed according to a superset of specification documents from different baselines.

The specification documents of Baseline Set 4 are structured in such a way that in a future release it is possible to release a new version of the specification documents related to SCI, SDI, SMI or SSI without the need to publish a new version of the specification document related to the other interfaces. In this way, compatibility of different versions of the four EULYNX interfaces can be managed independent from each other.

Even when the specifications for the interfaces SCI, SDI, SMI and SSI are managed independently in separate documents, there can be technical reasons that create interdependencies between them. This can e.g. be the introduction of a new functionality that requires an update on both SCI and SMI. The new functionality can only be used if a EULYNX product implements the newer version of both SCI and SMI.

To manage this, EULYNX will maintain a compatibility matrix for every subsystem/interface. Every time a new version is released of the defining specification document of one of the 4 interfaces, the compatibility matrix will list all defined versions of the other interfaces with which this new interface version can be combined. The compatibility matrices are listed in the document EULYNX BL4 R2 Compatibility matrices.
Copyright information

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Further information

Further information is available from EU-Rail System Pillar unit or the EULYNX Consortium Office.

EU-Rail System Pillar can be contacted through https://rail-research.europa.eu/about-europes-rail/contact

EULYNX Consortium office can be contacted through eulynx.eu and consortium@eulynx.eu.
Annex 1: Error correction CRs
<table>
<thead>
<tr>
<th>Status</th>
<th>In Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>EULYNX CP SCI-LX</td>
</tr>
<tr>
<td>Component/s</td>
<td>None</td>
</tr>
<tr>
<td>Type</td>
<td>Editorial</td>
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<tr>
<td>Priority</td>
<td>None</td>
</tr>
<tr>
<td>Reporter</td>
<td>Philipp Wolber</td>
</tr>
<tr>
<td>Assignee</td>
<td>Unassigned</td>
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<tr>
<td>Resolution</td>
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<tr>
<td>Remaining Estimate</td>
<td>Not Specified</td>
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<tr>
<td>Time Spent</td>
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</tr>
<tr>
<td>Original Estimate</td>
<td>Not Specified</td>
</tr>
<tr>
<td>Sprint</td>
<td>SCI-LX BL4R2+ topics</td>
</tr>
</tbody>
</table>

**Description**

**Problem**
For some IDs on BL4R2 Req. Spec. SCI-LC the Type Column is empty.

**Intended state**
Add Type:

- Eu.LC.3865 (Info)
- Eu.LC.3833 (Req)
- Eu.LC.3834 (Req)
- Eu.LC.3831 (Info)
- Eu.LC.3832 (Req)
- Eu.LC.3836 (Req)
- Eu.LC.3837 (Req)
- Eu.LC.3835 (Info)
- Eu.LC.3838 (Req)
- Eu.LC.3839 (Info)
- Eu.LC.3840 (Req)
Impact

Req. Spec. LC

Comments

Comment by Philipp Wolber [24.07.2023]
ticket implemented in current version of Req. Spec. LC in Doors, no baseline yet

Generated at Fri Sep 29 08:55:35 CEST 2023 by Nico Huurman using Jira 9.4.4#940004-sha1:26f64053da9e8780329c4d14d752a94327e2e61d.
### Description

**Problem**
On SD 2.1.2.4.9 (Eu.P.5804) and 2.1.2.4.10 (Eu.P.5374) in on Step 2 a incorrect IO Flow is used (Msg_Point_Position).

**Intended state**
Msg_Ability_To_Move_Point should be used.

**Impact**
Req. Spec. P

### Comments

Comment by Philipp Wolber [10.08.2023]
Corrected in PTC. Sync, Ticketed marking needed.

Generated at Fri Sep 29 08:56:02 CEST 2023 by Nico Huurman using Jira 9.4.4#940004-sha1:26f64053da9e8780329c4d14d752a94327e2e61d.
Eu.P.5374_Msg_Able_To_Move used.png

Alternative Scenario: Handle and report restoring of Ability to move point with n-th point machine (P SD 2.1.2.4.10)

Precondition:
The Subsystem - Point is in the state OPERATIONAL.
The Subsystem - Point is configured with a non-4-wire interface to the Point machine.
The Subsystem - Point is configured to observe the Ability to move point.
The Subsystem - Point is Unable to move point.

Interaction 2.1.2.4.10.A:

par [The 1st Point machine is Able to move point]

1.a.1 - The Subsystem - Point detects from the switch states of the Interface P3 to the 1st Point machine that the 1st Point machine has regained Ability to move point.

also par [The n-th Point machine is Able to move point and is configured with full functionality]

1.b.1 - The Subsystem - Point detects from the switch states of the Interface P3 to the n-th Point machine that the n-th Point machine has regained Ability to move point.

Eu.P.5374_Msg_Point_Position.png

Alternative Scenario: Handle and report restoring of Ability to move point with n-th point machine (P SD 2.1.2.4.10)

Precondition:
The Subsystem - Point is in the state OPERATIONAL.
The Subsystem - Point is configured with a non-4-wire interface to the Point machine.
The Subsystem - Point is configured to observe the Ability to move point.
The Subsystem - Point is Unable to move point.

