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|            |       |                                  |                                                                                                                                                                                                                                                                                                                                    |
|------------|-------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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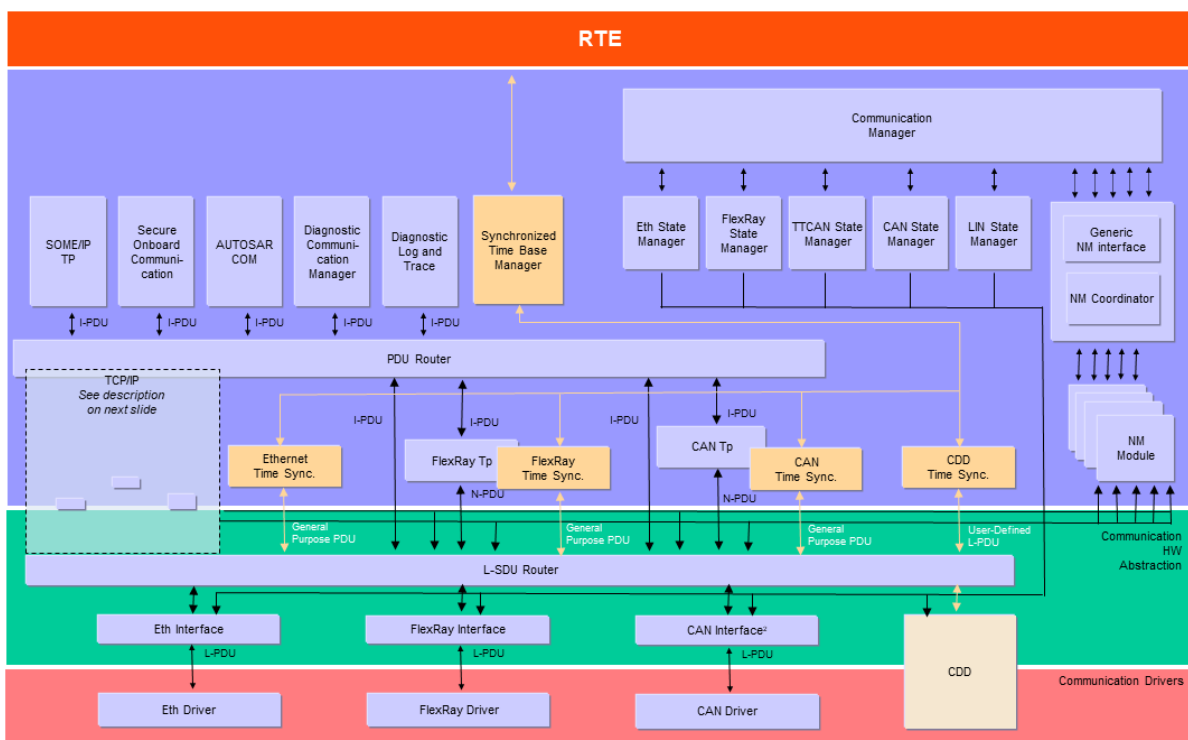
# 1 Introduction and functional overview

The EthTSyn module handles the Time Synchronization Protocol on Ethernet as specified in [1, PRS Time Synchronization Over Ethernet Protocol].

In addition to what is specified in [1, PRS Time Synchronization Over Ethernet Protocol] the EthTSyn module supports the following features:

- Debouncing of Timesync PDUs to avoid that a PDU with higher priority blocks those with lower priority
- "Immediate" transmission of Time Synchronization messages for fast (re-) synchronization of a Time Master and a Time Slave

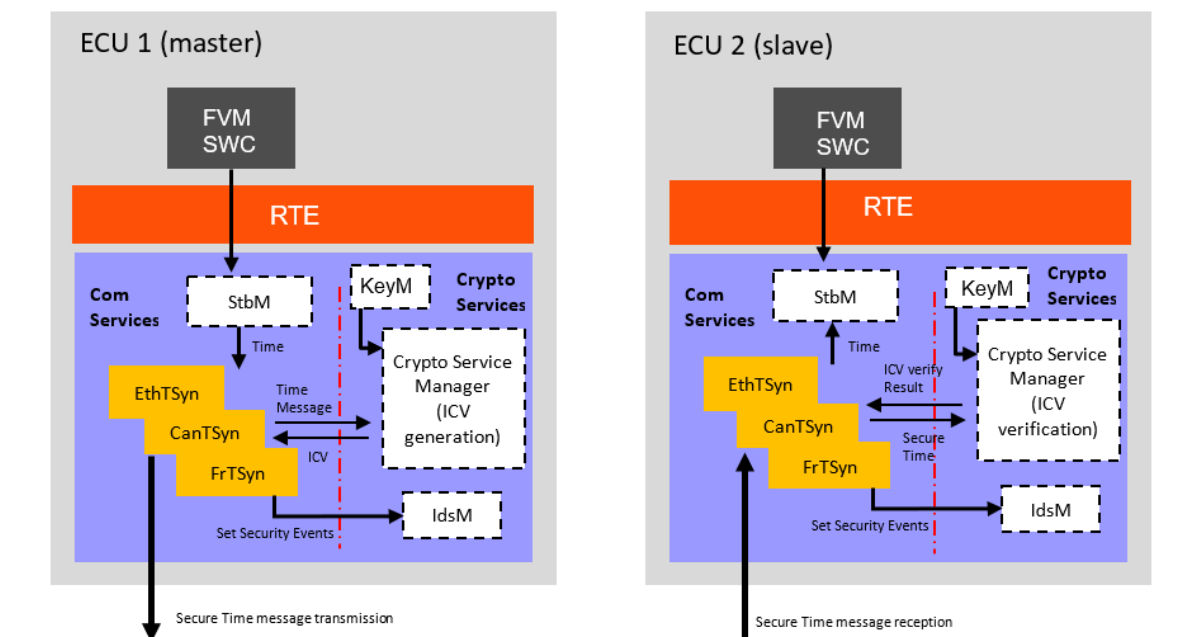
The EthTSyn is tightly coupled to the Synchronized Time-Base Manager (StbM; refer to [2, SWS-SynchronizedTimeBaseManager]), which is responsible for interpolating (a local instance of) a Synchronized Time Base between the reception of 2 consecutive Sync messages for that Time Base. The StbM also provides the service interface for Time Synchronization to the application. Figure 1 shows the Time Synchronization related modules in the AUTOSAR Layered Architecture.



**Figure 1.1: Timesync modules in the AUTOSAR Layered Architecture**

The EthTSyn supports securing the global time messages on the Ethernet communication bus. The figure below shows the time provider mod-

ules interface with the security modules in the AUTOSAR Layered Architecture.



**Figure 1.2: Timesync modules interface with security modules in the AUTOSAR Layered Architecture**

## 2 Acronyms, Abbreviations and Definitions

This section lists module local Abbreviations and Definitions. For a complete set of Synchronized Time Base related terms refer to the corresponding chapter in [3, CP-SWS-BSWGeneral].

| Abbreviation / Acronym:              | Description                                                     |
|--------------------------------------|-----------------------------------------------------------------|
| (G)TD                                | (Global) Time Domain                                            |
| (G)TM                                | (Global)Time Master                                             |
| <Bus>TSyn                            | A bus specific Time Synchronization module                      |
| AVB                                  | Audio Video Bridging                                            |
| BMCA                                 | Best Master Clock Algorithm                                     |
| CID                                  | Company ID (IEEE)                                               |
| CRC                                  | Cyclic Redundancy Checksum                                      |
| CSM                                  | Crypto Service Manager                                          |
| Debounce Time                        | Minimum gap between sending (Event) messages.                   |
| DEM                                  | Diagnostic Event Manager                                        |
| DET                                  | Default Error Tracer                                            |
| ETH                                  | Ethernet                                                        |
| EthTSyn                              | Time Synchronization Provider module for Ethernet               |
| Follow_Up                            | Time transport message (Follow-Up)                              |
| FV                                   | Freshness Value                                                 |
| FVM                                  | Freshness Value Manager                                         |
| GM(C)                                | Grand Master (Clock)                                            |
| ICV                                  | Integrity Check Value                                           |
| LSduR                                | L-SDU Router module                                             |
| MAC<br>[context - Ethernet protocol] | Media Access Control                                            |
| MAC<br>[context - security]          | Message Authentication Code                                     |
| meanPropagationDelay                 | meanPropagationDelay as defined by [4, IEEE Std 802.1AS-2011]   |
| neighborRateRatio                    | neighborRateRatio as defined by [4, IEEE Std 802.1AS-2011]      |
| Pdelay                               | Propagation / path delay as given in [4, IEEE Std 802.1AS-2011] |
| Pdelay_Req                           | Propagation / path delay request message                        |
| Pdelay_Resp                          | Propagation / path delay response message                       |
| Pdelay_Resp_Follow_Up                | Propagation / path delay Follow-Up message                      |
| PDU                                  | Protocol Data Unit                                              |
| PTP                                  | Precision Time Protocol                                         |
| rateRatio                            | rateRatio as defined by [4, IEEE Std 802.1AS-2011]              |
| StbM                                 | Synchronized Time-Base Manager                                  |
| Timesync                             | Time Synchronization                                            |
| Sync                                 | Time synchronization message (Sync)                             |
| TG                                   | Time Gateway                                                    |





| Abbreviation / Acronym: | Description                                                    |
|-------------------------|----------------------------------------------------------------|
| TLV                     | Type, Length, Value field (acc. to [4, IEEE Std 802.1AS-2011]) |
| TS                      | Time Slave                                                     |
| TSD                     | Time Sub-domain                                                |
| VLAN                    | Virtual Local Area Network                                     |

**Table 2.1: Acronyms and Abbreviations**

## 3 Related documentation

### 3.1 Input documents

- [1] Time Synchronization over Ethernet Protocol Specification  
AUTOSAR\_FO\_PRS\_TimeSyncOverEthernetProtocol
- [2] Specification of Synchronized Time-Base Manager  
AUTOSAR\_CP\_SWS\_SynchronizedTimeBaseManager
- [3] General Specification of Basic Software Modules  
AUTOSAR\_CP\_SWS\_BSWGeneral
- [4] IEEE 802.1AS-2011 - IEEE Standard for Local and metropolitan area networks - Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks, Rev. 2011
- [5] IEEE 802.1AS-2020 - IEEE Standard for Local and metropolitan area networks - Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks, Rev. 2020
- [6] IEEE P 802.1ASds - Amendment: Support for the IEEE Std 802.3 Clause 4 Media Access Control (MAC) operating in half-duplex
- [7] IEEE 802.1ASdm-2024 - IEEE Standard for Local and metropolitan area networks - Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks, Amendment 3: Hot Standby and Clock Drift Error Reduction
- [8] Explanation of Time Sensitive Network features  
AUTOSAR\_FO\_EXP\_TimeSensitiveNetworkFeatures
- [9] Requirements on Time Synchronization  
AUTOSAR\_FO\_RS\_TimeSync
- [10] General Requirements on Basic Software Modules  
AUTOSAR\_CP\_RS\_BSWGeneral
- [11] Specification of Crypto Service Manager  
AUTOSAR\_CP\_SWS\_CryptoServiceManager
- [12] Specification of CRC Library  
AUTOSAR\_CP\_SWS\_CRCLibrary
- [13] System Template  
AUTOSAR\_CP\_TPS\_SystemTemplate
- [14] Specification of Intrusion Detection System Manager  
AUTOSAR\_CP\_SWS\_IntrusionDetectionSystemManager

## 3.2 Related specification

AUTOSAR provides

- a General Specification on Basic Software [3, SWS BSW General] which is also valid for EthTSyn and
- a Time Synchronization Protocol Specification [1, PRS Time Synchronization Over Ethernet Protocol] which is also valid for EthTSyn.

Thus, the specification [3, SWS BSW General] and [1, PRS Time Synchronization Over Ethernet Protocol] shall be considered as additional and required specification for EthTSyn.

## 4 Constraints and assumptions

This section gives limitations with respect to the protocol implemented, specifically compared to [4, IEEE Std 802.1AS-2011]. Constraints of the configuration can be found in 10.4.

### 4.1 Limitations

- No support of BMCA protocol, like specified in [4, IEEE 802.1 AS].
- No support of Announce and Signaling messages, like specified in [4, IEEE 802.1 AS].
- The reception of a Pdelay\_Req is not taken as a pre-condition to start with the transmission of Sync messages.
- The Rate Correction will be performed by the StbM, (refer to [2]) based on Sync messages, which does not require the Pdelay mechanism, though the IEEE Standard mandates to calculate the rate correction based on Pdelay messages. This is considered to be a deviation from the IEEE-Standard, but it is considered to be interoperable. For some applications, e.g. for Audio/Video, it might be necessary to use Pdelay based Rate Correction performed by EthTSyn itself, which is optional and not considered by this specification.
- The Time Validation use case (Time Validation enabled) requires that the Pdelay measurement appears for a higher layer Validation application as if it was performed with timestamps from that Global Time Base that needs to be validated. The relevant timestamps are therefore mapped to the local instance of that Global Time. This is not considered to be a deviation from the IEEE-Standard, as no restrictions on the on-wire timestamps arise, i.e. one can still put Virtual Local Time into the PTP messages for each and every Pdelay measurement; only the corresponding instances of Global Time must be made available.
- EthTSyn will not maintain the Ethernet HW clock, but may use it as a source for the Virtual Local Time.
- While [4, IEEE Std 802.1AS-2011] states, that IEEE 802.1AS messages shall not have a VLAN tag nor a priority tag and are to be sent to a specific reserved multicast address, `EthTSynPTPPortDetails` allows to configure a `EthTSyn-GlobalTimeEthIfRef` using a VLAN while configuring a `EthTSynFramePrio` and `EthTSynDestPhyAddr`.
- "CRC secured" in the context of this document refers to CRC integrity protection mechanism and does not imply that CRC is used as a cybersecurity solution.
- No support of securing the messages of PDelay protocol.
- The Common Mean Link Delay Service (CMLDS) is adopted as a configuration option from [5, IEEE Std 802.1AS-2020].

