EULYNX

EULYNX Initiative

Europe's Rail

Europe's Rail Joint Undertaking

Generic interface and subsystem requirements for SMI

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Contents

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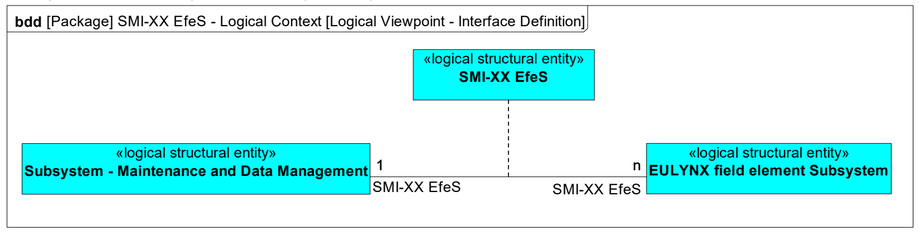
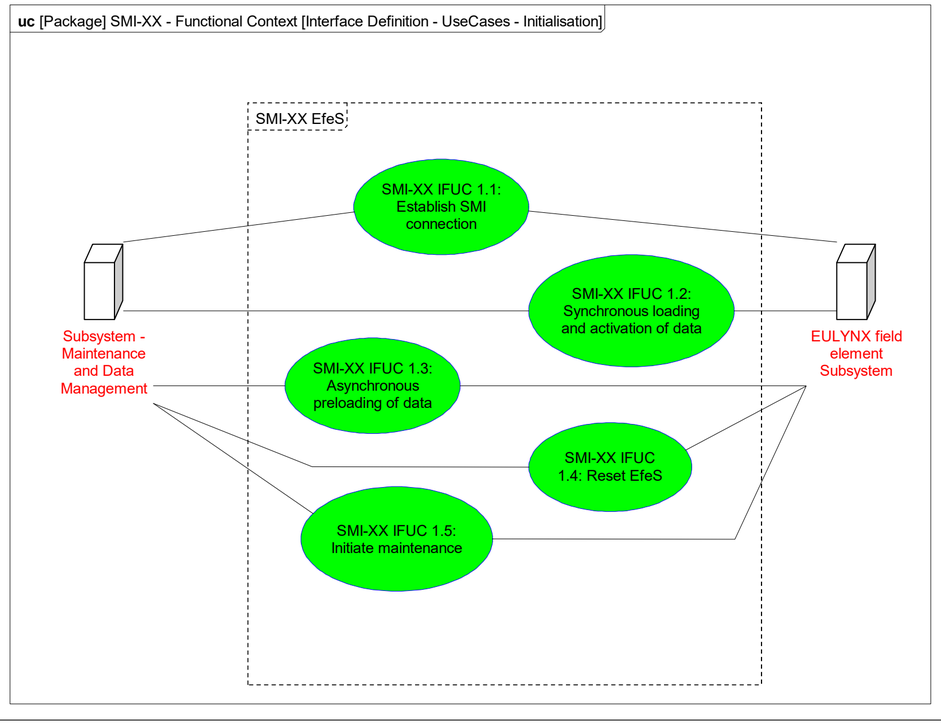
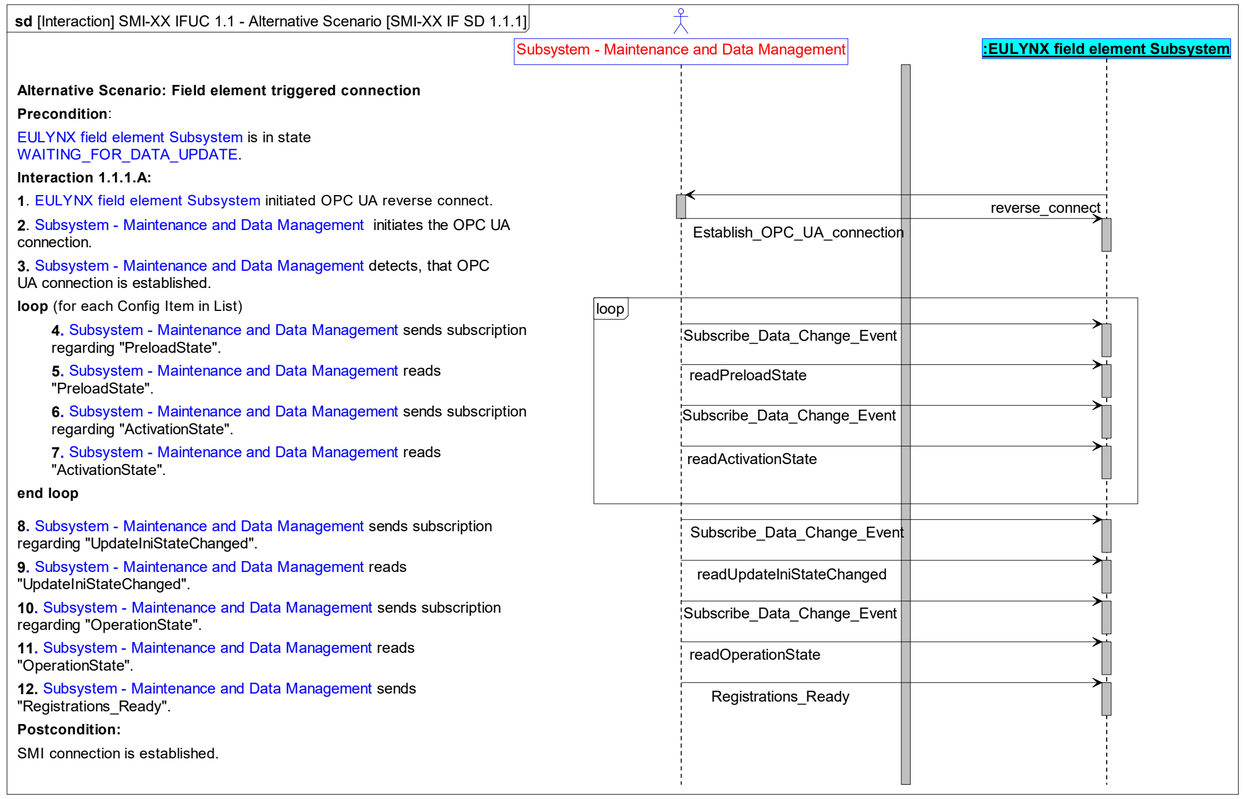
Eu.Gen-SMI.3	Info	[Eu.Doc.120] EULYNX Generic interface and subsystem requirements for SMI CENELEC Phase: 4 Version: 1.1 (0.A) Approval date: 29.05.2024		
Eu.Gen-SMI.4	Info	**Version history**		
Eu.Gen-SMI.176	Info	version number: 1.0 (0.A) date: 16.05.2022 author: Dennis Kunz, Filip Giering generic profile version: 18 review: CCB changes: EUAR-508, EUAR-510, EUAR-512, EUAR-520, EUAR-521, EUAR-523, EUAR-524, EUAR-527, EUAR-528, EUAR-532, EUAR-535		
Eu.Gen-SMI.185	Info	version number: 1.0 (1.A) date: 04.04.2023 author: Filip Giering generic profile version: 21 review: changes: EUAR-553, EUAR-564		
Eu.Gen-SMI.187	Info	version number: 1.0 (2.A) date: 11.05.2023 author: Filip Giering, Dominik Smajgl model version: 22 review: cluster changes: EUAR-589, EUAR-590		
Eu.Gen-SMI.189	Info	version number: 1.0 (3.A) date: 28.06.2023 author: Filip Giering model version: 22 review: TACS Mirror Group changes: EUAR-586, EUAR-594, EUAR-602, EUAR-606, EUAR-612, EUAR-613		
Eu.Gen-SMI.190	Info	version number: 1.0 (4.A) date: 15.12.2023 author: Filip Giering model version: 25 review: M&T changes: EUAR-550, EUAR-660, EUAR-662, EUAR-663, EUAR-664, EUAR-665, EUAR-666, EUAR-667, EUAR-668, EUAR-675		
Eu.Gen-SMI.202	Info	version number: 1.0 (5.A) date: 04.03.2024 author: Philipp Wolber, Filip Giering model version: 25 review: changes: EUAR-434, EUAR-609, EUAR-620, EUAR-638, EUAR-639, EUAR-640, EUAR-642, EUAR-644, EUAR-658, EUAR-698		
Eu.Gen-SMI.224	Info	version number: 1.0 (6.A) date: 30.04.2024 author: Philipp Wolber, Filip Giering model version: 26 review: cluster changes: EUAR-643, EUAR-681, EUAR-697, EUAR-708, EUAR-713, EUAR-714		
Eu.Gen-SMI.225	Info	version number: 1.1 (0.A) date: 18.06.2024 author: Philipp Wolber, Filip Giering model version: 26 review: TACS Mirror Group changes: EUAR-701, EUAR-740, EUAR-746, EUAR-750		
Eu.Gen-SMI.6	Head	**1.2 Impressum**		
Eu.Gen-SMI.7	Info	Publishers: **Europe's Rail Joint Undertaking** https://rail-research.europa.eu **EULYNX Initiative** https://eulynx.eu/		
Eu.Gen-SMI.8	Info	Responsible for this document: EU-Rail System Pillar Trackside Assets Control and Supervision domain		
Eu.Gen-SMI.9	Info	This document is drafted by and belongs to EU Rail. 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. 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]. 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.		