Interaction 2.1.2.4.10.A:

par [The 1st Point machine is Able to move point]

1.a.1 - The Subsystem - Point detects from the switch states of the Interface P3 to the 1st Point machine that the 1st Point machine has regained Ability to move point.

also par [The n-th Point machine is Able to move point and is configured with full functionality]

1.b.1 - The Subsystem - Point detects from the switch states of the Interface P3 to the n-th Point machine that the n-th
Alternative 5 scenario: Handle and report loss of ability to move point with n-th point machines \([P_{SD} 2.1.2.4.9]\).

Precondition:
The Subsystem - Point is in the state OPERATIONAL.
The Subsystem - Point is configured with a non-4 wire interface to the Point machine.
The Subsystem - Point is configured to observe the Ability to move point.
The Subsystem - Point is Able to move point.

Interaction 2.1.2.4.9.A:
- alt [The 1st Point machine is Unable to move point]
  1.a1 - The Subsystem - Point detects from the switch states of the Interface P3 to the 1st Point machine that the 1st Point machine has no Ability to move point.
- else alt [The n-th Point machine is configured with full functionality]
  1.b1.a1 - The Subsystem - Point detects from the switch states of the Interface P3 to the n-th Point machine that the n-th Point machine has no Ability to move point.
  end alt

- else alt [Internal trigger indicates non-ability to move point]
  1.c1 - The Subsystem - Point internal trigger indicates that the Point is Unable to move point.
  end alt

Interaction 2.1.2.4.9.B:
2. The Subsystem - Point reports to the Subsystem - Electronic Interlocking that it is Unable to move point.
**PUC2.1.2.4: Irregularities**

Alternative Scenario: Handle and report loss of ability to move point with n-th point machine (P SD 2.1.2.4.9)

Precondition:
- The Subsystem - Point is in the state OPERATIONAL.
- The Subsystem - Point is configured with a non-1-wire interface to the Point machine.
- The Subsystem - Point is configured to observe the Ability to move point.
- The Subsystem - Point is able to move point.

**Interaction 2.1.2.4.9:**

**alt** [The 1st Point machine is unable to move point]

1.a1: The Subsystem - Point detects from the switch states of the Interface P3 to the 1st Point machine that the 1st Point machine has no Ability to move point.

**else alt** [The n-th Point machine is configured with full functionality]

**opt** [The n-th Point machine is unable to move point]

1.b1.a1: The Subsystem - Point detects from the switch states of the Interface P3 to the n-th Point machine that the n-th Point machine has no Ability to move point.

**end opt**

**else alt** [Internal trigger indicates non-ability to move point]

1.c1: The Subsystem - Point internal trigger indicates that the Point is Unable to move point.

**end alt**

**Interaction 2.1.2.4.9.B**

2. The Subsystem - Point reports to the Subsystem - Electronic
**[EULS-427] Req spec: Correct Signal Aspect reporting after booted again**

**Status:** Open  
**Project:** EULYNX CP SCI-LS  
**Component/s:** None  

| Type:   | Error  | Priority: | None  
|---------|--------|-----------|-------|  
| Reporter: | Filip Giering | Assignee: | Unassigned  
| Resolution: | Unresolved  
| Remaining Estimate: | Not Specified  
| Time Spent: | Not Specified  
| Original Estimate: | Not Specified  

**Attachments:** ![image-2023-08-15-13-44-53-576.png]  
**Sprint:** LS: Postponed to later release

**Description**

**Current state**
When the LS will be set from OPERATIONAL (while indicating "most restrict Aspect" back to BOOTING and then back to OPERATIONAL the controller is not able to report the newly set Aspect to the interlocking.

**Problem**
This is caused due to a deadlock in the observing block as it reacts just on the change trigger of D17 and can therefore not leave the state WAITING.

**Intended state**
The STM for observe Signal Aspect shall be extended with transitions made of purely guard conditions (reacting on current state and not change trigger) as in attached pic shown. The four marked transitions/elements should be added to correct the described behaviour above.

**Impact**
Req spec of BL4R2(1)

**Comments**

**Comment by** *Nico Huurman* [22.09.2023]

LS 20230920: Agreed to implement in BL4R3

Generated at Fri Sep 29 08:42:04 CEST 2023 by Nico Huurman using Jira 9.4.4#940004-sha1:26f64053da9e8780329c4d14d752a94327e2e61d.
[EUAR-679] **Status Report Completed Correction**  Created: 09.01.2024  Updated: 18.03.2024

**Status:** In Development

**Project:** EULYNX CP Reference Architecture

**Component/s:** None

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<td><strong>Reporter:</strong></td>
<td>Philipp Wolber</td>
<td><strong>Assignee:</strong></td>
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<td><strong>Resolution:</strong></td>
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</tr>
</tbody>
</table>

**Sprint:** BL4R2 CRs

**Description**

**Current state**
BL4R2

**Problem**

Correction of table was incorrect.

mail by Christian Löfler:
"My understading of "Status Report Completed" Message is that it is only relevant for Adjacent Systems but not for Efes (see also Eu.Gen-SCI.489).

**EUAR-558** was used to align PDI behaviour of External Level Crossings to Efes. In this context Eu.SCI-XX.PDI.140 was changed for BL4 R2 and sender “EULYNX field element subsystem” was added as last row additionally to existing row for “External Level Crossing System”. Is this change correct? I would still have expected no use of "Status Report Completed" for Efes and also not for External Level Crossings anymore."