- The configuration options for executing one-way Pdelay are adopted from [6, IEEE P802.1ASds] to prepare for operation on shared media.
- The configuration options for the `DriftTrackingTLV` are adopted from [7, IEEE Std 802.1ASdm-2024] to allow accuracy improvements in large diameter networks.
- A configuration option to use synchronized hardware clocks (PHC) for time-stamping is introduced without technical detail. The implementation details are vendor specific.

## 4.2 Accuracy

The accuracy of Time Synchronization depends on various factors (e.g., oscillator accuracy, number of bridges in the network path, configuration, ...). Refer to [8] Chapter 4.7 *“Ensure Accuracy of Time Synchronization”*, for recommendations on how to properly configure the overall system for highest possible accuracy.

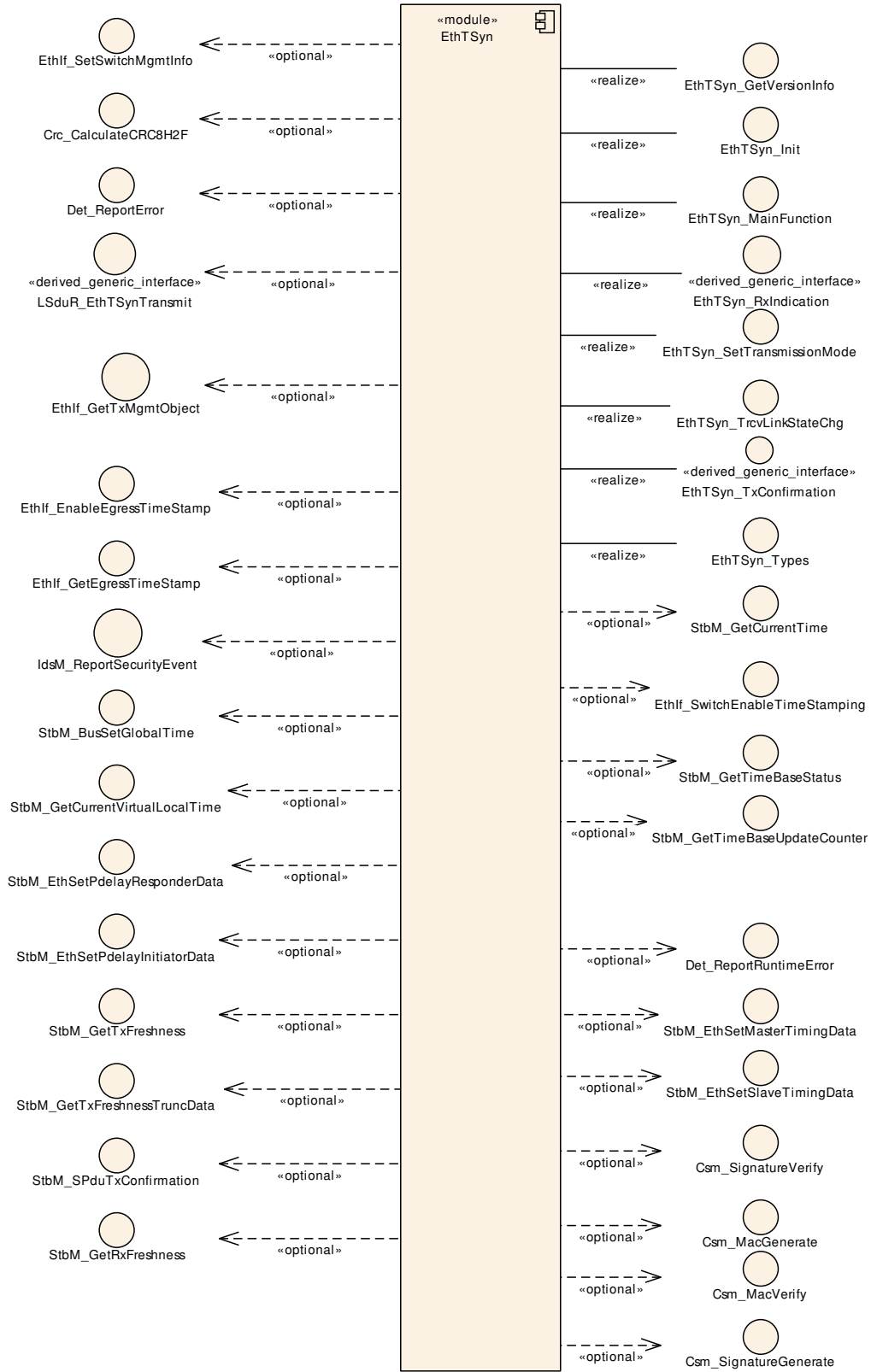
## 4.3 Applicability to car domains

Automotive systems requiring a common Time Base for ECUs regardless of which bus system the ECUs are connected to.

## 5 Dependencies to other modules

The Global Time Synchronization over Ethernet (EthTSyn) has interfaces towards the Synchronized Time-Base Manager (StbM), the Ethernet Interface (EthIf), the L-SDU Router (LSduR), the Basic Software Mode Manager (BswM), the Crypto Service Manager (CSM), the Intrusion Detection System Manager (IdsM) and the Default Error Tracer (DET).

- StbM -
  - Get and set the current time value
  - Get FV from FVM
- EthIf - Receiving and transmitting messages
- LSduR - Routing of L-SDUs between EthIf and upper layer modules (e.g. EthTSyn),
- BswM - Coordination of network access
- DET - Reporting of development errors
- CSM -
  - Generation of ICV for Time Master
  - Verification of ICV for Time Slave
- IdsM - Reporting of security events



**Figure 5.1: Module dependencies of the EthTSyn module**

## **5.1 File structure**

### **5.1.1 Code file structure**

For details, refer to the section 5.1.6 "Code file structure" of the SWS BSW General [\[3\]](#).

## 6 Requirements Tracing

The following tables reference the requirements specified in [9, RS TimeSync] and [10, SRS BSW General] and links to the fulfillment of these. Please note that if column "Satisfied by" is empty for a specific requirement this means that this requirement is not fulfilled by this document.

| Requirement   | Description                                                                                                   | Satisfied by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [RS_TS_00002] | The Implementation of Time Synchronization shall maintain its own Time Base independently of the acting role. | [SWS_EthTSyn_00210]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| [RS_TS_00034] | The Implementation of Time Synchronization shall provide measurement data to the application                  | [SWS_EthTSyn_00212] [SWS_EthTSyn_00213]<br>[SWS_EthTSyn_00216] [SWS_EthTSyn_00217]<br>[SWS_EthTSyn_00218] [SWS_EthTSyn_00219]<br>[SWS_EthTSyn_00220] [SWS_EthTSyn_00221]<br>[SWS_EthTSyn_00222] [SWS_EthTSyn_00223]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| [RS_TS_20047] | The Timesync over Ethernet module shall trigger Time Base Synchronization transmission                        | [SWS_EthTSyn_00130] [SWS_EthTSyn_00131]<br>[SWS_EthTSyn_00132] [SWS_EthTSyn_00133]<br>[SWS_EthTSyn_00134] [SWS_EthTSyn_00135]<br>[SWS_EthTSyn_00137] [SWS_EthTSyn_00139]<br>[SWS_EthTSyn_00187] [SWS_EthTSyn_00202]<br>[SWS_EthTSyn_00211] [SWS_EthTSyn_00265]<br>[SWS_EthTSyn_00400] [SWS_EthTSyn_00401]<br>[SWS_EthTSyn_00421] [SWS_EthTSyn_00422]<br>[SWS_EthTSyn_00423] [SWS_EthTSyn_00424]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| [RS_TS_20048] | The Timesync over Ethernet module shall support IEEE 802.1AS as well as AUTOSAR extensions                    | [SWS_EthTSyn_00013] [SWS_EthTSyn_00014]<br>[SWS_EthTSyn_00017] [SWS_EthTSyn_00019]<br>[SWS_EthTSyn_00020] [SWS_EthTSyn_00021]<br>[SWS_EthTSyn_00022] [SWS_EthTSyn_00031]<br>[SWS_EthTSyn_00032] [SWS_EthTSyn_00033]<br>[SWS_EthTSyn_00035] [SWS_EthTSyn_00036]<br>[SWS_EthTSyn_00039] [SWS_EthTSyn_00040]<br>[SWS_EthTSyn_00042] [SWS_EthTSyn_00043]<br>[SWS_EthTSyn_00044] [SWS_EthTSyn_00045]<br>[SWS_EthTSyn_00047] [SWS_EthTSyn_00049]<br>[SWS_EthTSyn_00052] [SWS_EthTSyn_00104]<br>[SWS_EthTSyn_00122] [SWS_EthTSyn_00123]<br>[SWS_EthTSyn_00124] [SWS_EthTSyn_00127]<br>[SWS_EthTSyn_00128] [SWS_EthTSyn_00138]<br>[SWS_EthTSyn_00159] [SWS_EthTSyn_00160]<br>[SWS_EthTSyn_00161] [SWS_EthTSyn_00162]<br>[SWS_EthTSyn_00180] [SWS_EthTSyn_00188]<br>[SWS_EthTSyn_00189] [SWS_EthTSyn_00190]<br>[SWS_EthTSyn_00200] [SWS_EthTSyn_00201]<br>[SWS_EthTSyn_00202] [SWS_EthTSyn_00203]<br>[SWS_EthTSyn_00204] [SWS_EthTSyn_00214]<br>[SWS_EthTSyn_00215] [SWS_EthTSyn_00263]<br>[SWS_EthTSyn_00264] [SWS_EthTSyn_00266]<br>[SWS_EthTSyn_00267] [SWS_EthTSyn_00268]<br>[SWS_EthTSyn_00412] [SWS_EthTSyn_00413] |
| [RS_TS_20051] | The Timesync over Ethernet module shall detect and handle errors in synchronization protocol / communication  | [SWS_EthTSyn_00019] [SWS_EthTSyn_00020]<br>[SWS_EthTSyn_00021] [SWS_EthTSyn_00022]<br>[SWS_EthTSyn_00029] [SWS_EthTSyn_00129]<br>[SWS_EthTSyn_00145] [SWS_EthTSyn_00146]<br>[SWS_EthTSyn_00417] [SWS_EthTSyn_00418]<br>[SWS_EthTSyn_00419] [SWS_EthTSyn_00420]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |





| Requirement     | Description                                                                                                                           | Satisfied by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [RS_TS_20052]   | The configuration of the Time Synchronization over Ethernet module shall allow the module to work as a Time Master                    | [SWS_EthTSyn_00051] [SWS_EthTSyn_00414]<br>[SWS_EthTSyn_00415] [SWS_EthTSyn_00416]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| [RS_TS_20053]   | The configuration of the Time Synchronization over Ethernet module shall allow the module to work as a Time Slave                     | [SWS_EthTSyn_00051] [SWS_EthTSyn_00414]<br>[SWS_EthTSyn_00415] [SWS_EthTSyn_00416]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| [RS_TS_20054]   | The Implementation of the Time Synchronization shall evaluate and propagate Time Gateway relevant information                         | [SWS_EthTSyn_00051]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| [RS_TS_20058]   | The Timesync over Ethernet module shall provide the precision of Synchronized Time Bases                                              | [SWS_EthTSyn_00150]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| [RS_TS_20059]   | The Timesync over Ethernet module shall access all communication ports belonging to Time Synchronization                              | [SWS_EthTSyn_00031] [SWS_EthTSyn_00047]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| [RS_TS_20061]   | The Timesync over Ethernet module shall support means to protect the Time Synchronization protocol                                    | [SWS_EthTSyn_00080] [SWS_EthTSyn_00096]<br>[SWS_EthTSyn_00111]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| [RS_TS_20062]   | The Timesync over Ethernet module shall support user specific data within the time measurement and synchronization protocol           | [SWS_EthTSyn_00080] [SWS_EthTSyn_00230]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| [RS_TS_20066]   | The Timesync over Ethernet module shall support measuring the peer-to-peer delay using the IEEE 802.1AS peer-to-peer delay mechanism. | [SWS_EthTSyn_00200] [SWS_EthTSyn_00201]<br>[SWS_EthTSyn_00224] [SWS_EthTSyn_00225]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| [RS_TS_20069]   | The TimeSync over Ethernet module shall provide read / write access to bus protocol specific parameters                               | [SWS_EthTSyn_00226] [SWS_EthTSyn_00227]<br>[SWS_EthTSyn_00330] [SWS_EthTSyn_00331]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| [RS_TS_20072]   | The Timesync over Ethernet module shall support means to secure the Time Synchronization protocol                                     | [SWS_EthTSyn_00104] [SWS_EthTSyn_00232]<br>[SWS_EthTSyn_00233] [SWS_EthTSyn_00234]<br>[SWS_EthTSyn_00236] [SWS_EthTSyn_00237]<br>[SWS_EthTSyn_00238] [SWS_EthTSyn_00239]<br>[SWS_EthTSyn_00240] [SWS_EthTSyn_00241]<br>[SWS_EthTSyn_00242] [SWS_EthTSyn_00243]<br>[SWS_EthTSyn_00244] [SWS_EthTSyn_00245]<br>[SWS_EthTSyn_00246] [SWS_EthTSyn_00247]<br>[SWS_EthTSyn_00248] [SWS_EthTSyn_00249]<br>[SWS_EthTSyn_00250] [SWS_EthTSyn_00251]<br>[SWS_EthTSyn_00252] [SWS_EthTSyn_00253]<br>[SWS_EthTSyn_00254] [SWS_EthTSyn_00255]<br>[SWS_EthTSyn_00256] [SWS_EthTSyn_00257]<br>[SWS_EthTSyn_00258] [SWS_EthTSyn_00402]<br>[SWS_EthTSyn_00403] [SWS_EthTSyn_00404]<br>[SWS_EthTSyn_00405] [SWS_EthTSyn_00406]<br>[SWS_EthTSyn_00407] [SWS_EthTSyn_00408]<br>[SWS_EthTSyn_00409] [SWS_EthTSyn_00410]<br>[SWS_EthTSyn_00411] [SWS_EthTSyn_91001]<br>[SWS_EthTSyn_91002] |
| [SRS_BSW_00101] | The Basic Software Module shall be able to initialize variables and hardware in a separate initialization function                    | [SWS_EthTSyn_00006]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |