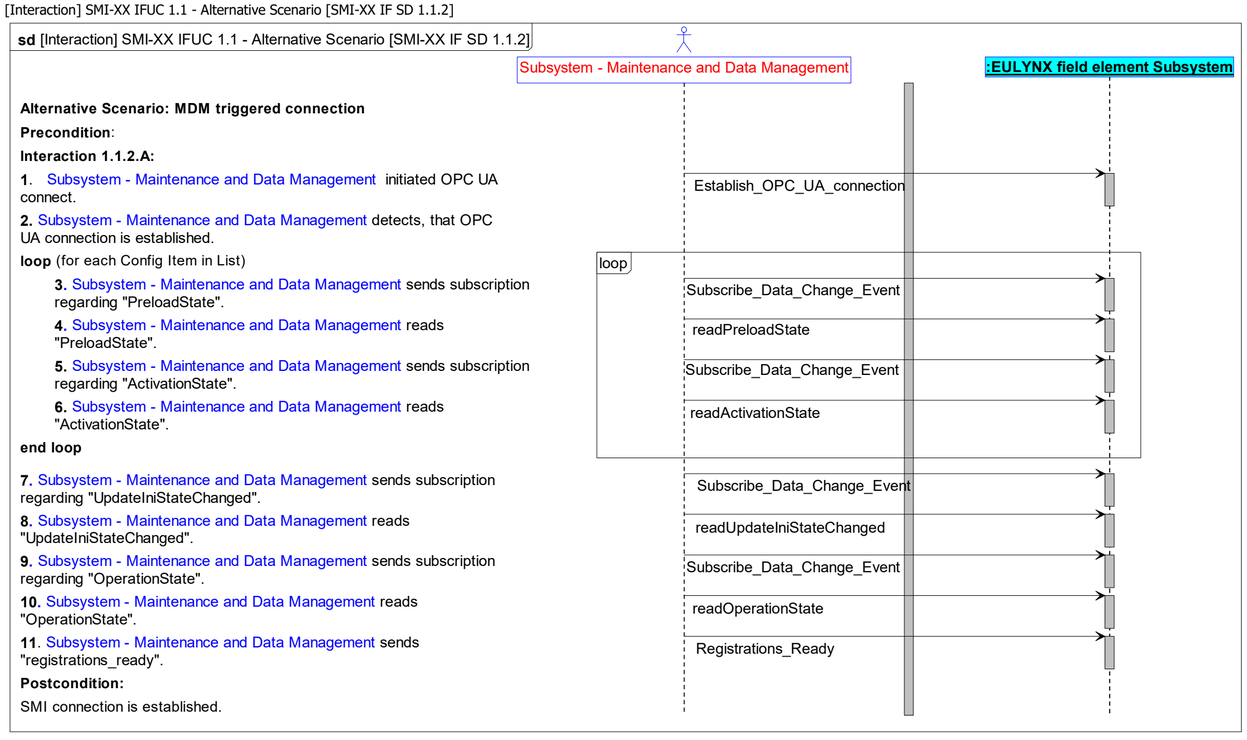
ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
		You may study, research, implement, adapt, improve and otherwise use the information, the content and the models in this document for your own purposes. If you decide to publish or disclose any adapted, modified or improved version of this document, 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.		
Eu.Gen-SMI.10	Head	**1.3 Purpose**		
Eu.Gen-SMI.11	Info	The purpose of the document is the specification of generic requirements for the development of the EULYNX System. The generic requirements complement the specific interface and subsystem requirements.		
Eu.Gen-SMI.12	Info	This document describes: • generic functional requirements for the interface SMI-XX between an EULYNX field element Subsystem and Subsystem - Maintenance and Data Management		
Eu.Gen-SMI.13	Info	This document is intended for the following users: • safety authorities • infrastructure managers • safety assessors • signalling system suppliers • validators		
Eu.Gen-SMI.14	Info	This document is the basis for the implementation by the supplier and for approval by the infrastructure manager.		
Eu.Gen-SMI.188	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.Gen-SMI.15	Head	**1.4 Applicable standards and regulations**		
Eu.Gen-SMI.16	Info	A list of applicable standards and regulations used in EULYNX is listed in the EULYNX Reference Document List [Eu.Doc.12].		
Eu.Gen-SMI.17	Head	**1.5 Applicable documents**		
Eu.Gen-SMI.18	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.Gen-SMI.19	Head	**1.6 Terms and abbreviations**		
Eu.Gen-SMI.20	Info	The terms and abbreviations are listed in the EULYNX Glossary [Eu.Doc.9].		
Eu.Gen-SMI.21	Head	**1.7 Variability management**		
Eu.Gen-SMI.22	Info	This document describes harmonised requirements. Variability management is not applicable. The specific applicability of requirements is captured in individual interface specifications.		
Eu.Gen-SMI.23	Head	**1.8 Definition of object types**		
Eu.Gen-SMI.24	Info	The following definition for object types is applied in this document:		
Eu.Gen-SMI.25	Info	• "Req" - This denotes a mandatory requirement.		
Eu.Gen-SMI.191	Info	• "Def" - This denotes referenceable model elements that are used in the model-based creation of requirements		
Eu.Gen-SMI.26	Info	• "Info" - This denotes additional information to help understand the specification. These objects do not specify any additional requirements.		
Eu.Gen-SMI.27	Info	• "Head" - This denotes chapter headings.		
Eu.Gen-SMI.28	Head	**1.9 Modelling**		
Eu.Gen-SMI.29	Info	The section "Generic requirements for SMI" follows a model based systems engineering process using Systems Modelling Language (SysML) and defines the functional system requirements for the EULYNX field element Subsystem in stimulus-response form. Furthermore the information objects (stimuli and responses) exchanged over the interfaces of the EULYNX field element Subsystem, Subsystem - Electronic Interlocking and the adjacent systems are defined.		
Eu.Gen-SMI.30	Info	The diagrams presented in this document are modelled in SysML [SysML].		
Eu.Gen-SMI.31	Info	The rules for the interpretation of the model based parts of specification are defined in [Eu.Doc.29].		
Eu.Gen-SMI.32	Info	In chapter 3 "Generic requirements for SMI" the functional system requirements, defined in the form of a SysML model in the PTC Integrity Modeler are depicted as a surrogate of this model in the form of DOORS-objects.		
Eu.Gen-SMI.33	Info	A requirement thereby consists of the respective SysML model element, for instance a SysML diagram, and if necessary an additional extension of the requirement.		
Eu.Gen-SMI.34	Info	In the column "Requirement Part 1" the particular SysML model element is depicted and in the column "Requirement Part 2" the corresponding extension of the definition is given. The stated object type normally applies both to "Requirement Part 1" and to "Requirement Part 2".		
Eu.Gen-SMI.35	Info	There are requirements with type "Req" given, where the column "Requirement Part 2" or a part of it is provided with the heading "Information". In this case, the defined type only applies to the column "Requirement Part 1" and the part of "Requirement Part 2", which is not labelled as "Information".		
Eu.Gen-SMI.192	Info	State machines or several state machines linked together in a Functional Architecture define the totality of all functional requirements of an SUS or an SIUS in a coherent and consistent manner. State diagrams of a corresponding state machine are marked with the object type "Req". For the later design and implementation, it is not the description language SysML that is binding, but the domain-specific meaning expressed by it. The specified behaviour can be converted into a vendor specific language but must retain the domain specific meaning describing the functional requirements. The specific model elements are additionally specified and defined by object type "Def" to allow for traceability to supplier designs or test cases. The compliance of products to the specifications must be demonstrated by testing against EULYNX test cases, which are derived from the functionality specified by the models.		
Eu.Gen-SMI.36	Head	**2 Conditions of use**		
Eu.Gen-SMI.37	Info	The specifications defined in this document shall follow the requirements of the EULYNX System Architecture Specification [Eu.Doc.16].		
Eu.Gen-SMI.175	Req	All references to [Eu.Doc.20] refer to Generic interface and subsystem requirements version 4.0 (6.A).		
Eu.Gen-SMI.210	Head	**2.1 Functional packages**		
Eu.Gen-SMI.211	Info	The specifications in this document are divided into functional packages. There are two types of packages related to the product capabilities.		
Eu.Gen-SMI.212	Info	'Basic packages': One or more packages, at least one of them must be implemented. It is allowed to combine and implement more than one 'basic package' in a product.		
Eu.Gen-SMI.213	Info	'Optional package': One or more packages that can be optionally implemented in addition to one or more basic packages.		