**Intended state**

The correct table in the BL4 R2 style should be:

<table>
<thead>
<tr>
<th>Sender</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsystem – Electronic Interlocking</td>
<td>Traffic Control System</td>
</tr>
<tr>
<td>Traffic Control System</td>
<td>Subsystem – Electronic Interlocking</td>
</tr>
</tbody>
</table>
| Subsystem – Electronic Interlocking Radio Block Centre | Subsystem – Electronic Interlocking
|------------------------------------------------------|------------------------------------------------------
| Radio Block Centre                                   | Adjacent Interlocking System                         |
| Subsystem – Electronic Interlocking Adjacent Interlocking System | Subsystem – Electronic Interlocking |
| Subsystem – Electronic Interlocking Centralised ETCS L1 Controller | Subsystem – Electronic Interlocking |
| Centralised ETCS L1 Controller                       | Adjacent Interlocking System                         |
| System – Electronic Interlocking Trackworker Safety System | Subsystem – Electronic Interlocking |
| External Level Crossing System                        | External Level Crossing System                        |
| EULYNX field element subsystem                        | Subsystem – Electronic Interlocking                  |

Eu.Gen-SCI.489 (in Eu.Doc.119), Req Part 2:

Message (Msg) from secondary communication partner to primary

communication partner or from primary communication partner to secondary communication partner that status message transmission of one partner is completed. This is only applicable to adjacent system interfaces.

Impact
To be determined.

Eu.Doc.119
Eu.Doc.93?

Comments
Comment by Filip Giering [18.03.2024]
For Eu.Doc.93: Already in new style where only Primary and Secondary is mentioned instead of specific Subsystems!

Comment by Filip Giering [18.03.2024]
Changes for Eu.Doc.119 done in PTC, marked in DOORS. Sync is missing.

Comment by Nico Huurman [17.01.2024]
Endorsed by TACS MG/CCB on 20240117 for implementation in BL4R3

Comment by Ricky Holz [17.01.2024]
Ticket will be solved by Polarion Task SPT2TACS-376.

Correction and simplification of reporting POM and power failures

Project: EULYNX CP SCI-TDS

Component/s: None

Type: Error
Priority: None

Reporter: Nico Huurman
Assignee: Unassigned

Resolution: Unresolved
Remaining Estimate: Not Specified
Time Spent: Not Specified
Original Estimate: Not Specified

Sprint: TDS Delivery v4.1 February 24

Current state
BL4 R2 (BL4 R2+)

Problem
ProRail raised that the modelled implementation of the functionality related to Power monitoring and POM failures is not in line with their expectations.

A failure of the power supply, detected by the POM (D50in_Failure_Of_The_Power_Supply = true) always leads to a reported state "TVPS is in state occupied".

It is physically true that absence of power at the track circuit must lead to detection of an occupancy (mandated by the safety principles of track circuits). But this should depend only on D48in_Occupancy_Detected = true, and not directly on D50in_Failure_Of_The_Power_Supply = true.

There are cases possible in which the POM detects a problem with the power supply, but there is still power available to detect a vacant track section (according to the required safety level). Reporting "TVPS is in state occupied" in such cases leads to unwanted reduction of availability.

Intended state
The true/false state of D50in_Failure_Of_The_Power_Supply should lead to exactly the same reporting on SCI-TDS as currently implemented for the true/false state of D49in_Failure_Of_The_POM.

It is therefore no longer needed to distinguish between these 2 distinct input ports in the model-based specifications of SubS TDS.

D50in_Failure_Of_The_Power_Supply will be deleted.
D49in_Failure_Of_The_POM will be renamed to D49in_Power_Monitoring_Failure.
The description in Eu.TDS.6365, Req Part 2 will be updated to:
The port D49in_Power_Monitoring_Failure represents a failure detected by the Power Off Monitoring. The POM detects a failure in the power supply of the track circuit or detects a failure in its own functioning.
- True: failure of the power monitoring
- False: no failure of the power monitoring

Change Description of D48in_Occupancy_Detected: The port D48in_Occupancy_Detected refines the FlowProperty Occupancy_Detected and represents a changing occupancy of a track circuit by a Wheel or absence of power.

Several SDs also need to be corrected or removed (worked out below).

SD 2.2.1.2 (Eu.TDS.4157)
- Reword precondition: The relevant POM is in the state “power supply NOK” due to a failure of the POM.

SD 2.2.2.2 (Eu.TDS.2583)
- Reword precondition: The relevant POM is in the state “power supply NOK” due to the failure of the TVPS power supply or a failure of the POM.
  - The relevant TVPS is occupied by at least one Wheel or the absence of a Wheel cannot be detected, due to a power supply failure of the relevant TVPS.
  - Reword postcondition: The relevant TVPS is in the state "TVPS occupied, unable to be forced to clear and power supply NOK" due to a failure of the TVPS power supply or the combination of a failure of the POM and the Wheel(s) in the TVPS.

SD 2.2.2.4 (Eu.TDS.3550)
- will be deleted is now covered by SD 2.2.2.2 (Eu.TDS.2583)

SD 2.2.2.5 (Eu.TDS.3523)
- is now 2.2.2.4

SD 2.2.2.6 (Eu.TDS.4208)
- is now 2.2.2.5
  - Reword precondition: The relevant POM is in the state “power supply NOK” due to a failure of the POM.