| Requirement     | Description                                                                                               | Satisfied by                                                                                                                                                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [SRS_BSW_00323] | All AUTOSAR Basic Software Modules shall check passed API parameters for validity                         | [SWS_EthTSyn_00029] [SWS_EthTSyn_00030]<br>[SWS_EthTSyn_00041] [SWS_EthTSyn_00172]<br>[SWS_EthTSyn_00174] [SWS_EthTSyn_00175]<br>[SWS_EthTSyn_00176] [SWS_EthTSyn_00228]<br>[SWS_EthTSyn_00229] [SWS_EthTSyn_00259]<br>[SWS_EthTSyn_00260] |
| [SRS_BSW_00337] | Classification of development errors                                                                      | [SWS_EthTSyn_00030] [SWS_EthTSyn_00041]<br>[SWS_EthTSyn_00172] [SWS_EthTSyn_00174]<br>[SWS_EthTSyn_00175] [SWS_EthTSyn_00176]<br>[SWS_EthTSyn_00228] [SWS_EthTSyn_00229]<br>[SWS_EthTSyn_00259] [SWS_EthTSyn_00260]                        |
| [SRS_BSW_00385] | List possible error notifications                                                                         | [SWS_EthTSyn_00030] [SWS_EthTSyn_00144]                                                                                                                                                                                                    |
| [SRS_BSW_00386] | The BSW shall specify the configuration and conditions for detecting an error                             | [SWS_EthTSyn_00172] [SWS_EthTSyn_00228]<br>[SWS_EthTSyn_00229]                                                                                                                                                                             |
| [SRS_BSW_00406] | API handling in uninitialized state                                                                       | [SWS_EthTSyn_00030]                                                                                                                                                                                                                        |
| [SRS_BSW_00417] | Software which is not part of the SW-C shall report error events only after the Dem is fully operational. | [SWS_EthTSyn_00029]                                                                                                                                                                                                                        |
| [SRS_BSW_00452] | Classification of runtime errors                                                                          | [SWS_EthTSyn_00172] [SWS_EthTSyn_00228]<br>[SWS_EthTSyn_00229]                                                                                                                                                                             |
| [SRS_BSW_00488] | Classification of security events                                                                         | [SWS_EthTSyn_00261] [SWS_EthTSyn_92000]<br>[SWS_EthTSyn_92001] [SWS_EthTSyn_92002]<br>[SWS_EthTSyn_92003]                                                                                                                                  |
| [SRS_BSW_00489] | Reporting of security events                                                                              | [SWS_EthTSyn_00231] [SWS_EthTSyn_00261]<br>[SWS_EthTSyn_92000] [SWS_EthTSyn_92001]<br>[SWS_EthTSyn_92002] [SWS_EthTSyn_92003]                                                                                                              |
| [SRS_BSW_00490] | List possible security events                                                                             | [SWS_EthTSyn_00261]                                                                                                                                                                                                                        |
| [SRS_BSW_00491] | Specification of trigger conditions and context data                                                      | [SWS_EthTSyn_00231]                                                                                                                                                                                                                        |
| [SRS_BSW_00496] | BSW modules shall be able to handle PDU meta data                                                         | [SWS_EthTSyn_00127]                                                                                                                                                                                                                        |

**Table 6.1: Requirements Tracing**

## 7 Functional specification

This chapter defines the behavior of the module EthTSyn, responsible for the Time Synchronization over Ethernet. The API of the module is defined in [Chapter 8](#), while the configuration is defined in [Chapter 10](#).

### 7.1 Overview

The module EthTSyn is responsible to ensure the collection and distribution of synchronized time information across the Ethernet network. It interacts with the StbM and provides all Ethernet specific functions to the StbM.

#### 7.1.1 General

Refer to chapter General in [[1](#), PRS Time Synchronization Over Ethernet Protocol].

#### 7.1.2 VLAN Support

##### [SWS\_EthTSyn\_00162]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[When calling `LSduR_EthTSynTransmit`, EthTSyn shall use a meta data item of type `PRIORITY_8` (referenced by the parameter `PduInfoPtr`) to set the frame priority to the value of the configuration parameter `EthTSynFramePrio`.]

Refer to chapter VLAN Support in [[1](#), PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

#### 7.1.3 Message Transmission

##### [SWS\_EthTSyn\_00417] Retry Counter for Transmission

*Upstream requirements:* [RS\\_TS\\_20051](#)

[For every transmission of messages, EthTSyn shall maintain a retry counter (refer to `EthTSynMaxNumberOfTransmitRetries`).]

##### [SWS\_EthTSyn\_00418] Initialization of Transmission Retry Counter

*Upstream requirements:* [RS\\_TS\\_20051](#)

[Upon the initial processing of messages, the retry counter shall be set to 0.]

**[SWS\_EthTSyn\_00419] Incrementing the Transmission Retry Counter**

*Upstream requirements:* [RS\\_TS\\_20051](#)

[If `LSduR_EthTSynTransmit` returns a value different than `E_OK`, the retry counter shall be incremented, and the message transmission shall be retried in the next call of `EthTSyn_MainFunction`.]

**[SWS\_EthTSyn\_00420] Stop of retrying transmissions**

*Upstream requirements:* [RS\\_TS\\_20051](#)

[If the retry counter has reached the configuration value `EthTSynMaxNumberOfTransmitRetries`, the EthTSyn shall stop retrying and resume cyclic transmission.]

## 7.2 Initialization

The EthTSyn is initialized via `EthTSyn_Init`. Except for `EthTSyn_GetVersion-Info` and `EthTSyn_Init`, the API functions of the EthTSyn module may only be called when the module has been properly initialized.

**[SWS\_EthTSyn\_00006]**

*Upstream requirements:* [SRS\\_BSW\\_00101](#)

[A call to `EthTSyn_Init` initializes all internal variables and sets the EthTSyn module to the initialized state.]

**Note:** Unless specified otherwise EthTSyn uses default values as given in [4, IEEE Std 802.1AS-2011].

## 7.3 Handling of different Virtual Local Time sources

If HW Timestamping is enabled, the StbM could also use the ETH free running counter for interpolation of the local instance of the Global Time. There are however use cases when the StbM is configured to use the GPT instead, e.g.

- A Global Time Master or a Time Gateway is connected to different CAN/ETH busses and HW timestamping of each CAN/ETH communication controller is unsynchronized with each other.

In such a case conversions are required between the timestamps of different Virtual Local Time sources:

- The StbM uses (i.e., captures, stores and returns) only timestamps in the scope of its Virtual Local Time source.
- `<Bus>TSyn` modules thus need to convert timestamps from their Virtual Local Time source to the scope of the StbM's Virtual Local Time source in case different scopes are used when either passing a global time to the StbM or when obtaining

it from the StbM (refer to alternative label "Time Source of StbM" in sequence diagrams [Figure 9.4](#) and [Figure 9.5](#)).

- The conversion can happen linearly, i.e., no rate correction terms need to be determined and applied.

#### [SWS\_EthTSyn\_00210]

*Upstream requirements:* [RS\\_TS\\_00002](#)

[EthTSyn shall discard a timestamp derived from the Ethernet Controller HW (e.g., via `EthIf_GetCurrentTimeTuple` or `EthIf_GetEgressTimeStamp`), if the quality of the timestamp (refer to `TimeStampQualType`) is indicated as `INVALID` or `UNCERTAIN`.]

## 7.4 Debounce Time

#### [SWS\_EthTSyn\_00130]

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If `EthTSynGlobalTimeDebounceTime` is set to 0, EthTSyn shall ignore any debouncing.]

#### [SWS\_EthTSyn\_00131]

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If `EthTSynGlobalTimeDebounceTime` is greater than 0, EthTSyn shall always consider debouncing for all Timesync PDUs (Sync, Follow\_Up, Pdelay\_Req, Pdelay\_Resp and Pdelay\_Resp\_Follow\_Up) as described below.  
]

**Note:** The Debouncing avoids misassignment of time stamps to false event message.

#### [SWS\_EthTSyn\_00132]

*Upstream requirements:* [RS\\_TS\\_20047](#)

[`EthTSynGlobalTimeDebounceTime` represents the reload value of a `debounceCounter` that shall be reloaded at that point in time, where a Timesync PDU has been sent and that shall be decremented on each `EthTSyn_MainFunction` call if no Timesync PDU is transmitted.  
]

#### [SWS\_EthTSyn\_00133]

*Upstream requirements:* [RS\\_TS\\_20047](#)

[A new Timesync PDU shall only be sent, if the corresponding `debounceCounter` has reached 0.]

#### [SWS\_EthTSyn\_00187]

*Upstream requirements:* [RS\\_TS\\_20047](#)

[Each [EthTSynPTPPort](#) of a [EthTSynGlobalTimeDomain](#) shall have its own `de-bounceCounter`.]

## 7.5 Pdelay Protocol

This chapter defines EthTSyn specific requirements in addition to the generic requirements in chapter "Pdelay Protocol for Latency Calculation" in [1, PRS Time Synchronization Over Ethernet Protocol].

The Pdelay protocol is executed:

- For every Domain for which [EthTSynNeighbourRateRatioConfig](#) is set to [TransportSpecific](#) or [EthTSynLinkDelayConfig](#) is set to [TransportSpecific](#)
- Only once for multiple Domains, if [EthTSynNeighbourRateRatioConfig](#) is set to [CMLDS](#) or [EthTSynLinkDelayConfig](#) is set to [CMLDS](#)

The Pdelay protocol is not executed, if neither of the above conditions are met.

The configuration restrictions of [Chapter 10.4 "Configuration Constraints"](#) apply.

The overall sequence of actions for the Pdelay measurement are given in [Figure 9.3](#).

### 7.5.1 Pdelay Message Transmission

The detailed sequences of actions for the transmission of

- the `Pdelay_Req` message
- the `Pdelay_Resp` message and
- the `Pdelay_Resp_Follow_Up` message

are given in [Figure 9.4](#).

#### [SWS\_EthTSyn\_00200]

*Upstream requirements:* [RS\\_TS\\_20048](#), [RS\\_TS\\_20066](#)

[If the Pdelay Initiator transmits a `Pdelay_Req` for latency calculation with the cycle (refer to [PRS\\_TS\\_00011](#) in [1, PRS Time Synchronization Over Ethernet Protocol]), the following sequence shall be applied:

1. Activate the time stamping via `EthIf_EnableEgressTimeStamp` if [EthTSynHardwareTimestampSupport](#) is set to `TRUE`
2. Transmit the `Pdelay_Req` message by calling `LSduR_EthTSynTransmit` with

- parameter `TxPduId` derived from the configuration parameter `EthTSynTx-PduRef` of the corresponding port
- and parameter `SduDataPtr` set to the actual `Pdelay_Req` message data
- and parameter `SduLength` set to length of the `Pdelay_Req` message data

]

#### [SWS\_EthTSyn\_00201]

*Upstream requirements:* [RS\\_TS\\_20048](#), [RS\\_TS\\_20066](#)

[If the `Pdelay_Responder` transmits a `Pdelay_Resp` for latency calculation (refer to [PRS\\_TS\\_00012](#)) in [1, PRS Time Synchronization Over Ethernet Protocol]) the following sequence shall be applied:

1. Activate the time stamping via `EthIf_EnableEgressTimeStamp` if `EthTSyn-HardwareTimestampSupport` is set to `TRUE`
2. Transmit the `Pdelay_Resp` message by calling `LSduR_EthTSynTransmit` with
  - parameter `TxPduId` derived from the configuration parameter `EthTSynTx-PduRef` of the corresponding port
  - and parameter `SduDataPtr` set to the actual `Pdelay_Resp` message data
  - and parameter `SduLength` set to length of the `Pdelay_Resp` message data

]

#### [SWS\_EthTSyn\_00013]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[On invocation of `EthTSyn_TxConfirmation` with parameter `Result` equal to `E_OK` the egress time stamp shall be retrieved for `t1` from the `EthIf` via `EthIf_GetEgressTimeStamp` on egress of the `Pdelay_Req` message, if `EthTSynHardwareTimestampSupport` is set to `TRUE`.

If the `StbM` does not use the Ethernet controller as source for the Virtual Local Time (refer to parameter `StbMLocalTimeHardware`, in [2]), the `EthTSyn` shall convert the egress time stamp to the Virtual Local Time as used in the `StbM`.]