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.214	Info	The specifications of the Generic requirements for SMI are divided into the following functional packages:		
Eu.Gen-SMI.215	Info	Basic SMI generic functionality [Basic SMI]		
Eu.Gen-SMI.216	Info	Asynchronous preloading [Option Preloading]		
Eu.Gen-SMI.38	Head	**3 Generic requirements for SMI**		
Eu.Gen-SMI.162	Head	**3.1 EULYNX field element Subsystems**		
Eu.Gen-SMI.39	Head	**3.1.1 Interface to Subsystem - Maintenance and Data Management (SMI-XX EfeS)**		
Eu.Gen-SMI.153	Head	**3.1.1.1 SMI-XX EfeS - Logical Viewpoint**		
Eu.Gen-SMI.155	Head	**3.1.1.1.1 SMI-XX EfeS - Logical Context**		
Eu.Gen-SMI.156	Def	[Package] SMI-XX EfeS - Logical Context [Logical Viewpoint - Interface Definition] 		Basic SMI
Eu.Gen-SMI.144	Head	**3.1.1.2 SMI-XX EfeS - Information Flows**		
Eu.Gen-SMI.145	Info	The InformationFlows between F_EST_EfeS and F_SMI_EfeS are specified in [Eu.Doc.20].		Basic SMI
Eu.Gen-SMI.146	Def	Subsystem_MDM_M	Definition of the InformationFlow (by FlowSpecification) for the data for the interface SMI-XX to Subsystem - Maintenance and Data Management.	Basic SMI
Eu.Gen-SMI.147	Def	Activating_item_i	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem indicating that the activation of the updateable item is triggered.	Basic SMI
Eu.Gen-SMI.148	Def	Maintaining_finished	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem indicating that the maintaining is finished.	Basic SMI
Eu.Gen-SMI.149	Def	Preload_item_i_finished	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem indicating that the preloading of the updateable item has been completed.	Basic SMI
Eu.Gen-SMI.150	Def	Preload_item_i_started	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem indicating that the preloading of the updateable item has started.	Basic SMI
Eu.Gen-SMI.152	Def	Update_process_aborted	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem indicating that the MDM has aborted the update process.	Basic SMI
Eu.Gen-SMI.169	Def	MDM_Request_Reset	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem to perform a remote reset. The remote reset is only applied if the EfeS is in state FALLBACK_MODE.	Basic SMI
Eu.Gen-SMI.170	Def	MDM_Safe_Maintenance	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem to perform maintenance. The data update will start if the EfeS was safely released from railway operation before.	Basic SMI
Eu.Gen-SMI.171	Def	Registrations_Ready	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem to inform the EfeS that the registration of OPC UA status variables has been finished.	Basic SMI

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.173	Def	Start_Async_Preload	Event from Subsystem - Maintenance and Data Management to EULYNX field element Subsystem to start a transfer that can be performed in parallel to the safe railway operation of an EfeS.	Option Preloading
Eu.Gen-SMI.40	Head	**3.1.1.3 SMI-XX EfeS - Functional Viewpoint**		
Eu.Gen-SMI.163	Head	**3.1.1.3.1 Definition of time values**		
Eu.Gen-SMI.164	Def	Con_tmax_DataInstallation	If the installation of the Engineering Data and Configuration Data on the particular EULYNX field element Subsystem is not completed within this configured time period after the termination of loading the data from Subsystem - Maintenance and Data Management, the activation is aborted. A diagnostic message is issued.	Basic SMI
Eu.Gen-SMI.165	Def	Con_tmax_DataTransmission	If the transmission of Engineering Data and Configuration Data from Subsystem - Maintenance and Data Management is not completed within this configured time period, the transmission of the data is restarted.	Basic SMI
Eu.Gen-SMI.166	Def	Con_tmax_Response_MDM	If, on the interface SMI-XX the Subsystem - Maintenance and Data Management doesn't perform any action on the EULYNX field element Subsystem during this configured time period, an attempt is made to establish a connection between Subsystem - Electronic Interlocking and EULYNX field element Subsystem.	Basic SMI
Eu.Gen-SMI.167	Def	Con_tmax_SMI_Connection	If the Subsystem - Maintenance and Data Management doesn't establish the connection on the interface SMI-XX to the EULYNX field element Subsystem within this configured time period an attempt is made to establish a connection between Subsystem - Electronic Interlocking and EULYNX field element Subsystem.	Basic SMI
Eu.Gen-SMI.41	Head	**3.1.1.3.2 SMI-XX EfeS - Functional Context**		
Eu.Gen-SMI.186	Info	[Package] SMI-XX - Functional Context [Interface Definition - UseCases - Initialisation] 		Basic SMI
Eu.Gen-SMI.42	Info	SMI-XX IFUC 1.1: Establish SMI connection		Basic SMI

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.43	Info	[Interaction] SMI-XX IFUC 1.1 - Alternative Scenario [SMI-XX IF SD 1.1.1]		Basic SMI
Eu.Gen-SMI.44	Info	[Interaction] SMI-XX IFUC 1.1 - Alternative Scenario [SMI-XX IF SD 1.1.2]		Basic SMI
Eu.Gen-SMI.45	Info	SMI-XX IFUC 1.2: Synchronous loading and activation of data		Basic SMI





ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.46	Info	[Interaction] SMI-XX IFUC 1.2 - Alternative Scenario [SMI-XX IF SD 1.2.1]		Basic SMI

sd [Interaction] SMI-XX IFUC 1.2 - Alternative Scenario [SMI-XX IF SD 1.2.1]

Alternative Scenario: Synchronous loading and activation of data

Precondition:

EULYNX field element Subsystem is in state WAITING_FOR_DATA_UPDATE.

Interaction 1.2.1.A:

opt [SMI connection is not established]

1. The EULYNX field element Subsystem initiates the establishment of the SMI connection.

end opt

2. EULYNX field element Subsystem sends operation state "maintenance".

loop (for each Config Item in List)

3. EULYNX field element Subsystem sends preload state "ReadyForPreloading".

end loop

4. EULYNX field element Subsystem sends that initialisation is done.

loop (for each Config Item in List)

5. Subsystem - Maintenance and Data Management reads "CurrentVersion".

6. Subsystem - Maintenance and Data Management reads "PreloadedVersion".

7. Subsystem - Maintenance and Data Management sends information about start of item preload.

8. EULYNX field element Subsystem sends preload state "Preloading"

9. Subsystem - Maintenance and Data Management writes preload file.

10. Subsystem - Maintenance and Data Management informs about finished preload item.

11. EULYNX field element Subsystem verifies the integrity and authenticity of the received preload file. The verification is successful.