SD 2.2.2.7 (Eu.TDS.3532)
- is now 2.2.2.6

SD 2.2.2.8 (Eu.TDS.4217)
Reword precondition: The relevant POM is in the state “power supply NOK” due to a failure of the power supply of the TVPS or a failure of the POM.

Reword step 1: The POM reports "power supply NOK", due to a failure of the power supply of the TVPS or a failure of the POM.
Delete step 2: The Subsystem - Train Detection System recognizes a failure of the power supply of the TVPS or a failure of the POM reporting "power supply NOK".
Reword postcondition: The relevant TVPS is in the state "TVPS disturbed and unable to be forced to clear with a technical reason and power supply NOK" due to a failure of the power supply of the TVPS or a failure of the POM.

Reword precondition: The relevant POM is in the state “power supply NOK” due to a failure of the POM.
Reword step 2: The Subsystem - Train Detection System reports the current state of the TVPS to Subsystem - Electronic Interlocking. The status depends on the ability of the relevant TVPS to detect absence of a Wheel. power supply of the relevant TVPS. In this case the TVPS is not occupied by wheels and the power supply has not failed. If the absence of a Wheel can be detected, the status includes the information that the TVPS is in the state "TVPS vacant, unable to be forced to clear and power supply NOK".

Reword precondition: The relevant POM is in the state “power supply NOK” due to a failure of the power supply of the TVPS or a failure of the POM.
Reword step 1: The POM reports “power supply OK”, due to the restoration of the power supply or the restoration of the POM.
Delete step 2: The Subsystem - Train Detection System recognizes a restoration of the power supply of a TVPS or a restoration of the POM due to the relevant POM reporting "power supply OK".

Reword step 1: The relevant POM reports “power supply NOK”, due to the failure of the POM.
Reword step 2: The Subsystem - Train Detection System reports the current state of the TVPS to Subsystem - Electronic Interlocking. The status depends on the ability of the relevant TVPS to detect absence of a Wheel. If the absence of a Wheel can be detected, the status includes the information that the TVPS is in the state "TVPS vacant, unable to be
Reword postcondition: The relevant TVPS is in the state "TVPS vacant, unable to be forced to clear and power supply NOK" due to the failure of the POM.

SD 2.2.2.13 (Eu.TDS.4255)

- is now 2.2.2.12

Reword step 1: The relevant POM reports "power supply NOK" and the absence of a Wheel can no longer be detected. due to the failure of the power supply of the relevant TVPS.

add IO Passing detected to step 1

Delete step 2: The Subsystem - Train Detection System recognizes a failure of the power supply of a TVPS due to the combination of the relevant POM reporting power supply NOK - and the relevant TVPS reports occupied.

Reword step 3: The Subsystem - Train Detection System reports the current state of the TVPS to Subsystem - Electronic Interlocking. The status depends on the ability of the relevant TVPS to detect absence of a Wheel. The status includes the information that the TVPS is in the state "TVPS occupied, unable to be forced to clear and power supply NOK".

SD 2.2.2.14 (Eu.TDS.4265)

- is now 2.2.2.13
- Reword precondition: The relevant POM is in the state "power supply NOK" due to a failure of the POM.
- Reword step 1: The relevant POM reports "power supply OK", due to a restoration of the POM.
- Delete step 2: The Subsystem - Train Detection System recognizes a restoration of the POM of a TVPS due to the relevant POM reporting power supply OK.

SD 2.2.2.15 (Eu.TDS.4178)

- is now 2.2.2.14
- Reword step 1: The POM reports "power supply NOK", due to the failure of the power supply of the relevant TVPS or a failure of the POM or a failure of the POM due to the relevant POM reporting power supply NOK.
- Delete step 2: The Subsystem - Train Detection System recognizes a failure of the power supply of a TVPS due to the or a failure of the POM due to the relevant POM reporting power supply NOK.
- Reword postcondition: The relevant TVPS is in the state "TVPS occupied, unable to be forced to clear and power supply NOK" due to the failure of the power supply of the relevant TVPS or a failure of the POM.

SD 2.2.2.16 (Eu.TDS.4188)

- is now 2.2.2.15
- Reword precondition: The relevant POM is in the state "power supply NOK" due to the failure of the power supply of the relevant TVPS or a failure of the POM.
- Reword step 1: The POM reports "power supply OK", due to a restoration of the power supply or due to a restoration of the POM.
Delete step 2: The Subsystem - Train Detection System recognizes a restoration of the power supply of a TVPS due to the relevant POM reporting power supply OK.

SD 2.2.2.17 (Eu.TDS.4198)

- is now 2.2.2.16
- Reword precondition: The relevant POM is in the state “power supply NOK” due to the failure of the power supply of the relevant TVPS.
- add IO Passing detected to step 1
- Reword step 1: The POM reports “power supply OK”, due to a restoration of the power supply and the absence of a Wheel can be detected again.
- Delete step 2: The Subsystem - Train Detection System recognizes a restoration of the power supply of a TVPS due to the relevant POM reporting power supply OK.