#### [SWS\_EthTSyn\_00123]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[On invocation of `EthTSyn_TxConfirmation` with parameter `Result` equal to `E_OK` the egress time stamp shall be retrieved for `t1` from the `StbM` via `StbM_GetCurrentVirtualLocalTime` on egress of the `Pdelay_Req` message, if `EthTSynHardwareTimestampSupport` is set to `FALSE`.]

#### [SWS\_EthTSyn\_00159]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[On invocation of [EthTSyn\\_TxConfirmation](#) with parameter [Result](#) equal to [E\\_OK](#) the egress timestamp shall be retrieved for t3 from the EthIf via [EthIf\\_EnableEgressTimeStamp](#) on egress of the [Pdelay\\_Resp](#) message, if [EthTSynHardwareTimestampSupport](#) is set to [TRUE](#).

If the StbM does not use the Ethernet controller as source for the Virtual Local Time (refer to parameter [StbMLocalTimeHardware](#), in [2]), the EthTSyn shall convert the egress time stamp to the Virtual Local Time as used in the StbM.]

#### [SWS\_EthTSyn\_00122]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[On invocation of [EthTSyn\\_TxConfirmation](#) with parameter [Result](#) equal to [E\\_OK](#) the egress timestamp shall be retrieved for t3 from the StbM via [StbM\\_GetCurrentVirtualLocalTime](#) on egress of [Pdelay\\_Resp](#) message, if [EthTSynHardwareTimestampSupport](#) is set to [FALSE](#).]

#### [SWS\_EthTSyn\_00225]

*Upstream requirements:* [RS\\_TS\\_20066](#)

[The Time Master shall set [responseOriginTimestamp](#) (for the [Pdelay\\_Resp\\_Follow\\_Up](#) message) to t3.]

#### [SWS\_EthTSyn\_00014]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If [EthTSynGlobalTimePdelayRespEnable](#) is set to [TRUE](#), a [Pdelay Responder](#) shall transmit a [Pdelay\\_Resp\\_Follow\\_Up](#) with the transmission timestamp of that message as defined in [\[SWS\\_EthTSyn\\_00159\]](#) as well as defined in [1, PRS Time Synchronization Over Ethernet Protocol] [1, PRS Time Synchronization Over Ethernet Protocol] Chapter 4.6.1 “*Pdelay Protocol for Latency Calculation*” considering [debounceCounter](#) which represents a time offset between [Pdelay\\_Resp](#) and [Pdelay\\_Resp\\_Follow\\_Up](#).

For that, the following sequence shall be applied:

1. Transmit the [Pdelay\\_Resp\\_Follow\\_Up](#) message by calling [LSduR\\_EthTSynTransmit](#) with
  - parameter [TxPduId](#) derived from the configuration parameter [EthTSynRxPduRef](#) of the corresponding port
  - and parameter [SduDataPtr](#) set to the actual [Pdelay\\_Resp\\_Follow\\_Up](#) message data including the transmission timestamp of [\[SWS\\_EthTSyn\\_00159\]](#)
  - and parameter [SduLength](#) set to length of the [Pdelay\\_Resp\\_Follow\\_Up](#) message data

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### 7.5.2 Pdelay Message Reception

The detailed sequences of actions for the reception of

- the Pdelay\_Req message
- the Pdelay\_Resp message and
- the Pdelay\_Resp\_Follow\_Up message

are given in sequence diagram [Figure 9.5](#).

#### [SWS\_EthTSyn\_00160]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If [EthTSynHardwareTimestampSupport](#) is set to TRUE, when [EthTSyn\\_RxIndication](#) is called on ingress of the Pdelay\_Req message, then the EthTSyn shall retrieve the ingress timestamp t2 from the meta data item of type `TIMETUPLE_TYPE_PTR` of the PDU identified by parameter [RxPduId](#).

If the StbM does not use the Ethernet controller as source for the Virtual Local Time (refer to parameter [StbMLocalTimeHardware](#) in [\[2\]](#)), the EthTSyn shall convert the ingress time stamp to the Virtual Local Time as used in the StbM.]

#### [SWS\_EthTSyn\_00124]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If [EthTSynHardwareTimestampSupport](#) is set to FALSE, when [EthTSyn\\_RxIndication](#) is called on ingress of Pdelay\_Req message, then the EthTSyn shall retrieve the ingress timestamp t2 from the StbM via [StbM\\_GetCurrentVirtualLocalTime](#).]

#### [SWS\_EthTSyn\_00224]

*Upstream requirements:* [RS\\_TS\\_20066](#)

[The Time Master shall set `requestReceiptTimestamp` (to be used in the Pdelay\_Resp message) to t2.]

#### [SWS\_EthTSyn\_00049]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If [EthTSynHardwareTimestampSupport](#) is set to TRUE, when [EthTSyn\\_RxIndication](#) is called on ingress of the Pdelay\_Resp message, then the EthTSyn shall retrieve the ingress time stamp t4 from the meta data item of type `TIMETUPLE_TYPE_PTR` of the PDU identified by parameter [RxPduId](#).

If the StbM does not use the Ethernet controller as source for the Virtual Local Time (refer to parameter `StbMLocalTimeHardware` in [2]), the EthTSyn shall convert the ingress time stamp to the Virtual Local Time as used in the StbM.]

**[SWS\_EthTSyn\_00161]**

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If `EthTSynHardwareTimestampSupport` is set to `FALSE`, when `EthTSyn_RxIndication` is called on ingress of the `Pdelay_Resp` message, then the EthTSyn shall retrieve the ingress time stamp `t4` from the StbM via `StbM_GetCurrentVirtualLocalTime`.]

**[SWS\_EthTSyn\_00263]**

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If

- configuration parameter `EthTSynNeighbourRateRatioConfig` is set to `CMLDS` or `TransportSpecific`
- and `EthTSynRateRatioMeasurementCount` consecutive `Pdelay` measurements have been completed successfully,

then EthTSyn shall calculate in the next main function call the `neighborRateRatio` as given in `PRS_TS_00259` in [1, PRS Time Synchronization Over Ethernet Protocol].]

**[SWS\_EthTSyn\_00264]**

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If

- configuration parameter `EthTSynGlobalTimeTxPdelayReqPeriod` is not 0
- and a valid `Pdelay_Resp_Follow_Up` message has been received,

then EthTSyn shall calculate the value `linkDelay` in the next main function call as given in `PRS_TS_00003` in [1, PRS Time Synchronization Over Ethernet Protocol].

]

## 7.6 Message Format

Refer to chapter Message format in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

### 7.6.1 Sync and Follow\_Up acc. to IEEE 802.1AS

Refer to chapter Sync and Follow\_Up acc. to IEEE 802.1AS in [1, PRS Time Synchronization Over Ethernet Protocol].

### 7.6.2 Sync and Follow\_Up acc. to AUTOSAR

Refer to chapter Sync and Follow\_Up acc. to AUTOSAR in [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.6.2.1 Follow\_Up Message Header [AUTOSAR]

Refer to chapter Follow\_Up Message Header [AUTOSAR] in [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.6.2.2 AUTOSAR and OEM Sub-TLV's

Refer to chapter AUTOSAR and OEM Sub-TLVs in [1, PRS Time Synchronization Over Ethernet Protocol].

##### 7.6.2.2.1 AUTOSAR Sub-TLV: Time Secured

Refer to chapter AUTOSAR Sub-TLV: Time Secured in [1, PRS Time Synchronization Over Ethernet Protocol].

##### 7.6.2.2.2 AUTOSAR Sub-TLV: Status Secured / Not Secured

Refer to chapter AUTOSAR Sub-TLV: Status Secured in [1, PRS Time Synchronization Over Ethernet Protocol].

##### 7.6.2.2.3 AUTOSAR Sub-TLV: UserData Secured / Not Secured

#### [SWS\_EthTSyn\_00080]

*Upstream requirements:* [RS\\_TS\\_20061](#), [RS\\_TS\\_20062](#)

[The AUTOSAR Sub-TLV: UserData shall be mapped to the `StbM_UserDataType`, whereas the User Byte number given in the message and by the `StbM_UserDataType` shall match (`UserByte_0` mapped to `StbM_UserDataType.userByte0` etc.).

The `UserDataLength` shall be mapped to `StbM_UserDataType.userDataLength` and vice versa.]

Refer to chapter AUTOSAR Sub-TLV: UserData Secured / Not Secured in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

#### 7.6.2.2.4 AUTOSAR Sub-TLV: Time Authenticated

Refer to chapter AUTOSAR Sub-TLV: Time Authenticated in [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.6.2.3 Pdelay Message Header

Refer to [1, PRS Time Synchronization over Ethernet Protocol] Chapter 4.3.1.1 “*Sync and Follow\_Up acc. to IEEE 802.1AS*” for the general header structure.

If `EthTSynNeighbourRateRatioConfig` or `EthTSynLinkDelayConfig` are configured to `TransportSpecific`:

- Either compliant with [5, IEEE Std 802.1AS-2020] using `domainNumber 0x00`,
- or Autosar specific using the lowest `domainNumber`,
- or with all configured `domainNumbers` for shared media like 10BASE-T1S.

If `EthTSynNeighbourRateRatioConfig` or `EthTSynLinkDelayConfig` is configured to `CMLDS`, the `majorSdoId` shall be transmitted as `0x2` and the `minorSdoId` shall be transmitted as `0x00`. As a result, the aggregation of the the previous `transportSpecific`, message-type, and reserved fields (now `SdoId`) for `CMLDS` is `0x200`.

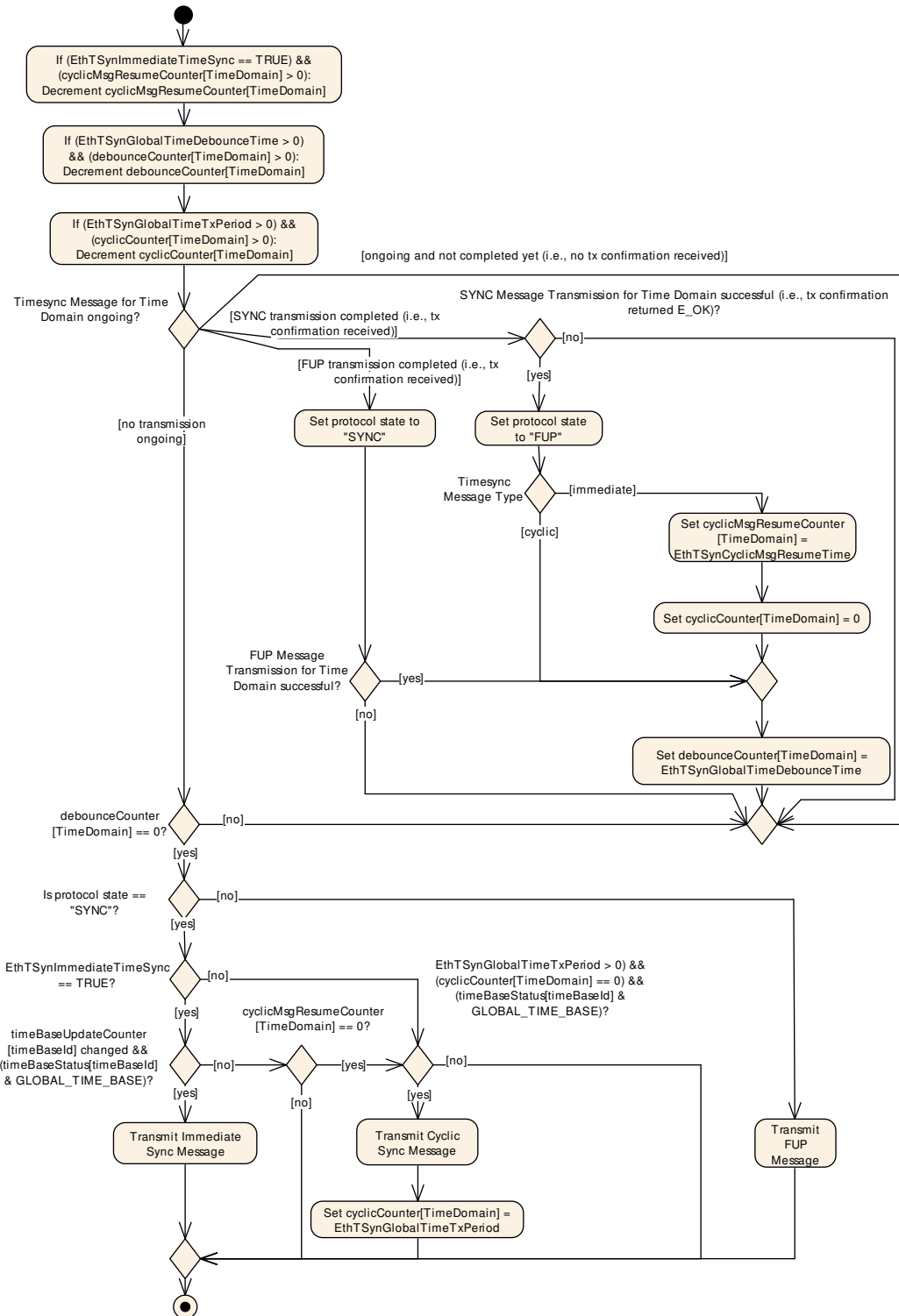
The `domainNumber` shall be transmitted as `0x00` for all `CMLDS Pdelay` messages.