12. EULYNX field element Subsystem sends preload state "NotYetPreloadable".

13. EULYNX field element Subsystem sends activation state "ReadyForActivation".

14. Subsystem - Maintenance and Data Management reads "CurrentVersion".

15. Subsystem - Maintenance and Data Management reads "PreloadedVersion".

16. Subsystem - Maintenance and Data Management informs about activating item.

17. EULYNX field element Subsystem sends activation state "Activating".

18. EULYNX field element Subsystem sends activation state "NotYetActivatable".

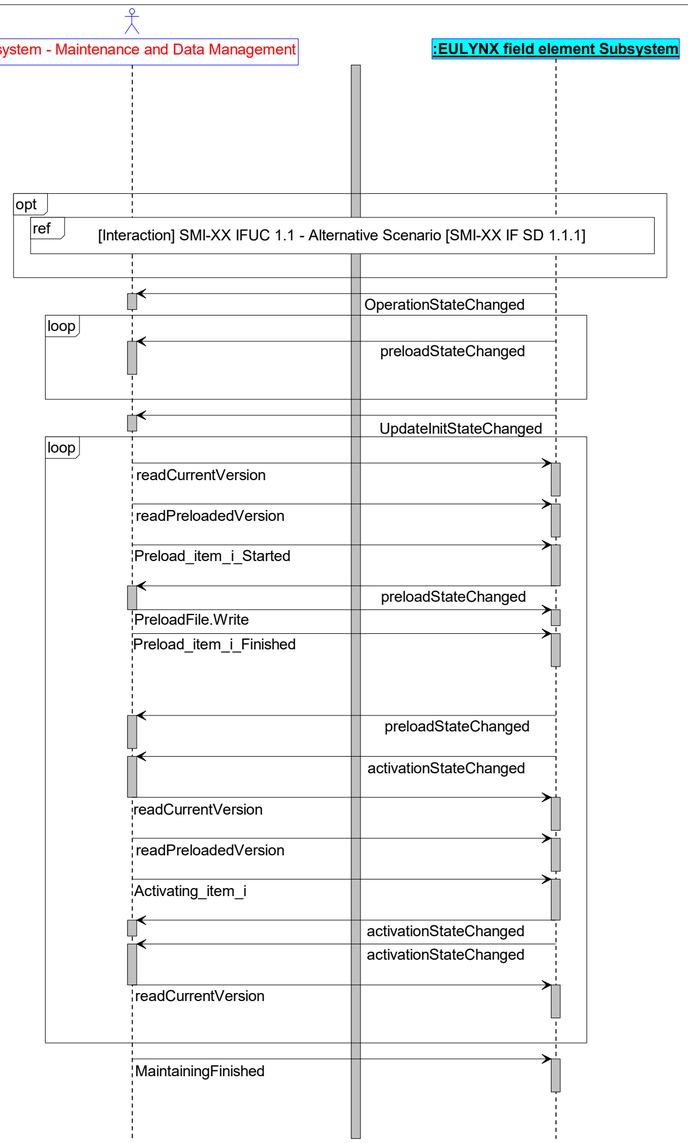
19. Subsystem - Maintenance and Data Management reads "CurrentVersion".

end loop

20. Subsystem - Maintenance and Data Management informs about "MaintainingFinished".

Postcondition:

Data update process complete



ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.47	Info	[Interaction] SMI-XX IFUC 1.2 - Alternative Scenario [SMI-XX IF SD 1.2.2]		Basic SMI

sd [Interaction] SMI-XX IFUC 1.2 - Alternative Scenario [SMI-XX IF SD 1.2.2]

Alternative Scenario: Synchronous preloading of data

Precondition:

EULYNX field element Subsystem is in state WAITING_FOR_DATA_UPDATE.

Interaction 1.2.2.A:

opt [SMI connection is not established]

1. The EULYNX field element Subsystem initiates the establishment of the SMI connection.

end opt

2. EULYNX field element Subsystem sends operation state "maintenance".

loop (for each Config Item in List)

3. EULYNX field element Subsystem sends preload state "ReadyForPreloading".

end loop

4. EULYNX field element Subsystem sends that initialisation is done.

loop (for each Config Item in List)

5. Subsystem - Maintenance and Data Management reads "CurrentVersion".

6. Subsystem - Maintenance and Data Management reads "PreloadedVersion".

7. Subsystem - Maintenance and Data Management sends information about start of item preload.

8. EULYNX field element Subsystem sends preload state "Preloading"

9. Subsystem - Maintenance and Data Management writes preload file.

10. Subsystem - Maintenance and Data Management informs about finished preload item.

11. EULYNX field element Subsystem verifies the integrity and authenticity of the received preload file. The verification is successful.

12. EULYNX field element Subsystem sends preload state "NotYetPreloadable".

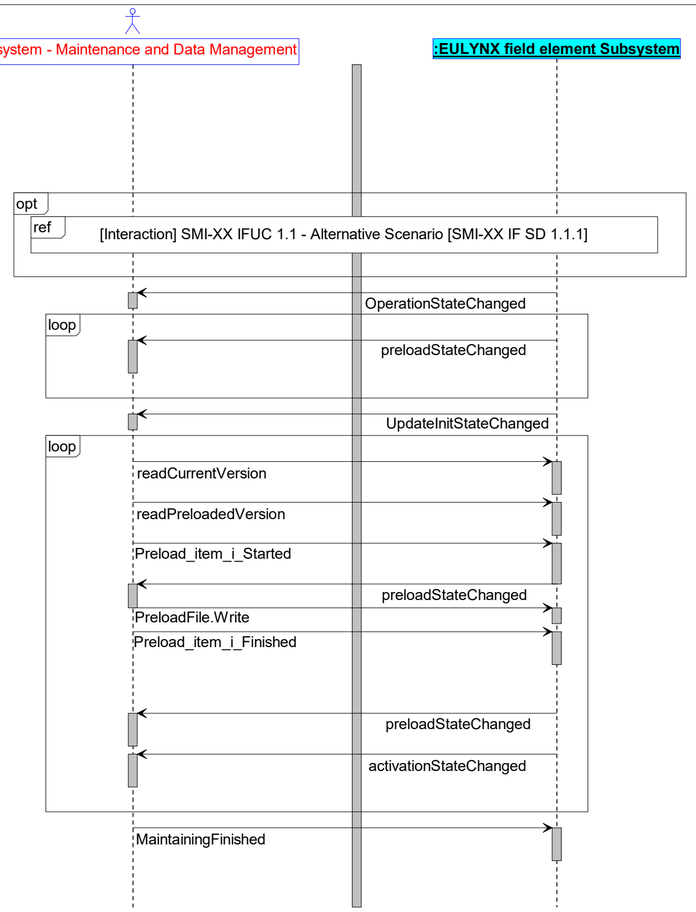
13. EULYNX field element Subsystem sends activation state "ReadyForActivation".