**Impact**
ReqSpec SubS TDS

**Comments**
Comment by **Ricky Holz** [11.01.2024]
Ticket will be solved by Polarian Task SPT2TACS-278.
Generated at Tue Apr 30 15:38:28 CEST 2024 by Nico Huurman using Jira 9.4.17#940017-sha1:2c0a67f2e46e8da6314dfb6924a27d936e4fcedf.
[EULS-475] **Req spec LS: Correct multiplicity of the Indicator, Eurobalise and Legacy ATP**  
Created: 22.05.2024  Updated: 19.06.2024

**Status:** Cluster Review  
**Project:** EULYNX CP SCI-LS  
**Component/s:** None  
**Type:** Error  
**Priority:** None  
**Reporter:** Ricky Holz  
**Assignee:** Unassigned  
**Resolution:** Unresolved  
**Remaining Estimate:** Not Specified  
**Time Spent:** Not Specified  
**Original Estimate:** Not Specified  
**Issue Links:** BTZ Verknüpfung wird gefordert durch EULS-339 Multiplicity of adjacent LS interfaces Finished  
**Sprint:** LS BL4R3

**Description**

**Current state**  
Draft for BL4R3

**Problem**  
multiplicity on LS4 to Eurobalise is set to 1.  
[EULS-339](#) was approved for implementation in BL4 Release 1, but not correctly implemented.

Same problem is valid for LS3 (Indicator) and LS5 (Legacy train protection system).

**Intended state**  
Change multiplicity for LS3, LS4 and LS5 to 4..8, as defined in EULS-339.

Also error correction for BL4 R1 and BL4 R2

**Impact**  
Req Spec LS

**Comments**

Comment by Ricky Holz [04.06.2024]  
multiplicity adapted - ticket marking done in doors

Comment by Nico Huurman [30.05.2024]
Ticket updated after MG 20240529

Comment by Ricky Holz [ 22.05.2024 ]
multiplicity adapted - ticket marking done in doors - sync needed

Generated at Thu Jun 20 13:30:23 CEST 2024 by Nico Huurman using Jira 9.4.21#940021-sha1:84e26b3d1a2d938c65e3cb0346c67a8c198675a9.
**[EULX-634]** **Req spec LC: Follow up - Correct cardinality of LC5 in Logical Context**

*Status:* Finished

*Project:* EULYNX CP SCI-LX

*Component/s:* None

*Type:* Error  
*Priority:* Niedrig

*Reporter:* Ricky Holz  
*Assignee:* Unassigned

*Resolution:* Unresolved  
*Remaining Estimate:* Not Specified

*Time Spent:* Not Specified  
*Original Estimate:* Not Specified

*Issue Links:* Ersetzen  
ersetzt EULX-608 SubS LC Check cardinality of LC5 in L...  Finished

*Sprint:* SCI-LC BL4R3

**Description**

**Current state**

BL4R3

**Problem**

see EULX-608, approved for BL4R3 to correct the cardinality from 1 to 1..*

The Logical Context diagram of SubS LC (Eu.LC.2776) shows a 1 <> 1...* relation between the SubS LC and the Detection Element on LC5. This may be an inaccurate representation, as there can be zero instances of the interface LC5.

**Intended state**

Change cardinality from 1 <> 1...* to 1 <> *

update corresponding req to :

"The Subsystem - Level Crossing shall provide a logical interface LC5 to each Detection element."

Also error correction for BL4 R1 and BL4 R2

**Impact**

ReqSpec LC
updated cardinality and corresponding req - ticket marking done in doors - sync needed
TCP parameters for SCI-XX

**Status:** In Development

**Project:** EULYNX CP Reference Architecture

**Component/s:** None

**Type:** Clarification

**Priority:** None

**Reporter:** Nico Huurman

**Assignee:** Unassigned

**Resolution:** Unresolved

**Remaining Estimate:** Not Specified

**Time Spent:** Not Specified

**Original Estimate:** Not Specified

**Attachments:** 2024-06-13 TCP Parameter Discussion result part 2.docx

**Sprint:** BL4R3 General RefArch

---

**Description**

**Current state**
Drafts for BL4R3

**Problem**
Review comment CLo (Thales)
Several TCP parameter values requested by the specification are either hard coded in a modern linux kernel or are configurable only for a complete TCP communication stack in a linux system which then also impacts other TCP connections e.g. for SDI, SMI or SSI with not analysed possible unwanted side effects. First discussions came to the conclusion that not all values have a good reason to do such a strange thing. Discussion is already started and Ibtihel is according to my understanding in lead to organise a clarification. More detailed comment for each parameter was provided via mail.

**Intended state**
To be discussed in RaSTA WG on June 11th.

Outcome of expert discussion on June 11th and June 13th collected in attached document.

Delete Eu.SCI.204, .205, .206.

Eu.SCI.214
Reduced heartbeat profile: **Recommended value** tcp_rto_max = 400 ms.
*Note: The use of this value is optional, depending on the implementation.*

Eu.SCI.235
Fast timeout profile: **Recommended value** tcp_rto_max = 150 ms
*Note: The use of this value is optional, depending on the implementation.*
Eu.SCI.236
Fast timeout profile: \texttt{tcp\_rto\_init} = 50 \texttt{200} ms

Eu.SCI.238
Change Req to Info.
Backwards compatibility profile: \textit{Recommended value} \texttt{tcp\_rto\_max} = 400 ms.
Note: The use of this value is optional, depending on the implementation.

\textbf{Impact}
IntDef SCI

\textbf{Backwards compatibility analysis}
The agreed changes are consider as error correction for BL4 Release 1 and BL4 Release 2.