### 7.7 Acting as Time Master

Refer to chapter Acting as Time Master in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

If the `EthTSyn` has at least one `EthTSynPTPPort` configured in the `EthTSynPort-Role TIME_MASTER`, the `EthTSyn` module checks on each `EthTSyn_MainFunction` call the necessity for a Timesync message transmission for the respective Time Domains.

Figure 7.1 illustrates the flow for the Time Master to trigger a (immediate and cyclic) message transmission of a Timesync message.



**Figure 7.1: Timesync Message Transmission**

### 7.7.1 Message processing

#### [SWS\_EthTSyn\_00265]

Status: DRAFT

Upstream requirements: [RS\\_TS\\_20047](#)

[When [EthTSynPortRole](#) is set to [DYNAMIC](#) or [TIME\\_MASTER](#), ports (for eth controller only 1 port and for switch individual port) shall transmit Sync and Follow\_Up message according to the configuration parameter [EthTSynGlobalTimeTxPeriod](#).]

**Note:** For [\[SWS\\_EthTSyn\\_00265\]](#) Immediate Synchronization is not further affected by the port-specific [EthTSynGlobalTimeTxPeriod](#).

Refer to chapter Message Processing in [\[1, PRS Time Synchronization Over Ethernet Protocol\]](#) for additional requirements.

#### [SWS\_EthTSyn\_00202]

Upstream requirements: [RS\\_TS\\_20047](#), [RS\\_TS\\_20048](#)

[If the Time Master transmits a Sync message (refer to [\[PRS\\_TS\\_00016\]](#) in [\[1, PRS Time Synchronization Over Ethernet Protocol\]](#)), the following sequence shall be applied:

- Retrieve the Global Time Tuple  $[T_0; T_{0_{VLT}}]$  from the StbM via `StbM_GetCurrentTime` according to [Figure 9.2](#).
- Activate the time stamping via `EthIf_EnableEgressTimeStamp`, if [EthTSynHardwareTimestampSupport](#) is set to `TRUE`
- Transmit the `Pdelay_Resp_Follow_Up` message by calling `LSduR_EthTSynTransmit` with
  - parameter `TxPduId` derived from the configuration parameter [EthTSynTxPduRef](#) of the corresponding port
  - and parameter `SduDataPtr` set to the actual Sync message data
  - and parameter `SduLength` set to the length of the Sync message data

]

**Note:** The `timeBaseStatus` can be read from StbM by `StbM_GetTimeBaseStatus` or `StbM_GetCurrentTime`.

**Note:** For further details refer to sequence diagram [Figure 9.4](#).

#### [SWS\_EthTSyn\_00211]

Upstream requirements: [RS\\_TS\\_20047](#)

[If

- the protocol requirement [\[PRS\\_TS\\_00016\]](#) is fulfilled,

- and the associated `cyclicMsgResumeCounter` is equal to or less than 0

the Time Master shall start cyclic transmission of Sync messages in the earliest possible `EthTSyn_MainFunction` call.]

**Note:** "earliest possible" means:

- In the next `EthTSyn_MainFunction`, because `GLOBAL_TIME_BASE` is set outside the `EthTSyn_MainFunction`.
- In the current `EthTSyn_MainFunction`, when switching from immediate to cyclic transmission (because this decision is made inside the `EthTSyn_MainFunction`).

#### [SWS\_EthTSyn\_00127]

*Upstream requirements:* [RS\\_TS\\_20048](#), [SRS\\_BSW\\_00496](#)

[On invocation of `EthTSyn_TxConfirmation` with parameter 'Result' equal to `E_OK` the egress time stamp of the Sync message shall be retrieved via `EthIf_GetEgressTimeStamp` from the `EthIf` and converted to the Virtual Local Time `T2_VLT` according to `EthTSyn_Egress_Time_Stamping`, if `EthTSynHardwareTimestampSupport` is set to `TRUE`.

]

**Note:** `EthTSyn_Egress_Time_Stamping` is shown in [Figure 9.4](#).

#### [SWS\_EthTSyn\_00017]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If `EthTSynHardwareTimestampSupport` is set to `TRUE` and if the `StbM` does not use the Ethernet hardware counter as Virtual Local Time Source for the Time Base, the following sequence shall be applied on invocation of `EthTSyn_TxConfirmation` with parameter 'Result' equal to `E_OK` or in the following `EthTSyn_MainFunction` call:

1. Protect the following two steps against interruptions:
2. the current time of the Ethernet hardware counter shall be retrieved via parameter `currentTimeTuplePtr -> timestampClockValue` of `EthIf_GetCurrentTimeTuple` from the `EthIf` and converted to the Virtual Local Time `T3_VLT`.
3. the current value of the Virtual Local Time of the Time Base shall be retrieved as `T4_VLT` via `StbM_GetCurrentVirtualLocalTime`
4. the `preciseOriginTimestamp` shall be calculated as  $T0 - (T3_{VLT} - T2_{VLT}) + (T4_{VLT} - T0_{VLT})$

]

**Note:** When using interrupt mode with interrupt nesting disabled, the `EthTSyn` does not need to explicitly establish a protection against interruptions in `EthTSyn_TxCongfirmation`, because this is implicitly done by the controller.

#### [SWS\_EthTSyn\_00188]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If `EthTSynHardwareTimestampSupport` is set to `TRUE` and if the `StbM` does use the Ethernet hardware counter as Virtual Local Time Source for the Time Base, the `preciseOriginTimestamp` shall be calculated as  $T0 + (T2_{VLT} - T0_{VLT})$ .]

#### [SWS\_EthTSyn\_00189]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If `EthTSynHardwareTimestampSupport` is set to `FALSE` the `preciseOriginTimestamp` shall be calculated as  $T0 + (T4_{VLT} - T0_{VLT})$ .]

#### [SWS\_EthTSyn\_00204]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[The Time Master shall consider the `debounceCounter`, which represents a time offset between `Sync` and `Follow_Up` message, before transmitting the `Follow_Up` message.]

#### [SWS\_EthTSyn\_00226]

*Upstream requirements:* [RS\\_TS\\_20069](#)

[The following parameters provided by the invocation of `EthTSyn_SetProtocolParam` in argument `protocolParam`, shall be used by `EthTSyn` for the next `Follow_Up` information TLV message:

- `cumulativeScaledRateOffset`
- `gmTimeBaseIndicator`
- `lastGmPhaseChange`
- `scaledLastGmFreqChange`

]

#### [SWS\_EthTSyn\_00203]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[The Time Master shall transmit a `Follow_Up` message (refer to [PRS\_TS\_00018] in [1, PRS Time Synchronization Over Ethernet Protocol]), by calling `LS-duR_EthTSynTransmit` with

- parameter `TxPduId` derived from the configuration parameter `EthTSynTxPdu` of the corresponding port

- and parameter `SduDataPtr` set to the `Follow_Up` message data including the calculated `preciseOriginTimestamp`
- and parameter `SduLength` set to length of the `Follow_Up` message data

]

#### 7.7.1.1 Runtime Error detection

##### [SWS\_EthTSyn\_00145]

*Upstream requirements:* [RS\\_TS\\_20051](#)

[If [EthTSynMasterSlaveConflictDetection](#) is set to `TRUE` and if the Time Master receives a Sync message from another Time Master, it shall report a runtime error by calling `Det_ReportRuntimeError` with error code `ETHTSYN_E_TMCONFLICT` and discard the received Sync message.]

#### 7.7.1.2 Frame Debouncing

The EthTSyn debounces Tx PDUs of a Time Master to avoid bursts of Timesync messages on the network (e.g. if immediate transmission is enabled).

For each Tx PDU the EthTSyn maintains a `debounceCounter`. On each transmission of a Timesync message the debounce counter is (re-)loaded by the configured debounce time [EthTSynGlobalTimeDebounceTime](#). The counter is decremented in each EthTSyn main cycle. Transmission of the same PDU can only be triggered, if the debounce counter has reached the value 0. Refer also to the overall sequence for the Timesync message transmission in [Figure 7.1](#).

The EthTSyn does not support sharing of PDUs across domains and busses, i.e. same PDU ID shall not be used for different time domains.

##### [SWS\_EthTSyn\_00421] Setting the Debounce Counter After Successful Timesync PDU Transmission

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If for a Time Domain

- [EthTSynGlobalTimeDebounceTime](#) is greater than 0
- and the corresponding Timesync PDU has been successfully sent,

then the EthTSyn shall set the PDU specific `debounceCounter` to [EthTSynGlobalTimeDebounceTime](#).]

**Note:** A Timesync PDU is considered to be successfully sent, if a transmission confirmation for the PDU has been received.

### [SWS\_EthTSyn\_00422] Periodic Decrement of Debounce Counter in EthTSyn Main Function

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If for a Time Domain

- [EthTSynGlobalTimeDebounceTime](#) is greater than 0
- and the `debounceCounter` for the corresponding Timesync PDU is greater than 0,

then the EthTSyn shall decrement the `debounceCounter` value by [EthTSynMain-FunctionPeriod](#) on each invocation of [EthTSyn\\_MainFunction](#).]

### [SWS\_EthTSyn\_00423] Deferring Timesync Transmission While Debounce Counter Is Active

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If for a Time Domain

- [EthTSynGlobalTimeDebounceTime](#) is greater than 0
- and the `debounceCounter` for the corresponding Timesync PDU is greater than 0
- and a transmission of a TimeSync message is requested,

then EthTSyn shall defer the actual transmission of the Timesync message until `debounceCounter` is equal or less than 0.]

**Rationale:** While debouncing, a new transmission request should not get lost.

### [SWS\_EthTSyn\_00424] Replacing Pending Timesync Transmission Request with New Request During Debounce

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If for a Time Domain

- [EthTSynGlobalTimeDebounceTime](#) is greater than 0
- a SYNC transmission request is pending
- and a new immediate or cyclic transmission of a SYNC message is requested for the same PDU,

then the EthTSyn shall discard the pending request for that Time Domain.]

**Rationale:** While debouncing, there is no queuing of multiple transmission requests. The latest request is the best one.

Refer to chapter Frame Debouncing in [1, PRS Time Synchronization Over Ethernet Protocol].

### 7.7.1.3 Immediate Time Synchronization

In addition to the standard cyclic message transmission an immediate message transmission might be required. Depending on configuration, the `EthTSyn` module checks on each `EthTSyn_MainFunction` call the necessity for a Timesync message transmission for each Time Base, where a Master Port belongs to.

Figure 7.1 illustrates how immediate and cyclic message transmission align.

#### [SWS\_EthTSyn\_00134]

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If `EthTSynImmediateTimeSync` is set to `TRUE`, `EthTSyn` shall check within each `EthTSyn_MainFunction` call by calling `StbM_GetTimeBaseUpdateCounter` if the returned `timeBaseUpdateCounter` has been changed.]

#### [SWS\_EthTSyn\_00135]

*Upstream requirements:* [RS\\_TS\\_20047](#)

[If

- `EthTSynImmediateTimeSync` is set to `TRUE`
- and the `timeBaseUpdateCounter[timeBaseId]` for the updated Time Base resp. `timeBaseId` has been changed
- and the `GLOBAL_TIME_BASE` bit within the `timeBaseStatus`, which is read from `StbM`, is set,

`EthTSyn` shall trigger an immediate transmission of Time Synchronization messages belonging to this Time Base.]

**Note:** The `timeBaseStatus` can be read from `StbM` by `StbM_GetTimeBaseStatus` or `StbM_GetCurrentTime`.

The `debounceCounter` as described in [Chapter 7.4](#) has always to be considered.

In addition to the actual trigger condition for an immediate transmission (refer to [\[SWS\\_EthTSyn\\_00135\]](#) above) the parameter `EthTSynCyclicMsgResumeTime` needs to be considered for immediate transmission. Refer also to the trigger condition for cyclic Timesync message transmissions (refer to [\[SWS\\_EthTSyn\\_00211\]](#)).

Two main scenarios are relevant for configuration of `EthTSynCyclicMsgResumeTime`:

- With `EthTSynCyclicMsgResumeTime` and `EthTSynGlobalTimeTxPeriod` both being configured as zero, a single shot mode is achieved that is solely triggered by the change of the `timeBaseUpdateCounter`.
- With `EthTSynCyclicMsgResumeTime` greater than `EthTSynGlobalTimeTxPeriod` a hold-over scenario in a Time Gateway can be configured:

- While Timesync messages are received from the Time Master side, the Timesync messages on the sub-busses are only triggered by immediate transmission (cyclic transmission is suspended while `cyclicMsgResumeCounter` is running)
- If no Timesync messages from the Time Master side are received anymore and a timeout is detected, cyclic transmission takes over (cyclic transmission no longer suspended because `cyclicMsgResumeCounter` has elapsed)
- reception of Timesync messages from the Time Master side resumes, the Timesync messages on the sub-busses are again triggered by immediate transmission (cyclic transmission is again suspended by running `cyclicMsgResumeCounter`)

#### [SWS\_EthTSyn\_00137]

Upstream requirements: [RS\\_TS\\_20047](#)

[If for a Time Domain:

- `EthTSynImmediateTimeSync` is set to TRUE,
- and `EthTSynCyclicMsgResumeTime` is greater than 0,
- and an immediate SYNC message is successfully sent

EthTSyn shall set the counter `cyclicMsgResumeCounter` to `EthTSynCyclicMsgResumeTime` for the corresponding Time Domain.]

#### [SWS\_EthTSyn\_00400]

Status: DRAFT

Upstream requirements: [RS\\_TS\\_20047](#)

[While for a Time Domain:

- `cyclicMsgResumeCounter` is greater than 0

EthTSyn shall discard cyclic Timesync message transmission requests for that Time Domain.]