end loop

13. Subsystem - Maintenance and Data Management informs about "MaintainingFinished".

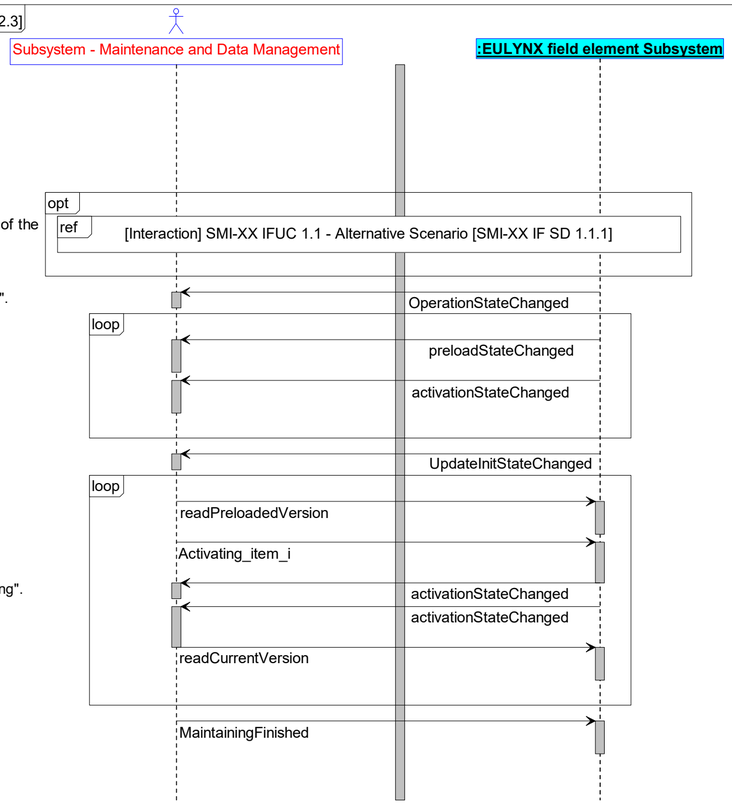
Postcondition:

Data update process complete



ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.48	Info	[Interaction] SMI-XX IFUC 1.2 - Alternative Scenario [SMI-XX IF SD 1.2.3]		Basic SMI
Eu.Gen-SMI.49	Info	SMI-XX IFUC 1.3: Asynchronous preloading of data		Option Preloading

sd [Interaction] SMI-XX IFUC 1.2 - Alternative Scenario [SMI-XX IF SD 1.2.3]



Alternative Scenario: Synchronous activation of data

Precondition:

EULYNX field element Subsystem is in state WAITING_FOR_DATA_UPDATE.

Interaction 1.2.3.A:

opt [SMI connection is not established]

1. The EULYNX field element Subsystem initiates the establishment of the SMI connection.

end opt

2. EULYNX field element Subsystem sends operation state "maintenance".

loop (for each Config Item in List)

3. EULYNX field element Subsystem sends preload state "NotYetPreloadable".

4. EULYNX field element Subsystem sends activation state "ReadyForActivation".

end loop

5. EULYNX field element Subsystem sends that initialisation is done.

loop (for each Config Item in List)

6. Subsystem - Maintenance and Data Management reads "PreloadedVersion".

7. Subsystem - Maintenance and Data Management informs about activating item.

8. EULYNX field element Subsystem sends activation state "Activating".

9. EULYNX field element Subsystem sends activation state "NotYetActivatable".

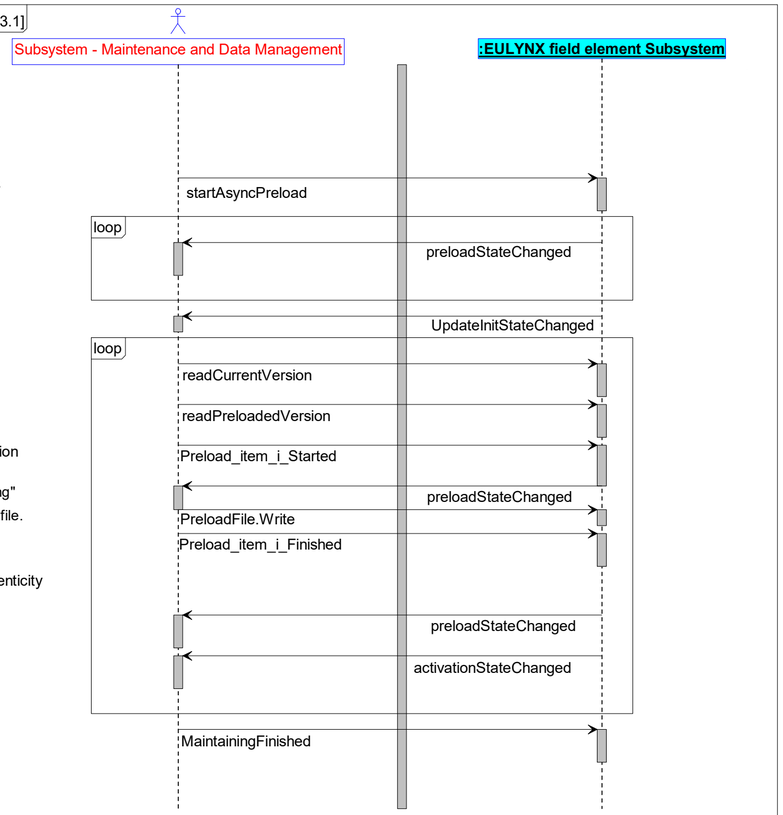
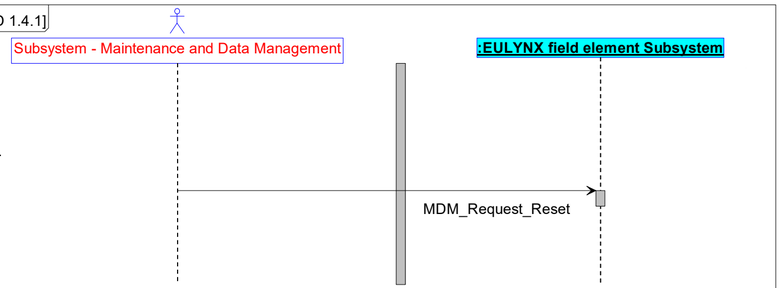
10. Subsystem - Maintenance and Data Management reads "CurrentVersion".

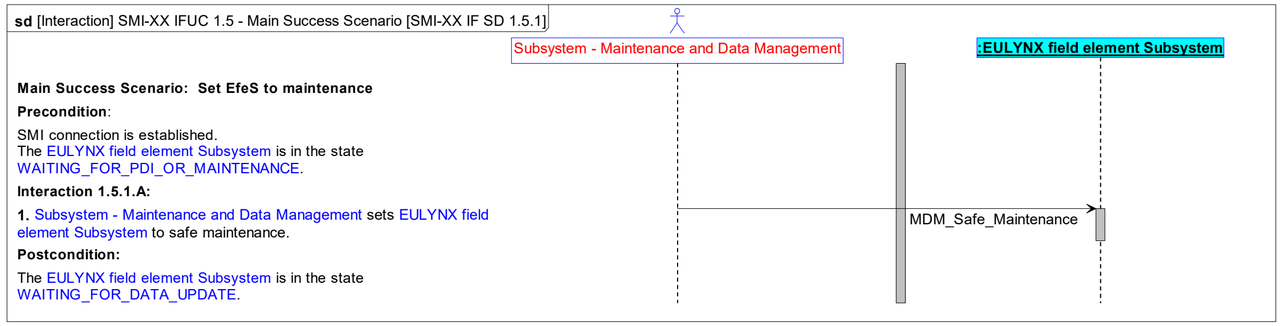
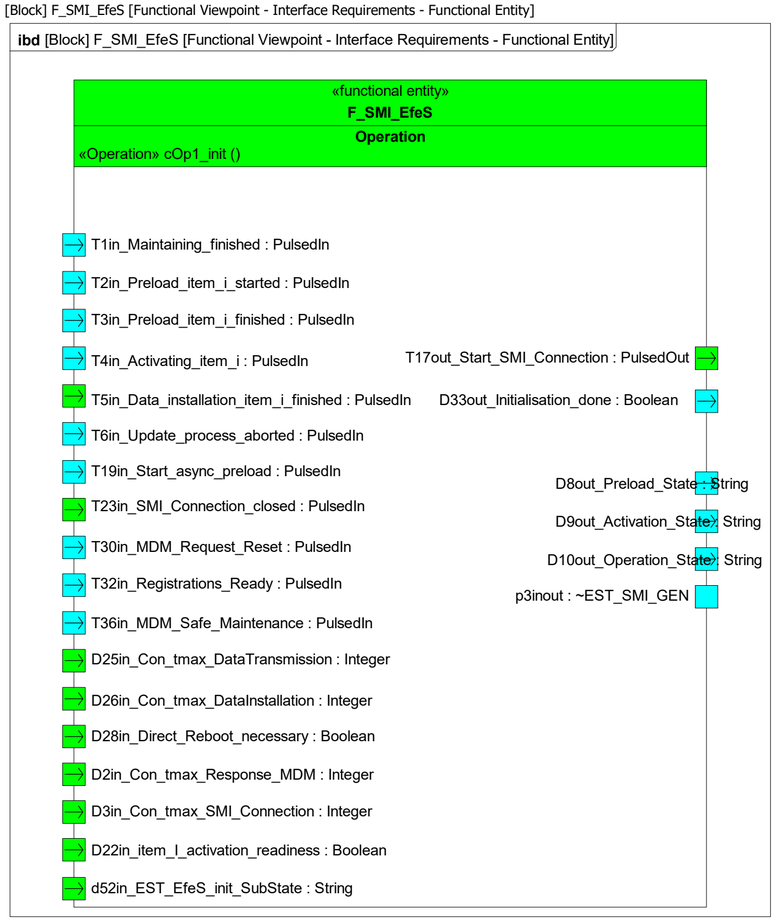
end loop