<Provide an answer to the following questions:
Question 1: Can an EfeS implementing the change (new EfeS) operate with an EIL NOT implementing the change (old EIL)?
Question 2: Can an EfeS NOT implementing the change (old EfeS) operate with an EIL implementing the change (new EIL)?
Question 3: Must the PDI version be increased because of this change?>

\textbf{Comments}

\textbf{Comment by Ricky Holz [14.06.2024]}
updated version of reference in Eu.Doc.93 - Eu.SCI-XX.PDI.211 - ticketmarking done in doors

\textbf{Comment by Nico Huurman [11.06.2024]}
Agreed in MG/CCB 20240611 to implement in BL4 Release 3.
Final parameter value to be defined for:
Fast timeout profile: \texttt{tcp\_rto\_min} = 10 ms

Generated at Thu Jun 20 13:40:01 CEST 2024 by Nico Huurman using Jira 9.4.21#940021-sha1:84e26b3d1a2d938ce65e3cb0346c67a8c198675a9.
Revision of TCP parameters supporting different RaSTA profiles

Introduction
In EULYNX BL4 R2, three RaSTA profiles were defined for three different purposes if TCP is used.

I. Backwards compatibility profile compatible to RaSTA profile over UDP
II. Reduced heartbeat profile to keep failure detection time and reducing the heartbeats so reducing the processor load. Retransmit by TCP is used for availability.
III. Fast timeout profile to reduce failure detection time and keep the heartbeat frequency. Retransmit by TCP is used for availability.

Due to this different RaSTA profiles and the usage of TCP for a real time communication with small telegrams, several TCP parameters were adjusted. There are statements form the suppliers Thales, Alstom and Siemens on this topic, which are given in the following table.

TCP parametrization statements
In the following table, the TCP Parameters from EULYNX document EU.Doc.92

<table>
<thead>
<tr>
<th>EULYNX ID</th>
<th>Parameter name</th>
<th>Thales comment</th>
<th>Alstom comment</th>
<th>Siemens comment</th>
<th>Agreement 11.06 and 13.06.2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eu.SCI.196</td>
<td>tcp_nodelay = true</td>
<td>Ok</td>
<td>Active, configurable per connection</td>
<td>Ok</td>
<td>Ok, accepted No changes.</td>
</tr>
<tr>
<td>Eu.SCI.199</td>
<td>tcp_quickack = on</td>
<td>Ok</td>
<td>Active</td>
<td>Ok</td>
<td>Ok, accepted No changes.</td>
</tr>
<tr>
<td>EULYNX ID</td>
<td>Parameter name</td>
<td>Thales comment</td>
<td>Alstom comment</td>
<td>Siemens comment</td>
<td>Agreement 11.06 and 13.06.2024</td>
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<tr>
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</tr>
<tr>
<td>Eu.SCI.202</td>
<td>tcp_sack = enable</td>
<td>In linux based solutions this value is configurable for the complete communication stack only. A restriction to SCI is not possible and only a physical separation and usage of different HW controllers for SCI and other interfaces (SDI, SMI, SSI) allows to avoid side effects on the other interfaces. Is there any requirement for SDI/SMI/SSI related to this value? Otherwise the SCI value will be the master for the other interfaces but this could have very unwanted side effects.</td>
<td>Active, not configurable</td>
<td>Default since Linux Kernel Version 2.2 (1999), used with BANE NOR with no problem There should be no negative impact on other communication.</td>
<td>Ok, accepted No changes.</td>
</tr>
<tr>
<td>EULYNX ID</td>
<td>Parameter name</td>
<td>Thales comment</td>
<td>Alstom comment</td>
<td>Siemens comment</td>
<td>Agreement 11.06 and 13.06.2024</td>
</tr>
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</tr>
<tr>
<td>Eu.SCI.205</td>
<td>tcp_thin_dupack = enable</td>
<td>See tcp_sac</td>
<td></td>
<td>used with BANE NOR with no problem</td>
<td>Configureable at stack level</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This parameter is available since at least linux kernel version 6.9 and not</td>
<td>Agreed: Remove the parameter</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td>activated by default.</td>
<td>from the list.</td>
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<td></td>
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<td></td>
<td></td>
<td>Give only requirements for TCP parameters which are covered by RFCs, tcp_thin_</td>
<td>Eu.SCI.204, .205 and .206</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dupack is not covered by RFCs</td>
<td>will be deleted from Eu.Doc.92.</td>
</tr>
<tr>
<td>Eu.SCI.208</td>
<td>tcp_thin_linear_timeouts = false</td>
<td>See tcp_sac</td>
<td></td>
<td>This parameter is available since at least linux kernel version 6.9 and not</td>
<td>Ok, default accepted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>activated by default.</td>
<td>No changes.</td>
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<tr>
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<td></td>
<td>So, there should be no negative impact on other communication.</td>
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<td></td>
<td>Give only requirements for TCP parameters which are covered by RFCs, tcp_thin_</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>linear_timeouts is not covered by RFCs</td>
<td></td>
</tr>
<tr>
<td>EULYNX ID</td>
<td>Parameter name</td>
<td>Thales comment</td>
<td>Alstom comment</td>
<td>Siemens comment</td>
<td>Agreement 11.06 and 13.06.2024</td>
</tr>
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<td>----------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Eu.SCI.211</td>
<td>tcp_cork = off</td>
<td>See tcp_sac</td>
<td>-</td>
<td>TCP_cork activated may delay sending TCP frames that are not filled up. This contradicts our wish to send immediately. Disabled with BANE NOR with no problem. This parameter is used to prevent sending of singular small packets. If it is set to off, nothing happens, so there should be no problem.</td>
<td>Ok, default accepted No changes.</td>
</tr>
</tbody>
</table>
| Eu.SCI.213 | Reduced heartbeat profile: \( tcp\_rto\_min = 50 \) ms;  
| Eu.SCI.234 | Fast timeout profile: \( tcp\_rto\_min = 10 \) ms  
| Eu.SCI.237 | Backwards compatibility profile: \( tcp\_rto\_min = 50 \) ms | Ok |  |