#### [SWS\_EthTSyn\_00401]

Upstream requirements: [RS\\_TS\\_20047](#)

[While for a Time Domain the `cyclicMsgResumeCounter` is greater than 0, EthTSyn shall decrement the `cyclicMsgResumeCounter` of the corresponding Time Domain by `EthTSynMainFunctionPeriod` on each invocation of `EthTSyn_MainFunction`.]

#### [SWS\_EthTSyn\_00139]

Upstream requirements: [RS\\_TS\\_20047](#)

[If the `cyclicMsgResumeCounter` is decremented to 0 or below, EthTSyn shall resume within the same `EthTSyn_MainFunction` call cyclic Timesync message transmission by requesting either a SYNC message transmission.]

**Note:** [[SWS\\_EthTSyn\\_00139](#)] is to ensure, that the first cyclic transmission is requested in the same main function call in which also `cyclicMsgResumeCounter` reaches 0 (refer to term "earliest possible" main function call in [[SWS\\_EthTSyn\\_00211](#)]). Whether the message is actually transmitted depends also on the `debounceCounter`.

#### 7.7.1.4 Secure Time Synchronization

Refer to the chapter in StbM [[2](#)] for the configuration details of FV referenced in each Time Domain.

##### [SWS\_EthTSyn\_00246]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[When the FV is referenced (refer [EthTSynIcvGenerationFvIdRef](#), see link in note below) and the configured truncated FV length (`StbMFreshnessValueTruncLength`) is equal to FV length (`StbMFreshnessValueLength`) in StbM, the Time Master shall call the `StbM_GetTxFreshness` Api in order to obtain the full FV by using the `StbMFreshnessValueId`.]

##### [SWS\_EthTSyn\_00247]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[When the FV is referenced (refer [EthTSynIcvGenerationFvIdRef](#)) and the configured truncated FV length (`StbMFreshnessValueTruncLength`) is less than FV length (`StbMFreshnessValueLength`) in StbM, the Time Master shall call the `StbM_GetTxFreshnessTruncData` Api in order to obtain the full FV and the truncated FV by using the `StbMFreshnessValueId`.]

##### [SWS\_EthTSyn\_00248]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `StbM_GetTxFreshness` returns `E_OK`, the Time Master shall construct of the AUTOSAR Sub-TLV: Time Authenticated with FV and use the full FV in ICV generation.]

##### [SWS\_EthTSyn\_00249]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `StbM_GetTxFreshnessTruncData` returns `E_OK`, the Time Master shall construct of the AUTOSAR Sub-TLV: Time Authenticated with truncated FV and use the full FV in ICV generation.]

##### [SWS\_EthTSyn\_00250]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `StbM_GetTxFreshness` or `StbM_GetTxFreshnessTruncData` returns non-recoverable error code i.e, `E_NOT_OK`, the Time Master shall:

- stop the ICV generation (refer to chapter "ICV Generation", see link in note below) and accordingly set the `ICV_Flags` in AUTOSAR Sub-TLV: Time Authenticated of Follow\_Up message,
- call `Det_ReportRuntimeError` with the parameter `ErrorId := ETHTSYN_E_FRESHNESSFAILURE` (refer [SWS\_EthTSyn\_00144]),
- report the security event `SEV_TSYN_ETH_FRESHNESS_NOT_AVAILABLE` to the IdsM (refer [SWS\_EthTSyn\_00261]).

]

**Note:** Refer to chapter ICV Generation [7.7.3.4](#)

**Note:** Refer to the chapter in [11] for the configuration details of CSM job used for ICV generation.

#### [SWS\_EthTSyn\_00251]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If [EthTSynIcvGenerationBase](#) for the Time Domain is configured to `ICV_MAC`, the Time Master shall call `Csm_MacGenerate` to generate the ICV value.]

#### [SWS\_EthTSyn\_00252]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If [EthTSynIcvGenerationBase](#) for the Time Domain is configured to `ICV_SIGNATURE`, the Time Master shall call `Csm_SignatureGenerate` to generate the ICV value.]

**Note:** The `mode` parameter is intentionally left open for the implementer to choose (i.e. `CRYPTO_OPERATIONMODE_SINGLECALL` would possibly be the best option since it does not require further calls to `Csm`).

The CSM job used to generate the ICV can be configured to synchronous or asynchronous behaviour.

#### [SWS\_EthTSyn\_00253]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If the CSM job used to generate ICV is configured in synchronous behaviour, the Time Master shall disable ICV generation timeout monitoring.]

#### [SWS\_EthTSyn\_00254]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `Csm_MacGenerate` or `Csm_SignatureGenerate` returns `E_OK`, the Time Master shall start the [EthTSynIcvGenerationTimeout](#).]

#### [SWS\_EthTSyn\_00255]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[When the `EthTSyn_IcvGenerationIndication` callback is called, the Time Master shall stop the running ICV generation timeout timer (`EthTSynIcvGenerationTimeout`).]

#### [SWS\_EthTSyn\_00256]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If one of the following conditions is true:

- authentication build counter has reached the configuration value `EthTSynTxAuthenticationBuildAttempts`,
- the verification of the ICV has returned a non-recoverable error such as returning `E_NOT_OK` or `KEY_FAILURE`,
- `EthTSynIcvGenerationTimeout` expires before the notification of the `EthTSyn_IcvGenerationIndication` callback,

the time master shall:

- stop the ICV generation and accordingly set the `ICV_Flags` in AUTOSAR Sub-TLV: Time Authenticated of Follow\_Up message,
- report the security event `SEV_TSYN_ETH_ICV_GENERATION_FAILED` to the IdsM (refer to [SWS\_EthTSyn\_00261]).

]

**Note:** If ICV generation failed, there is no need to include the FV in the AUTOSAR Sub-TLV: Time Authenticated.

#### [SWS\_EthTSyn\_00257]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[With the notification of the `EthTSyn_IcvGenerationIndication` callback, the Time Master shall add the generated ICV to AUTOSAR Sub-TLV: Time Authenticated and transmit the Follow\_Up message.]

#### [SWS\_EthTSyn\_00258]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[When a FV is referenced (refer `EthTSynIcvGenerationFvIdRef`), the Time Master shall notify the successful transmission of the Follow\_Up message to FVM by calling `StbM_SPduTxConfirmation`.]

#### [SWS\_EthTSyn\_00402]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[For every transmission of messages that contain the AUTOSAR Sub-TLV: Time Authenticated, EthTSyn shall maintain an authentication build counter (refer [EthTSyn-TxAuthenticationBuildAttempts](#)).]

#### [SWS\_EthTSyn\_00403]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[Upon the initial processing of messages that contain the AUTOSAR Sub-TLV: Time Authenticated, the authentication build counter shall be set to 0.]

#### [SWS\_EthTSyn\_00404]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `StbM_GetTxFreshness` or `StbM_GetTxFreshnessTruncData` return recoverable error code (e.g., `STBM_E_BUSY`), the authentication build counter shall be incremented.]

#### [SWS\_EthTSyn\_00405]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `Csm_MacGenerate` or `Csm_SignatureGenerate` return recoverable error code (e.g., `E_BUSY`, `QUEUE_FULL`), the authentication build counter shall be incremented.]

#### [SWS\_EthTSyn\_00406]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If building the authenticated message generation has failed and the authentication build counter has not yet reached the configuration value [EthTSynTxAuthenticationBuildAttempts](#), the freshness attempt and ICV calculation shall be retried in the next call of the [EthTSyn\\_MainFunction](#).]

### 7.7.2 Link State and Transmission Mode

#### [SWS\_EthTSyn\_00019]

*Upstream requirements:* [RS\\_TS\\_20048](#), [RS\\_TS\\_20051](#)

[A transceiver link state change (notification call of [EthTSyn\\_TrcvLinkStateChg](#)) from `ETHTRCV_LINK_STATE_ACTIVE` to `ETHTRCV_LINK_STATE_DOWN` resets the state machines for transmission and reception of Time Synchronization messages.]

#### [SWS\_EthTSyn\_00020]

*Upstream requirements:* [RS\\_TS\\_20048](#), [RS\\_TS\\_20051](#)

[A transceiver link state change (notification call of [EthTSyn\\_TrcvLinkState-Chg](#)) from ETHTRCV\_LINK\_STATE\_DOWN to ETHTRCV\_LINK\_STATE\_ACTIVE (re-)starts the transmission and reception of Time Synchronization messages.]

#### [SWS\_EthTSyn\_00021]

*Upstream requirements:* [RS\\_TS\\_20048](#), [RS\\_TS\\_20051](#)

[If [EthTSyn\\_SetTransmissionMode](#) is called and the parameter Mode equals ETHTSYN\_TX\_OFF, all transmit request from [EthTSyn](#) shall be omitted on this Ethernet controller.]

#### [SWS\_EthTSyn\_00022]

*Upstream requirements:* [RS\\_TS\\_20048](#), [RS\\_TS\\_20051](#)

[If [EthTSyn\\_SetTransmissionMode](#) is called and the parameter Mode equals ETHTSYN\_TX\_ON, all transmit request from [EthTSyn](#) on this Ethernet controller shall be able to be transmitted.]

### 7.7.3 Message Field Calculation and Assembling

Refer to chapter Message Field Calculation and Assembling in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

#### 7.7.3.1 SGW Calculation

Refer to chapter SGW Calculation in [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.7.3.2 CRC Calculation

Refer to chapter CRC Calculation in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

#### [SWS\_EthTSyn\_00096]

*Upstream requirements:* [RS\\_TS\\_20061](#)

[The function `Crc_CalculateCRC8H2F` as defined in [12] shall be used to calculate the CRC if configured.]

#### **7.7.3.2.1 AUTOSAR Sub-TLV: Time Secured**

Refer to chapter AUTOSAR Sub-TLV: Time Secured in [1, PRS Time Synchronization Over Ethernet Protocol].

#### **7.7.3.2.2 AUTOSAR Sub-TLV: Status secured**

Refer to chapter AUTOSAR Sub-TLV: Status secured in [1, PRS Time Synchronization Over Ethernet Protocol].

#### **7.7.3.2.3 AUTOSAR Sub-TLV: UserData secured**

Refer to chapter AUTOSAR Sub-TLV: UserData secured in [1, PRS Time Synchronization Over Ethernet Protocol].

#### **7.7.3.3 Sequence Counter (sequenceld) Calculation**

Refer to chapter Sequence Counter (sequenceld) Calculation in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

#### **7.7.3.4 ICV Generation**

Refer to chapter ICV Generation in [1, PRS Time Synchronization Over Ethernet Protocol].

#### **7.7.3.5 Message Assembling**

##### **[SWS\_EthTSyn\_00104]**

*Upstream requirements:* [RS\\_TS\\_20048](#), [RS\\_TS\\_20072](#)

[Refer to chapter Message Assembling in [1, PRS Time Synchronization Over Ethernet Protocol].]

### 7.7.3.6 Dynamic port configuration for Time Master or Time Slave

#### [SWS\_EthTSyn\_00414]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20052](#), [RS\\_TS\\_20053](#)

[If the parameter [EthTSynPortRole](#) is set to [DYNAMIC](#) on any port, receiving a Sync message shall turn the respective reception port automatically into a Slave port. All remaining ports which are set as [DYNAMIC](#) shall turn as Master port.]

**Note:** Receiving Sync messages on different ports can cause inconsistencies.

#### [SWS\_EthTSyn\_00415]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20052](#), [RS\\_TS\\_20053](#)

[If Sync and [Follow\\_Up](#) messages are not received on dynamically set to Slave port for [HoldOverTime](#), then all the ports which are dynamically set to either Master or Slave shall turn back to [DYNAMIC](#).]

**Note:** This will stop transmission of Sync and [Follow\\_Up](#) on dynamically set to Master port and allow for a seamless change-over of the Slave port.

#### [SWS\_EthTSyn\_00416]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20052](#), [RS\\_TS\\_20053](#)

[If Sync and [Follow\\_Up](#) are not received on a Slave port for [HoldOverTime](#), then all the ports which are set to [TIME\\_MASTER](#) (dynamically or statically) shall stop transmission of Sync and [Follow\\_Up](#) messages.]

**Note:** It does not matter whether the Slave port was dynamically or statically configured as [TIME\\_SLAVE](#); in any case transmission of Sync and [Follow\\_Up](#) messages shall be stopped after [HoldOverTime](#) to prevent discontinuities.

## 7.7.4 System Wide Global Time Master

If the [Time Base](#) referred to by [EthTSynSynchronizedTimeBaseRef](#) of the ports in [EthTSynPortRole](#) [TIME\\_MASTER](#) is not referenced by any other [TIME\\_SLAVE](#) port of any other <Bus>TSyn module, the master is considered a System Wide Global Time Master for the top level Time Domain of the [13, System Template].

Refer also to section 7.9 on the difference between an AR Time Gateway and an IEEE Time-aware Bridge.