11. Subsystem - Maintenance and Data Management informs about "MaintainingFinished".

Postcondition:

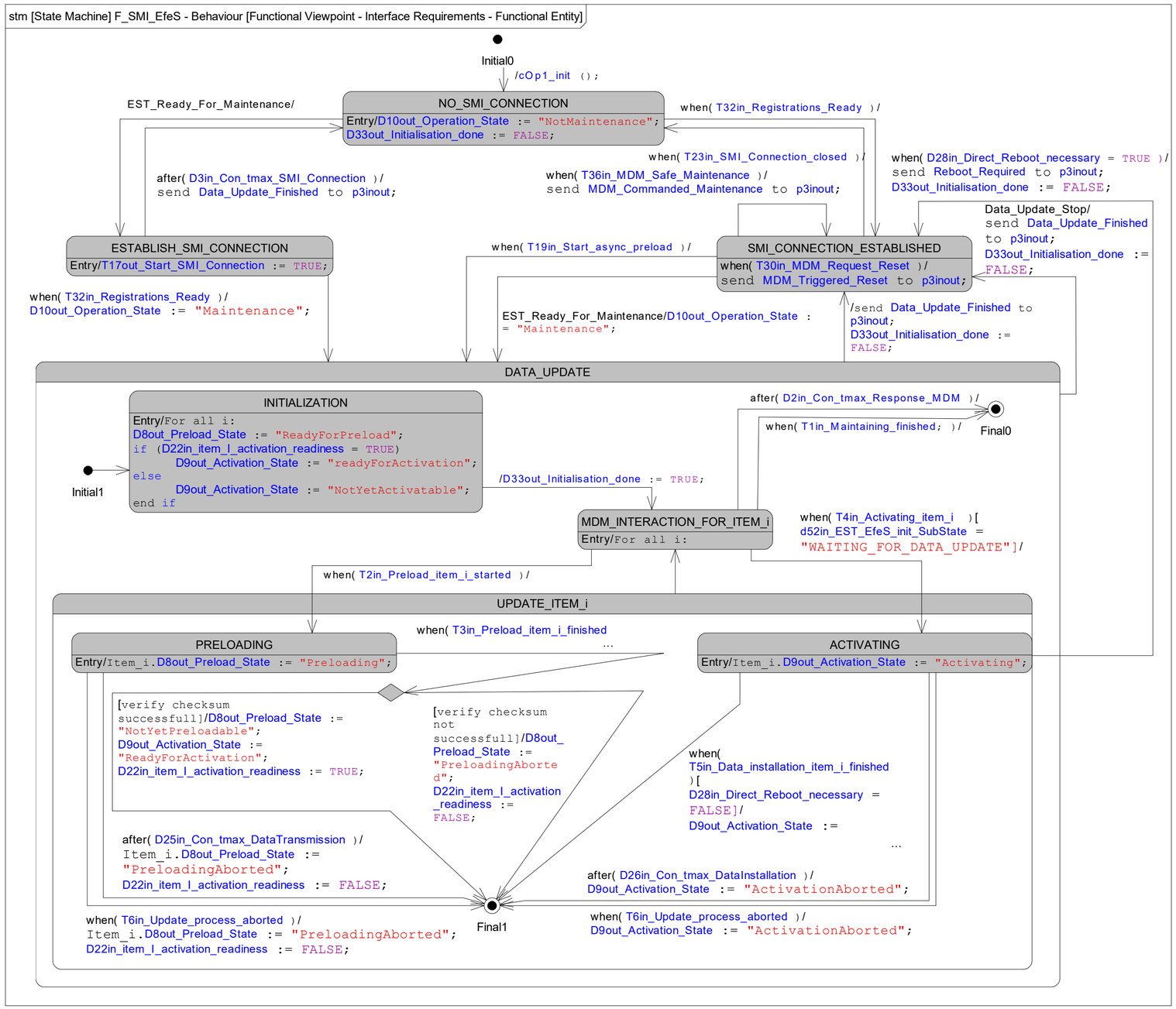
Data update process complete

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.50	Info	[Interaction] SMI-XX IFUC 1.3 - Alternative Scenario [SMI-XX IF SD 1.3.1] **sd** [Interaction] SMI-XX IFUC 1.3 - Alternative Scenario [SMI-XX IF SD 1.3.1] **Alternative Scenario: Asynchronous preloading of data** **Precondition**: SMI connection is established **Interaction 1.3.1.A:** **1.** Subsystem - Maintenance and Data Management starts asynchronous preload. **loop** (for each Config Item in List) **2.** EULYNX field element Subsystem sends preload state "ReadyForPreloading". **end loop** **3.** EULYNX field element Subsystem sends that initialisation is done. **loop** (for each Config Item in List) **4.** Subsystem - Maintenance and Data Management reads "CurrentVersion". **5.** Subsystem - Maintenance and Data Management reads "PreloadedVersion". **6.** Subsystem - Maintenance and Data Management sends information about start of item preload. **7.** EULYNX field element Subsystem sends preload state "Preloading" **8.** Subsystem - Maintenance and Data Management writes preload file. **9.** Subsystem - Maintenance and Data Management informs about finished preload item. **10.** EULYNX field element Subsystem verifies the integrity and authenticity of the received preload file. The verification is successful. **11.** EULYNX field element Subsystem sends preload state "NotYetPreloadable". **12.** EULYNX field element Subsystem sends activation state "ReadyForActivation". **end loop** **12.** Subsystem - Maintenance and Data Management informs about "MaintainingFinished". **Postcondition:** Data update process complete 		Option Preloading
Eu.Gen-SMI.177	Info	SMI-XX IFUC 1.4: Reset EfeS		Basic SMI
Eu.Gen-SMI.178	Info	[Interaction] SMI-XX IFUC 1.4 - Main Success Scenario [SMI-XX IF SD 1.4.1] **sd** [Interaction] SMI-XX IFUC 1.4 - Main Success Scenario [SMI-XX IF SD 1.4.1] **Main Success Scenario: Requested reset by MDM** **Precondition**: SMI connection is established. The EULYNX field element Subsystem is in the state FALLBACK_MODE. **Interaction 1.4.1.A:** **1.** Subsystem - Maintenance and Data Management requests a reset. **Postcondition:** The EULYNX field element Subsystem is in the state BOOTING. 	This reset is only possible if the device is having a working SMI connection while in the state FALLBACK_MODE.	Basic SMI
Eu.Gen-SMI.179	Info	SMI-XX IFUC 1.5: Initiate maintenance		Basic SMI