For SUBSET037: Interval [1000ms..5000ms]  
Recommended: 4000ms  
Configurable for all TCP connections  
Currently not aligned – to be discussed  
Give only requirements for TCP parameters which are covered by RFCs,  
\( tcp\_rto\_min, tcp\_rto\_max \) and \( tcp\_rto\_init \) are not configurable according to RFCs. The \( tcp\_rto\_min \), \( tcp\_rto\_max \) and \( tcp\_rto\_init \) values are hardcoded in Linux, to implement a configurability per socket would need a modification in the linux kernel.  
Ok, recommendation is value of 50ms as 10 ms is only the network delay and will not be reached by the TCP RTO computation  
Fast timeout profile: \( tcp\_rto\_min = 10 \) ms.  

**Discussion 13.06**  
MGr: Could be hard to test. Should be possible to do. Doubt the advantage is measurable in real life. Can be set via IP route command.  
PZie: Can be made. Agree with MGr statements.  
MGr: Very low probability that a telegram is lost on both channels at the same time.  
UMe: If we have fast networks, we should tune our TCP to make use of the speed.  
AEr: A very low rto_min with a network disturbance could lead to
<table>
<thead>
<tr>
<th>EULYNX ID</th>
<th>Parameter name</th>
<th>Thales comment</th>
<th>Alstom comment</th>
<th>Siemens comment</th>
<th>Agreement 11.06 and 13.06.2024</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>retransmission of a high number of packets. JSc: UMe: TCP values can be set per route. These low values for SCI, it will not influence SDI/SMI/SSI. Agreement: No changes needed in Eu.SCI.213, .234 and .237.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eu.SCI.214</th>
<th>Eu.SCI.235</th>
<th>Eu.SCI.238</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced heartbeat profile: tcp_rto_max = 400 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fast timeout profile: tcp_rto_max = 150 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backwards compatibility profile: tcp_rto_max = 400 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In linux based solutions this value is hard coded in the linux kernel and valid for all TCP/IP connections. A restriction to SCI is not possible within one HW controller which makes it impossible to support the required separation for the different standardised interfaces as described in e.g. Eu.PoS.1007 and only a physical separation and usage of different HW controllers for SCI and other interfaces (SDI, SMI, SSI) to avoid overloading of communication channels intended to be used with longer round trip times. This would lead to a cost explosion and seems not to be a good solution. Is the reason for this very demanding value a result of an analysis to avoid any interference with RaSTA functionality? Is there any requirement for SDI/SMI/SSI related to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interval: &gt;=5000ms Recommended: 10000ms Configurable for all TCP connections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See tcp_rto_min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommendation: Use Linux Standard values Default: 120.000 ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Changes agreed 13.06
Change Eu.SCI.238 from Req to Info.
Backwards compatibility profile: Recommended value tcp_rto_max = 400 ms.
Note: The use of this value is optional, depending on the implementation.

Eu.SCI.214.
Reduced heartbeat profile: Recommended value tcp_rto_max = 400 ms.
Note: The use of this value is optional, depending on the implementation.

Eu.SCI.235.
Fast timeout profile: Recommended value tcp_rto_max = 150 ms
Note: The use of this value is optional,
<table>
<thead>
<tr>
<th>EULYNX ID</th>
<th>Parameter name</th>
<th>Thales comment</th>
<th>Alstom comment</th>
<th>Siemens comment</th>
<th>Agreement 11.06 and 13.06.2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eu.SCI.215</td>
<td>Reduced heartbeat profile: tcp_rto_init = 200 ms</td>
<td>this value? Otherwise the SCI value will be the master for the other interfaces increasing the performance requirements towards the Subsystem - Communication System but also to the SDI, SMI and SSI TCP based services of the subsystems (object controllers, MDM, EIL, ...). Also this could have very unwanted side effects.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eu.SCI.236</td>
<td>Fast timeout profile: tcp_rto_init = 50 ms</td>
<td>See tcp_rto_max</td>
<td>Interval: [TCP_RTO_MIN..TCP_RTO_MAX] Recomended: TCP_RTP_MIN Configurable per individual connection</td>
<td>See tcp_rto_min</td>
<td>Recommendation: Use Linux Standard values, 200 ms. Change Eu.SCI.236 to 200 ms.</td>
</tr>
<tr>
<td>Eu.SCI.239</td>
<td>Backwards compatibility profile: tcp_rto_init = 200 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Remark
Some parameters are now default in Linux-based implementations. If those parameters are changed, a new assessment of the parameters is necessary.

### TCP parameters in original document
The following table contains the input from EU.Doc.20 with some additional information from RFCs if possible.