## 7.8 Acting as Time Slave

Refer to chapter Acting as Time Slave in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

### 7.8.1 Message processing

In addition to the Follow\_Up message fields:

- `preciseOriginTimeStamp`
- `correctionField`

(refer to [1, PRS Time Synchronization Over Ethernet Protocol] in chapter `Message Processing` which are received by the Time Slave on the bus from the Time Master, this chapter defines and uses the following internal variables for calculation of the Rx Time Tuple of a Synchronized Time Base:

- $T1_{VLT}$ : Ingress timestamp of SYNC message as captured by HW in the Ethernet controller or by SW in `EthTSyn_RxIndication`.
- $T2$ : Global Time component of the Rx Time Tuple (equivalent to  $TG_{Rx}$  in the StbM).
- $T2_{VLT}$ : Virtual Local Time component of the Rx Time Tuple (equivalent to  $TV_{Rx}$  in the StbM).
- $T3_{VLT}$ : Current time read out from Ethernet controller hardware - used for correlation of StbM time and Ethernet HW clock.
- $T4_{VLT}$ : Current virtual local time in StbM - used for correlation of StbM local time and Ethernet HW clock.
- $T_{SRD}$ : SYNC reception delay as difference between  $T3_{VLT}$  and  $T1_{VLT}$ .

Figure 7.2 illustrates the flow of actions to calculate the Rx Time Tuple from the data that is received in the Sync and in the Follow\_Up messages. The diagram helps to understand the requirements in this chapter. Further details are given in sequence diagram Figure 9.5.

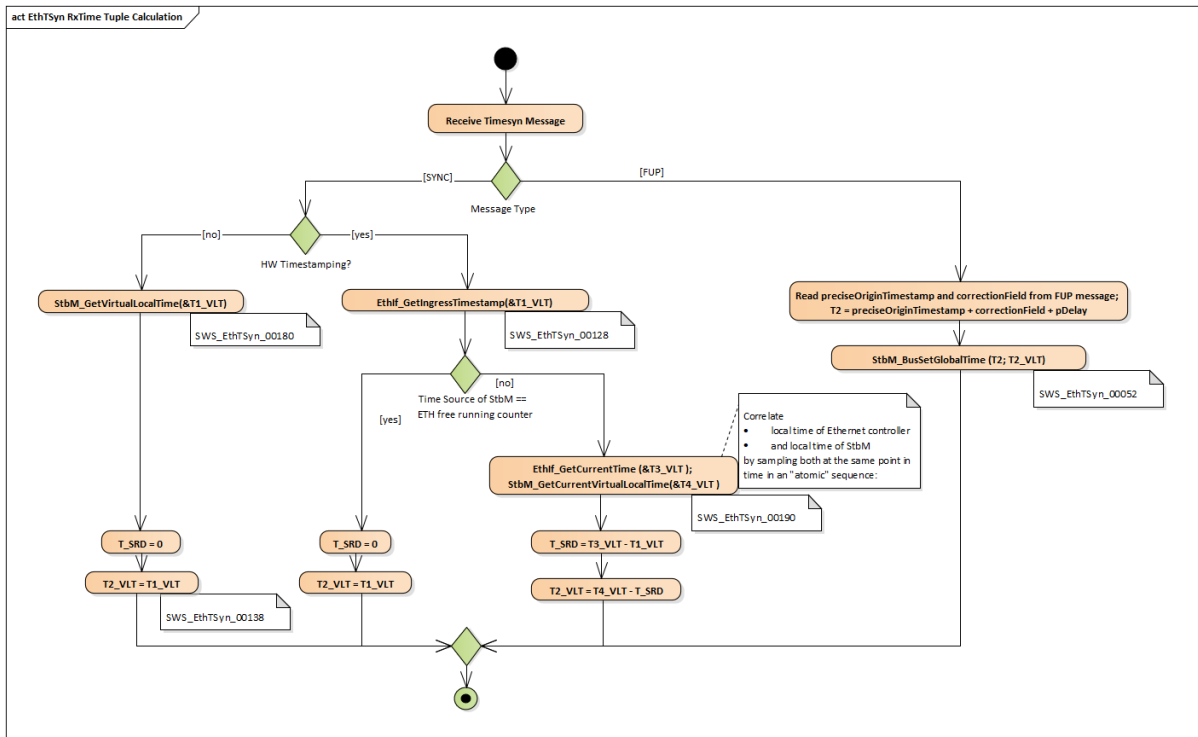


Figure 7.2: Evaluate Timesync message

#### [SWS\_EthTSyn\_00412]

Upstream requirements: [RS\\_TS\\_20048](#)

[If [EthTSynPortRole](#) is set to [TIME\\_SLAVE](#) or [DYNAMIC](#), the Sync and Follow\_Up message shall be processed in [EthTSyn\\_RxIndication](#) according to requirements [\[SWS\\_EthTSyn\\_00128\]](#), [\[SWS\\_EthTSyn\\_00138\]](#), [\[SWS\\_EthTSyn\\_00180\]](#), [\[SWS\\_EthTSyn\\_00190\]](#).]

#### [SWS\_EthTSyn\_00413]

Upstream requirements: [RS\\_TS\\_20048](#)

[If [EthTSynPortRole](#) is set to [TIME\\_SLAVE](#), no other port shall accept the Sync and Follow\_Up messages, i.e., time synchronization messages are only processed by the configured Slave port.]

**Note:** For [\[SWS\\_EthTSyn\\_00412\]](#) and [\[SWS\\_EthTSyn\\_00413\]](#): When configuring more than one Slave port for the same Time Domain, inconsistencies may arise.

#### [SWS\_EthTSyn\_00128]

Upstream requirements: [RS\\_TS\\_20048](#)

[If [EthTSynHardwareTimestampSupport](#) is set to [TRUE](#), when [EthTSyn\\_RxIndication](#) is called on ingress of a Sync message, then the EthTSyn shall retrieve the ingress time stamp  $T1_{VLT}$  from the meta data item of type [TIMETUPLE\\_TYPE\\_PTR](#) of the PDU identified by parameter [RxPduId](#).]

### [SWS\_EthTSyn\_00138]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[On invocation of [EthTSyn\\_RxIndication](#) for the Sync message and if [EthTSynHardwareTimestampSupport](#) is set to `TRUE` and if the StbM does use the Ethernet hardware counter as Virtual Local Time Source for the Time Base:

- The  $T2_{VLT}$  part of the Rx Time Tuple shall be set to the value of  $T1_{VLT}$  (i.e.,  $T2_{VLT} = T1_{VLT}$ )
- The Sync reception delay  $T_{SRD}$  shall be set to 0

]

### [SWS\_EthTSyn\_00180]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[On invocation of [EthTSyn\\_RxIndication](#) and if [EthTSynHardwareTimestampSupport](#) is set to `FALSE` the following sequence shall be applied:

- Immediately establish a protection against interruptions and run the next step directly afterwards:
- Retrieve the reference time  $T1_{VLT}$  for the Sync message via `StbM_GetCurrentVirtualLocalTime` from the StbM
- The protection against interruptions may be removed now.

The  $T2_{VLT}$  part of the Rx Time Tuple shall be set to the value of  $T1_{VLT}$  (i.e.,  $T2_{VLT} = T1_{VLT}$ ). The Sync reception delay  $T_{SRD}$  shall be set to 0.

]

**Note:** Immediately protecting against interruptions means that there shall be no frame checks before. If called in context of the Rx interrupt with interrupt nesting disabled, protection against interruptions is implicitly done by the controller. Once the interrupts are locked, it is ok to check whether the received message is a Sync message for which a snapshot of the Virtual Local Time shall be taken, but no other frame checks (e.g., SC validation) shall be done before taking the snapshot. Once the snapshot has been taken it is ok to remove the protection against interruptions and to make the necessary validations. This means that a snapshot of the Virtual Local Time shall be taken even if the succeeding validations fail and thus making the snapshot superfluous.

### [SWS\_EthTSyn\_00190]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[On invocation of [EthTSyn\\_RxIndication](#), a reference time shall be retrieved on reception of the Sync message if [EthTSynHardwareTimestampSupport](#) is set to `TRUE` and if the StbM does not use the Ethernet hardware counter as Virtual Local Time Source for the Time Base by applying the following sequence:

- Protect the following two steps against interruptions:

- the current time of the Ethernet hardware counter shall be retrieved via `parameter currentTimeTuplePtr ->timestampClockValue` of `EthIf_GetCurrentTimeTuple` from the `EthIf` and converted to the Virtual Local Time  $T3_{VLT}$
- the current value of the Virtual Local Time of the Time Base shall be retrieved as  $T4_{VLT}$  via `StbM_GetCurrentVirtualLocalTime`.
- the `Sync` reception delay  $T_{SRD}$  shall be calculated as  $T3_{VLT} - T1_{VLT}$ .
- $T2_{VLT}$  shall be calculated as  $T4_{VLT} - T_{SRD}$ .

]

#### [SWS\_EthTSyn\_00052]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[When a valid Follow-Up message is received,  
the EthTSyn shall

- calculate  $T2$  by adding the values
  - `preciseOriginTimestamp` (from the Follow-Up message),
  - `correctionField` (from the Follow-Up message),
  - `Pdelay` (calculated according to [\[SWS\\_EthTSyn\\_00264\]](#))
- and forward the resulting Rx Time Tuple  $[T2; T2_{VLT}]$  to the `StbM` module via `StbM_BusSetGlobalTime`

]

**Note:** The `Pdelay` value is not influenced significantly by a `RateRatio` according to [\[4, IEEE Std 802.1AS-2011\]](#) Note-2 of chapter "11.2.15.2.4 computePropTime()".

#### [SWS\_EthTSyn\_00266]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If

- configuration parameter `EthTSynNeighbourRateRatioConfig` is set to `CMLDS` or `TransportSpecific`
- and a valid `neighborRateRatio` has been calculated (refer to [\[SWS\\_EthTSyn\\_00263\]](#))
- and a new valid Follow-Up message has been received,

then EthTSyn shall calculate in the next main function the `rateRatio` as given in [PRS\\_TS\\_00261](#) in [\[1, PRS Time Synchronization Over Ethernet Protocol\]](#).]

#### [SWS\_EthTSyn\_00267]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If a `rateRatio` has been successfully calculated (refer to [\[SWS\\_EthTSyn\\_00266\]](#)), then when calling `StbM_BusSetGlobalTime`, `EthTSyn` shall set parameter `measureDataPtr->rateDeviation` as follows:

- calculate `rateDeviationValue` as
  - $\text{rateDeviationValue} = (\text{rateRatio} - 1) * 2^{41}$
  - and then truncate `rateDeviationValue` to the next smaller signed integer
- and set `rateDeviationStatus` to `ETH_RATE_OK`.

If the calculated rate deviation value exceeds the value range of `rateDeviationValue`, then `EthTSyn` shall

- set `rateDeviationValue` to `SINT32_MIN` or `SINT32_MAX`, respectively.
- set `rateDeviationStatus` to `ETH_RATE_EXCEEDED`.

]

**Note:** According to [4, IEEE Std 802.1AS-2011] assumption is that the fractional value of the rate deviation is within the range  $[-(2^{-10} - 2^{-41}), 2^{-10} - 2^{-41}]$ , i.e., approximately  $[-9.766 * 10^{-4}, 9.766 * 10^{-4}]$ .

#### [SWS\_EthTSyn\_00268]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If a `rateRatio` has not yet been successfully calculated (refer to [\[SWS\\_EthTSyn\\_00266\]](#)), then when calling `StbM_BusSetGlobalTime`, `EthTSyn` shall set parameter `measureDataPtr->rateDeviation` as follows:

- `rateDeviationValue` to 0
- and `rateDeviationStatus` to `ETH_RATE_NOT_AVAILABLE`.

]

#### [SWS\_EthTSyn\_00150]

*Upstream requirements:* [RS\\_TS\\_20058](#)

[When calling `StbM_BusSetGlobalTime`, `EthTSyn` shall pass the current `linkDelay` value (refer [\[SWS\\_EthTSyn\\_00264\]](#)) by the parameter `measureDataPtr->pathDelay` to the `StbM`.]

**[SWS\_EthTSyn\_00129]**

*Upstream requirements:* [RS\\_TS\\_20051](#)

[When providing a new Global Time tuple to the StbM via `StbM_BusSetGlobalTime`, `EthTSyn` shall set the `SYNC_TO_GATEWAY` bit in `timeBaseStatus` (structure member, which is referenced by the parameter `timeTuplePtr`), according to the `SGW` value (refer to [\[PRS\\_TS\\_00156\]](#)). The remaining status bits shall be set to 0.]

**[SWS\_EthTSyn\_00230]**

*Upstream requirements:* [RS\\_TS\\_20062](#)

[If `EthTSynMessageCompliance` is either set to `TRUE` or if `EthTSynRxSub-TLVUserData` is set to `FALSE`, `EthTSyn` shall pass a `NULL` pointer as parameter `UserData` of `StbM_BusSetGlobalTime`.]

**[SWS\_EthTSyn\_00227]**

*Upstream requirements:* [RS\\_TS\\_20069](#)

[On invocation of `EthTSyn_GetProtocolParam` `EthTSyn` shall return the following values received in the latest `Follow_Up` information TLV via argument `protocolParam`:

- `cumulativeScaledRateOffset`
- `gmTimeBaseIndicator`
- `lastGmPhaseChange`
- `scaledLastGmFreqChange`

Member `protocolType` of argument `protocolParam` shall be set to `STBM_TIMESYNC_ETHERNET`.]

**7.8.1.1 Runtime Error detection****[SWS\_EthTSyn\_00146]**

*Upstream requirements:* [RS\\_TS\\_20051](#)

[If `EthTSynMasterSlaveConflictDetection` is set to `TRUE` and if the Time Slave receives a Sync frame with different `sourcePortIdentity` (i.e., different MAC addresses), it shall report a runtime error by calling `Det_ReportRuntimeError` with error code `ETHTSYN_E_TSCONFLICT` and discard the received Sync frame.]

**7.8.1.2 Frame Debouncing**

Refer to chapter Frame Debouncing in [\[1, PRS Time Synchronization Over Ethernet Protocol\]](#) for additional requirements.