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.180	Info	[Interaction] SMI-XX IFUC 1.5 - Main Success Scenario [SMI-XX IF SD 1.5.1] 		Basic SMI
Eu.Gen-SMI.51	Head	**3.1.1.3.3 SMI-XX EfeS - Functional Entities**		
Eu.Gen-SMI.52	Info	F_SMI_EfeS		Basic SMI
Eu.Gen-SMI.53	Req	[Block] F_SMI_EfeS [Functional Viewpoint - Interface Requirements - Functional Entity] 		Basic SMI
Eu.Gen-SMI.54	Def	/* cOp1_init */ Update_performed := FALSE;	cOp1_init	Basic SMI
Eu.Gen-SMI.131	Def	T1in_Maintaining_finished	The port T1in_Maintaining_finished refines the FlowProperty Maintaining_finished.	Basic SMI
Eu.Gen-SMI.133	Def	T2in_Preload_item_i_started	The port T2in_Preload_item_i_started refines the FlowProperty Preload_item_i_started.	Basic SMI
Eu.Gen-SMI.138	Def	T3in_Preload_item_i_finished	The port T3in_Preload_item_i_finished refines the FlowProperty Preload_item_i_finished.	Basic SMI

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.139	Def	T4in_Activating_item_i	The port T4in_Activating_item_i refines the FlowProperty Activating_item_i.	Basic SMI
Eu.Gen-SMI.140	Def	T5in_Data_installation_item_i_finished	The port T5in_Data_installation_item_i_finished signalizes that the installation of an item i on EfeS has been successfully done.	Basic SMI
Eu.Gen-SMI.141	Def	T6in_Update_process_aborted	The port T6in_Update_process_aborted refines the FlowProperty Update_process_aborted.	Basic SMI
Eu.Gen-SMI.130	Def	T19in_Start_async_preload	The port T19in_Start_async_preload refines the FlowProperty Start_Async_Preload.	Option Preloading
Eu.Gen-SMI.132	Def	T23in_SMI_Connection_closed	The port T23in_SMI_Connection_closed represents the event of the closed SMI connection.	Basic SMI
Eu.Gen-SMI.134	Def	T30in_MDM_Request_Reset	The port T30in_MDM_Request_Reset refines the FlowProperty MDM_Request_Reset.	Basic SMI
Eu.Gen-SMI.135	Def	T32in_Registrations_Ready	The port T32in_Registrations_Ready refines the FlowProperty Registrations_Ready.	Basic SMI
Eu.Gen-SMI.137	Def	T36in_MDM_Safe_Maintenance	The port T36in_MDM_Safe_Maintenance refines the FlowProperty MDM_Safe_Maintenance.	Basic SMI
Eu.Gen-SMI.57	Def	D25in_Con_tmax_DataTransmission	The port D25in_Con_tmax_DataTransmission refines the time value Con_tmax_DataTransmission.	Basic SMI
Eu.Gen-SMI.58	Def	D26in_Con_tmax_DataInstallation	The port D26in_Con_tmax_DataInstallation refines the time value Con_tmax_DataInstallation.	Basic SMI
Eu.Gen-SMI.59	Def	D28in_Direct_Reboot_necessary	The port D28in_Direct_Reboot_necessary signalizes that the installation of an item i on EfeS requires a reboot of the EfeS.	Basic SMI
Eu.Gen-SMI.60	Def	D2in_Con_tmax_Response_MDM	The port D2in_Con_tmax_Response_MDM refines the time value Con_tmax_Response_MDM.	Basic SMI
Eu.Gen-SMI.62	Def	D3in_Con_tmax_SMI_Connection	The port D3in_Con_tmax_SMI_Connection refines the time value Con_tmax_SMI_Connection.	Basic SMI
Eu.Gen-SMI.56	Def	D22in_item_I_activation_readiness	The port D22in_item_I_activation_readiness signalizes that an activation of an item i on EfeS is possible.	Basic SMI
Eu.Gen-SMI.129	Def	T17out_Start_SMI_Connection	The port T17out_Start_SMI_Connection represents event of the start of the SMI connection. This is realised with an OPC UA reverse connect.	Basic SMI
Eu.Gen-SMI.136	Def	D33out_Initialisation_done	The port D33out_Initialisation_done represents the event that initialisation is done. Realised as UpdateInitState in OPC UA Information Model.	Basic SMI
Eu.Gen-SMI.63	Def	D8out_Preload_State	The port D8out_Preload_State represents the preload state.	Basic SMI
Eu.Gen-SMI.64	Def	D9out_Activation_State	The port D9out_Activation_State represents the activation state.	Basic SMI
Eu.Gen-SMI.55	Def	D10out_Operation_State	The port D10out_Operation_State represents the operation state.	Basic SMI
Eu.Gen-SMI.168	Def	d52in_EST_EfeS_init_SubState		Basic SMI
Eu.Gen-SMI.127	Def	p3inout		Basic SMI
Eu.Gen-SMI.65	Info	F_SMI_EfeS - Behaviour		Basic SMI

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.111	Req	Functional Viewpoint - Interface Requirements - Functional Entity	This state machine diagram describes the requirements for the following functionalities: - Establish communication between MDM and EfeS - Load configuration data into EfeS and activate these The state machine starts after waiting for the PDI connection established, either in safe maintenance mode or data update mode and then mainly receives Signals from the MDM, which guide through the update process. Note: Item i is a configuration item and is therefore representative for example for the default luminosity of a Light Signal or a software update of a subsystem controller.	Basic SMI



ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.112	Def	Initial0		Basic SMI
Eu.Gen-SMI.113	Def	/cOp1_init ();{Initial0 - NO_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.114	Def	NO_SMI_CONNECTION		Basic SMI
Eu.Gen-SMI.115	Def	EST_Ready_For_Maintenance/{NO_SMI_CONNECTION - ESTABLISH_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.116	Def	entry/D10out_Operation_State := "NotMaintenance"; D33out_Initialisation_done := FALSE;{State-internal in NO_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.118	Def	when(T12_Data_Update_After_Operational)/{NO_SMI_CONNECTION - ESTABLISH_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.119	Def	when(T18_Data_Update_In_Initialising)/{NO_SMI_CONNECTION - ESTABLISH_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.120	Def	when(T32in_Registrations_Ready)/{NO_SMI_CONNECTION - SMI_CONNECTION_ESTABLISHED}		Basic SMI
Eu.Gen-SMI.121	Def	SMI_CONNECTION_ESTABLISHED		Basic SMI
Eu.Gen-SMI.122	Def	/{SMI_CONNECTION_ESTABLISHED - ESTABLISH_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.123	Def	EST_Ready_For_Maintenance/D10out_Operation_State := "Maintenance";{SMI_CONNECTION_ESTABLISHED - DATA_UPDATE}		Basic SMI
Eu.Gen-SMI.124	Def	when(T19in_Start_async_preload)/{SMI_CONNECTION_ESTABLISHED - DATA_UPDATE}		Option Preloading
Eu.Gen-SMI.125	Def	when(T23in_SMI_Connection_closed)/{SMI_CONNECTION_ESTABLISHED - NO_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.126	Def	when(T36in_MDM_Safe_Maintenance)/ send MDM_Commanded_Maintenance to p3inout;{SMI_CONNECTION_ESTABLISHED - SMI_CONNECTION_ESTABLISHED}		Basic SMI
Eu.Gen-SMI.160	Def	when(T30in_MDM_Request_Reset)/ send MDM_Triggered_Reset to p3inout;{State-internal in SMI_CONNECTION_ESTABLISHED}		Basic SMI
Eu.Gen-SMI.108	Def	ESTABLISH_SMI_CONNECTION		Basic SMI
Eu.Gen-SMI.109	Def	after(D3in_Con_tmax_SMI_Connection)/ send Data_Update_Finished to p3inout;{ESTABLISH_SMI_CONNECTION - NO_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.110	Def	when(T32in_Registrations_Ready)/ D10out_Operation_State := "Maintenance";{ESTABLISH_SMI_CONNECTION - DATA_UPDATE}		Basic SMI
Eu.Gen-SMI.159	Def	entry/T17out_Start_SMI_Connection := TRUE;{State-internal in ESTABLISH_SMI_CONNECTION}		Basic SMI
Eu.Gen-SMI.66	Def	DATA_UPDATE		Basic SMI
Eu.Gen-SMI.67	Def	/send Data_Update_Finished to p3inout; D33out_Initialisation_done := FALSE;{DATA_UPDATE - SMI_CONNECTION_ESTABLISHED}		Basic SMI
Eu.Gen-SMI.68	Def	Data_Update_Stop/ send Data_Update_Finished to p3inout; D33out_Initialisation_done := FALSE;{DATA_UPDATE - SMI_CONNECTION_ESTABLISHED}		Basic SMI
Eu.Gen-SMI.70	Def	Initial1		Basic SMI
Eu.Gen-SMI.71	Def	/{Initial1 - INITIALIZATION}		Basic SMI
Eu.Gen-SMI.72	Def	INITIALIZATION		Basic SMI
Eu.Gen-SMI.73	Def	/D33out_Initialisation_done := TRUE;{INITIALIZATION - MDM_INTERACTION_FOR_ITEM_i}		Basic SMI