#### Changes agreed 11.06 and 13.06 marked in table.

<table>
<thead>
<tr>
<th>ID</th>
<th>A_DX_ID_EU</th>
<th>Eu.Doc.92</th>
<th>A_Object_Type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Eu.SCI.195</td>
<td>3.4.2.1 Nagle Algorithm (tcp_nodelay)</td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Eu.SCI.196</td>
<td>tcp_nodelay = true</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Eu.SCI.197</td>
<td>Explanation: The Nagle’s algorithm is disabled to avoid buffering and combining multiple packets into one TCP-packet.</td>
<td>Info</td>
<td>Default is usage of Nagle’s algorithm, which means tcp_nodelay = false</td>
</tr>
<tr>
<td>18</td>
<td>Eu.SCI.198</td>
<td>3.4.2.2 TCP Fast Retransmit (tcp_quickack)</td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Eu.SCI.199</td>
<td>tcp_quickack = on</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>A_DXL_ID_EU</td>
<td>Eu.Doc.92</td>
<td>A_Object_Type</td>
<td>Information</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>----------------------------------------------------------------------------</td>
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<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>44</td>
<td>Eu.SCI.200</td>
<td>Explanation: To immediately acknowledge packets instead of waiting a bit to acknowledge multiple packets.</td>
<td>Info</td>
<td>This option must be set at the socket when sending an ACK immediately and will reset to off afterwards</td>
</tr>
<tr>
<td>17</td>
<td>Eu.SCI.201</td>
<td>3.4.2.3 Selective Acknowledge (tcp_sack)</td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Eu.SCI.202</td>
<td>tcp_sack = enable</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Eu.SCI.203</td>
<td>Explanation: To reduce the number of retransmissions if multiple packets are lost.</td>
<td>Info</td>
<td>Default since Linux Kernel Version 2.2 (1999)</td>
</tr>
<tr>
<td>16</td>
<td>Eu.SCI.204</td>
<td>3.4.2.4 Thin Stream Option (tcp_thin_dupack)</td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Eu.SCI.205</td>
<td>tcp_thin_dupack = enable</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Eu.SCI.206</td>
<td>Explanation: Optimisations for interactive sessions (as opposed to streaming bulk data).</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Eu.SCI.207</td>
<td>3.4.2.5 Linear timeouts (tcp_thin_linear_timeouts)</td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Eu.SCI.208</td>
<td>tcp_thin_linear_timeouts = false</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Eu.SCI.209</td>
<td>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).</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Eu.SCI.210</td>
<td>3.4.2.6 Buffers (tcp_cork)</td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Eu.SCI.211</td>
<td>tcp_cork = off</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Eu.SCI.246</td>
<td>Explanation: tcp_cork parameter delays sending out partial frames.</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Eu.SCI.212</td>
<td>3.4.2.7 Retransmission timeout (tcp_rto_min, tcp_rto_max)</td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Eu.SCI.213</td>
<td>Reduced heartbeat profile: tcp_rto_min = 50 ms</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Eu.SCI.214</td>
<td>Reduced heartbeat profile: <strong>Recommended value</strong> tcp_rto_max = 400 ms.</td>
<td>Info</td>
<td>Note: The use of this value is optional, depending on the implementation.</td>
</tr>
<tr>
<td>33</td>
<td>Eu.SCI.215</td>
<td>Reduced heartbeat profile: tcp_rto_init = 200 ms</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Eu.SCI.234</td>
<td>Fast timeout profile: tcp_rto_min = 10 ms</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>A_DXL_ID_EQ</td>
<td>Eu.Doc.92</td>
<td>A_Object_Type</td>
<td>Information</td>
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</tr>
<tr>
<td>31</td>
<td>Eu.SCI.235</td>
<td>Fast timeout profile: <strong>Recommended value</strong> tcp_rto_max = 150 ms</td>
<td>Info</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The use of this value is optional, depending on the implementation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Eu.SCI.236</td>
<td>Fast timeout profile: tcp_rto_init = <strong>50 200 ms</strong></td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Eu.SCI.237</td>
<td>Backwards compatibility profile: tcp_rto_min = 50 ms</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Eu.SCI.238</td>
<td>Backwards compatibility profile: <strong>Recommended value</strong> tcp_rto_max = 400 ms.</td>
<td>Req</td>
<td>Info</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The use of this value is optional, depending on the implementation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Eu.SCI.239</td>
<td>Backwards compatibility profile: tcp_rto_init = 200 ms</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Eu.SCI.216</td>
<td>Explanation: Retransmission Time Out (RTO) will dynamically adapt to the actual round-trip-time (network delay + processing time).</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Eu.SCI.217</td>
<td><strong>3.4.2.8 RTT-accuracy (tcp_timestamp)</strong></td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Eu.SCI.218</td>
<td>tcp_timestamp = on</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Eu.SCI.219</td>
<td>Explanation: Use of TCP-timestamps according to RFC7323 for more accurate round-trip-time calculations.</td>
<td>Info</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Eu.SCI.220</td>
<td><strong>3.4.2.9 Number of retries (tcp_retries2)</strong></td>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Eu.SCI.221</td>
<td>tcp_retries2 = 15</td>
<td>Req</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Eu.SCI.222</td>
<td>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.</td>
<td>Info</td>
<td></td>
</tr>
</tbody>
</table>