Eu.Gen-SMI.157	Def	entry/For all i:
		D8out_Preload_State := "ReadyForPreload";
		if (D22in_item_I_activation_readiness = TRUE)
		D9out_Activation_State := "readyForActivation";
		else
		D9out_Activation_State := "NotYetActivatable";
		end if{State-internal in INITIALIZATION}
				Basic SMI

Eu.Gen-SMI.74	Def	MDM_INTERACTION_FOR_ITEM_i		Basic SMI
Eu.Gen-SMI.75	Def	after(D2in_Con_tmax_Response_MDM)/{MDM_INTERACTION_FOR_ITEM_i - Final0}		Basic SMI
Eu.Gen-SMI.76	Def	entry/For all i:{State-internal in MDM_INTERACTION_FOR_ITEM_i}		Basic SMI
Eu.Gen-SMI.77	Def	when(T1in_Maintaining_finished ;)[Update_performed]/ T14_Data_installation_item_i := TRUE;{MDM_INTERACTION_FOR_ITEM_i - Final0}		Basic SMI
Eu.Gen-SMI.79	Def	when(T1in_Maintaining_finished;)/{MDM_INTERACTION_FOR_ITEM_i - Final0}		Basic SMI
Eu.Gen-SMI.80	Def	when(T2in_Preload_item_i_started)/{MDM_INTERACTION_FOR_ITEM_i - PRELOADING}		Basic SMI
Eu.Gen-SMI.81	Def	when(T4in_Activating_item_i)[d52in_EST_EfeS_init_SubState = "WAITING_FOR_DATA_UPDATE"]/{MDM_INTERACTION_FOR_ITEM_i - ACTIVATING}		Basic SMI
Eu.Gen-SMI.69	Def	Final0		Basic SMI
Eu.Gen-SMI.82	Def	UPDATE_ITEM_i		Basic SMI
Eu.Gen-SMI.83	Def	/{UPDATE_ITEM_i - MDM_INTERACTION_FOR_ITEM_i}		Basic SMI
Eu.Gen-SMI.84	Def	ACTIVATING		Basic SMI
Eu.Gen-SMI.85	Def	after(D26in_Con_tmax_DataInstallation)/ D9out_Activation_State := "ActivationAborted";{ACTIVATING - Final1}		Basic SMI
Eu.Gen-SMI.86	Def	entry/Item_i.D9out_Activation_State := "Activating";{State-internal in ACTIVATING}		Basic SMI
Eu.Gen-SMI.87	Def	when(D28in_Direct_Reboot_necessary = TRUE)/ send Reboot_Required to p3inout; D33out_Initialisation_done := FALSE;{ACTIVATING - SMI_CONNECTION_ESTABLISHED}		Basic SMI

ID	Type	Requirement Part 1	Requirement Part 2	Func. Pkg.
Eu.Gen-SMI.88	Def	when(T5in_Data_installation_item_i_finished)[D28in_Direct_Reboot_necessary = FALSE]/ D9out_Activation_State := "NotYetActivatable";{ACTIVATING - Final1}		Basic SMI
Eu.Gen-SMI.89	Def	when(T6in_Update_process_aborted)/ D9out_Activation_State := "ActivationAborted";{ACTIVATING - Final1}		Basic SMI
Eu.Gen-SMI.94	Def	PRELOADING		Basic SMI
Eu.Gen-SMI.95	Def	after(D25in_Con_tmax_DataTransmission)/ Item_i.D8out_Preload_State := "PreloadingAborted"; D22in_item_I_activation_readiness := FALSE;{PRELOADING - Final1}		Basic SMI
Eu.Gen-SMI.96	Def	entry/Item_i.D8out_Preload_State := "Preloading";{State-internal in PRELOADING}		Basic SMI
Eu.Gen-SMI.98	Def	when(T3in_Preload_item_i_finished)/verify checksum{PRELOADING - Junction}		Basic SMI
Eu.Gen-SMI.99	Def	when(T6in_Update_process_aborted)/ Item_i.D8out_Preload_State := "PreloadingAborted"; D22in_item_I_activation_readiness := FALSE;{PRELOADING - Final1}		Basic SMI
Eu.Gen-SMI.91	Def	Final1		Basic SMI
Eu.Gen-SMI.206	Def	Junction		Basic SMI
Eu.Gen-SMI.207	Def	[verify checksum not successfull]/D8out_Preload_State := "PreloadingAborted"; D22in_item_I_activation_readiness := FALSE;{Junction - Final1}		Basic SMI
Eu.Gen-SMI.208	Def	[verify checksum successfull]/D8out_Preload_State := "NotYetPreloadable"; D9out_Activation_State := "ReadyForActivation"; D22in_item_I_activation_readiness := TRUE;{Junction - Final1}		Basic SMI
Eu.Gen-SMI.181	Head	3.1.1.3.3.1 Additional requirements for the behaviour		
Eu.Gen-SMI.182	Req	After preloading the data the EfeS shall validate the integrity and authenticity of the transferred data.		Basic SMI
Eu.Gen-SMI.183	Req	If the integrity and authenticity validation fails, the EfeS shall prevent the activation of the configuration item.		Basic SMI
Eu.Gen-SMI.209	Info	The calculation method of the integrity and authenticity validation mechanism may be chosen by the supplier of the connected system, in accordance with the EULYNX Security Specification [Eu.Doc.114]. Note: In future phases, the EULYNX security specifications will be replaced by harmonised specifications published by the EU-Rail System Pillar Cyber Security domain.		Basic SMI
Eu.Gen-SMI.217	Head	**4 Technical requirements**		
Eu.Gen-SMI.218	Head	**4.1 Configuration and engineering data**		
Eu.Gen-SMI.219	Head	**4.1.1 Value configuration**		
Eu.Gen-SMI.220	Req	**Con_tmax_DataInstallation** The time value shall be configured in accordance with: Resolution of configuration: 30 s Configurable range: between 30 and 300 s The default value for the configurable period Con_tmax_DataInstallation is 60 s. Con_tmax_DataInstallation is defined in Eu.Gen-SMI.164.		Basic SMI
Eu.Gen-SMI.221	Req	**Con_tmax_DataTransmission** The time value shall be configured in accordance with: Resolution of configuration: 60 s Configurable range: between 60 and 1800 s The default value for the configurable period Con_tmax_DataTransmission is 300 s. Con_tmax_DataTransmission is defined in Eu.Gen-SMI.165.		Basic SMI
Eu.Gen-SMI.222	Req	**Con_tmax_Response_MDM** The time value shall be configured in accordance with: Resolution of configuration: 1 s Configurable range: between 1 and 30 s The default value for the configurable period Con_tmax_Response_MDM is 10 s. Con_tmax_Response_MDM is defined in Eu.Gen-SMI.166.		Basic SMI
Eu.Gen-SMI.223	Req	**Con_tmax_SMI_Connection** The time value shall be configured in accordance with: Resolution of configuration: 1 s Configurable range: between 1 and 60 s The default value for the configurable period Con_tmax_SMI_Connection is 20 s. Con_tmax_SMI_Connection is defined in Eu.Gen-SMI.167.		Basic SMI