#### [SWS\_EthTSyn\_00232]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[During the [EthTSynGlobalTimeRxDebounceTime](#), if the sequence is reset, then the Time Slave shall report the security event `SEV_TSYN_ETH_MSG_SEQUENCE_ERROR` to the IdsM (refer to [\[SWS\\_EthTSyn\\_00261\]](#)).]

### 7.8.1.3 Secure Time Synchronization

Refer to the chapter in StbM [\[2\]](#) for the configuration details of FV referenced in each Time Domain.

#### [SWS\_EthTSyn\_00233]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[When the FV is referenced (refer [EthTSynIcvVerificationFvIdRef](#)), FVL is greater than 0 and 'ICV with FV' bit is set in `ICV_Flags` of received `Follow_Up` message, the Time Slave shall call the `StbM_GetRxFreshness` Api in order to obtain the Freshness Value by using

- the `StbMFreshnessValueId` from the reference [EthTSynIcvVerificationFvIdRef](#)
- the `StbMTruncatedFreshnessValue` as received in the FV field of the `Follow_Up` message
- the `StbMTruncatedFreshnessValueLength` as received in the FVL field of the `Follow_Up` message
- the `StbMAuthVerifyAttempts` as the number of failed verification attempt counts for the current message (ICV verification attempt counter)
- the `StbMFreshnessValueLength` from the reference [EthTSynIcvVerificationFvIdRef](#)

]

#### [SWS\_EthTSyn\_00234]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `StbM_GetRxFreshness` returns `E_OK`, the Time Slave shall use the FV in ICV verification.]

#### [SWS\_EthTSyn\_00236]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If

- `StbM_GetRxFreshness` returns non-recoverable error code (e.g., `E_NOT_OK`)

- or FVL == 0 and ICV with FV bit is set in ICV\_Flags of received Follow\_Up message,

the ICV verification of received Follow\_Up message is considered to be failed, and the Time Slave shall :

- stop the ICV verification (refer to chapter "ICV Verification". see link in note below) and discard the received Follow\_Up message,
- call `Det_ReportRuntimeError` with the parameter `ErrorId := ETHTSYN_E_FRESHNESSFAILURE` (refer [SWS\_EthTSyn\_00144]),
- report the security event `SEV_TSYN_ETH_FRESHNESS_NOT_AVAILABLE` to the IdSM (refer to [SWS\_EthTSyn\_00261]).

]

Refer to the chapter in [11] for the configuration details of CSM job used for ICV verification.

#### [SWS\_EthTSyn\_00237]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If [EthTSynIcvVerificationBase](#) for the Time Domain is configured to `ICV_MAC`, the Time Slave shall call `Csm_MacVerify` to verify the ICV value.]

#### [SWS\_EthTSyn\_00238]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If [EthTSynIcvVerificationBase](#) for the Time Domain is configured to `ICV_SIGNATURE`, the Time Slave shall call `Csm_SignatureVerify` to verify the ICV value.]

#### Note: 7.8.2.4

**Note:** The `mode` parameter is intentionally left open for the implementer to choose (i.e. `CRYPTO_OPERATIONMODE_SINGLECALL` would possibly be the best option since it does not require further calls to Csm).

The CSM job used to generate the ICV can be configured to synchronous or asynchronous behaviour.

#### [SWS\_EthTSyn\_00239]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[The ICV verification timeout observation is disabled, when the CSM job to verify ICV is configured in synchronous behaviour. In this case, the [EthTSynIcvVerificationTimeout](#) shall be set to 0.]

#### [SWS\_EthTSyn\_00240]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `Csm_MacVerify` or `Csm_SignatureVerify` returns `E_OK`, the Time Slave shall start the `EthTSynIcvVerificationTimeout`.]

#### [SWS\_EthTSyn\_00241]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `Csm_MacVerify` or `Csm_SignatureVerify` returns recoverable error code (e.g., `CRYPTO_E_BUSY`, `CRYPTO_QUEUE_FULL`), the current verification of received `Follow_Up` message is considered to be failed, and the Time Slave shall increment the authentication build counter for this `Follow_Up` message.]

#### [SWS\_EthTSyn\_00242]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[The `EthTSynIcvVerificationTimeout` shall be stopped with the notification of the `EthTSynIcvVerificationIndication` callback.]

#### [SWS\_EthTSyn\_00243]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If one of the following conditions is true:

- the authentication build counter has reached the configuration value `EthTSyn-RxAuthenticationBuildAttempts`,
- the ICV verification attempt counter has reached the configuration value `EthTSynIcvVerificationAttempts`,
- the verification of the ICV has returned a non-recoverable error such as returning `E_NOT_OK` or `KEY_FAILURE`,
- `EthTSynIcvVerificationTimeout` expires before the notification of the `EthTSynIcvVerificationIndication` callback,

the time slave shall:

- stop the ICV verification (refer to chapter ICV Verification, see link in note below) and discard the received `Follow_Up` message,
- report the security event `SEV_TSYN_ETH_ICV_VERIFICATION_FAILED` to the `IdsM` (refer to [[SWS\\_EthTSyn\\_00261](#)]).

]

Note: [7.8.2.4](#)

#### [SWS\_EthTSyn\_00407]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[For every reception of messages that require ICV verification, EthTSyn shall maintain an authentication build counter (refer [EthTSynRxAuthenticationBuildAttempts](#)).]

#### [SWS\_EthTSyn\_00408]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[Upon the initial processing of messages that require ICV verification, the authentication build counter shall be set to 0.]

#### [SWS\_EthTSyn\_00409]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If `StbM_GetRxFreshness` returns recoverable error code (e.g., `STBM_E_BUSY`), the authentication build counter shall be incremented and no attempt for verification of the ICV shall be executed.]

#### [SWS\_EthTSyn\_00410]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If building the authenticated message verification has failed and the authentication build counter has not yet reached the configuration value [EthTSynRxAuthenticationBuildAttempts](#), the freshness attempt and ICV verification shall be retried in the next call of the [EthTSyn\\_MainFunction](#).]

#### [SWS\_EthTSyn\_00411]

*Status:* DRAFT

*Upstream requirements:* [RS\\_TS\\_20072](#)

[If the verification of the ICV could be successfully executed but the verification failed (e.g. the MAC verification has failed or the key was invalid), the ICV verification attempt counter shall be incremented and the authentication build counter shall be set to 0.]

**Note:** Resetting the authentication build counter shall prevent to drop the authentication process too early even though ICV verification attempts are still possible.

#### [SWS\_EthTSyn\_00244]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[When the [EthTSyn\\_IcvVerificationIndication](#) callback is called and ICV verification result is successful, the Time Slave shall accept the `Follow_Up` message and call `StbM_BusSetGlobalTime` to forward the global time to `StbM`.]

#### [SWS\_EthTSyn\_00245]

*Upstream requirements:* [RS\\_TS\\_20072](#)

[When the [EthTSyn\\_IcvVerificationIndication](#) callback is called and ICV verification result is unsuccessful, the Time Slave shall discard the `Follow_Up` message.]

### 7.8.2 Message Field Validation and Disassembling

Additional content to this chapter can be found in [1, PRS Time Synchronization Over Ethernet Protocol] in chapter Message Field Validation and Disassembling.

#### 7.8.2.1 SGW Calculation

Refer to chapter SGW Calculation in [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.8.2.2 CRC Validation

##### [SWS\_EthTSyn\_00111]

*Upstream requirements:* [RS\\_TS\\_20061](#)

[The function `Crc_CalculateCRC8H2F` as defined in [12] shall be used to calculate the CRC if configured.]

Refer to chapter CRC Calculation in [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

##### 7.8.2.2.1 AUTOSAR Sub-TLV: Time Secured

Refer to chapter AUTOSAR Sub-TLV: Time Secured in [1, PRS Time Synchronization Over Ethernet Protocol].

##### 7.8.2.2.2 AUTOSAR Sub-TLV: Status secured

Refer to chapter AUTOSAR Sub-TLV: Status secured in [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.8.2.2.3 AUTOSAR Sub-TLV: UserData secured

Refer to chapter AUTOSAR Sub-TLV: UserData secured in [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.8.2.3 Sequence Counter (sequenceId) Validation

Refer to chapter Sequence Counter (sequenceId) Validation in AUTOSAR Time Synchronization Protocol Specification [1, PRS Time Synchronization Over Ethernet Protocol] for additional requirements.

#### 7.8.2.4 ICV Verification

Refer to chapter ICV Verification in PRS-TimeSyncProtocol [1, PRS Time Synchronization Over Ethernet Protocol].

#### 7.8.2.5 Message Disassembling

Refer to chapter Message Disassembling in [1, PRS Time Synchronization Over Ethernet Protocol].

### 7.9 Time Gateway

A Time Gateway synchronizes a Time Base of the [2, StbM] to a `TIME_SLAVE` port of a `<Bus>TSyn` module and uses the `TIME_MASTER` port(s) of potentially one or more (different or same) `<Bus>TSyn` modules to distribute time information. The role of Time Gateway is an implicit configuration of the `EthTSyn` module only. It means there is potentially one port in `EthTSynPortRole TIME_SLAVE` (see 7.8) and potentially more than one port in `EthTSynPortRole TIME_MASTER` (see 7.7) with the same `EthTSynSynchronizedTimeBaseRef`.

In the context of the [13, System Template] a `EthTSynGlobalTimeDomain`, identified by its `EthTSynGlobalTimeDomainId`, represents a sub domain. The root of the top level Time Domain is defined by the System Wide Global Time Master (see 7.7.4).

#### 7.9.1 Differences to a Time Aware Bridge

In a Time-aware Bridge (according to [4, IEEE Std 802.1AS-2011]) the Ethernet ports participating in the distribution of time are connected through a PTP Relay Instance. There is one relay instance per gPTP Time Domain as identified by its Time Domain ID in every Bridge. In contrast to an Autosar Time Gateway, the IEEE Time

Aware Bridge does not maintain a `time base` for the synchronized time. Instead it only uses a local time base for time stamping and to measure short time intervals between reception and transmission of gPTP messages.

The `Grandmaster` of [4, IEEE Std 802.1AS-2011] is not to be confused with the `System Wide Global Time Master` (see 7.7.4). As described in 7.9 above, Autosar defines a more abstract top level `TimeDomain` based on a hierarchy of `TimeBases` in [13, AUTOSAR System Template] Chapter 9.2 “*The big Picture*”.

## 7.10 Time Recording

### 7.10.1 Time Validation

#### [SWS\_EthTSyn\_00212]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[The `EthTSyn` shall support Time Validation, if `EthTSynTimeValidationSupport` set to `TRUE`.]

#### [SWS\_EthTSyn\_00213]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[If

- `EthTSynTimeValidationSupport` is enabled and
- `EthTSynEnableTimeValidation` for the Time Domain is enabled,

`EthTSyn` shall do time recording for Time Validation for that Time Domain.]

#### [SWS\_EthTSyn\_00214]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[If time recording for Time Validation is enabled for a Master Port Domain of a Time Domain (refer to [SWS\_EthTSyn\_00212] and [SWS\_EthTSyn\_00213]). The `EthTSyn` shall call `StbM_EthSetMasterTimingData` upon successful transmission of a `Sync` message (refer to `EthTSyn TimesyncSequence`).]

**Note:** `EthTSyn TimesyncSequence` is shown in [Figure 9.2](#).

#### [SWS\_EthTSyn\_00215]

*Upstream requirements:* [RS\\_TS\\_20048](#)

[Upon invocation of `StbM_EthSetMasterTimingData` (refer to [\[SWS\\_EthTSyn\\_00214\]](#)) the `EthTSyn` shall pass the following parameters

- The `sequenceId` of the sent `Sync` message,
- The `sourcePortIdentity` as sent in the `Sync` message and

- The Virtual Local Time  $T2_{VLT}$  sampled on egress of the `Sync` message (refer to [SWS\_EthTSyn\_00127]),
- The `preciseOriginTimestamp` as copied to the `Follow_Up` message and (refer to [SWS\_EthTSyn\_00188]).
- The `correctionField` as copied to the `Follow_Up` message.

by the parameter `measureDataPtr`.]

### [SWS\_EthTSyn\_00216]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[If

- Time recording for Time Validation is enabled for a Time Domain (refer to [SWS\_EthTSyn\_00212] and [SWS\_EthTSyn\_00213]) and
- `EthTSyn` is configured as Time Slave for that Time Domain.

`EthTSyn` shall call `StbM_EthSetSlaveTimingData` upon successful reception of a `FollowUp` message (refer to `EthTSyn TimesyncSequence`).

`StbM_EthSetSlaveTimingData` shall be called after `StbM_BusSetGlobalTime`.]

**Note:** `EthTSyn TimesyncSequence` is shown in [Figure 9.2](#).

**Note:** `StbM_BusSetGlobalTime` shall be called first, because it updates the Synclocal Time Tuple (refer to [2]), which is required by `StbM_EthSetSlaveTimingData`).

### [SWS\_EthTSyn\_00217]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[Upon invocation of `StbM_EthSetSlaveTimingData` `EthTSyn` shall pass following values

- The `sequenceId` received in the `Follow_Up` message,
- The `sourcePortIdentity` received in the `Follow_Up` message and
- The Virtual Local Time  $T1_{VLT}$  sampled on ingress of the `Sync` message (refer to [SWS\_EthTSyn\_00128]),
- The `preciseOriginTimestamp` received in the `Follow_Up` message
- The `correctionField` received in the `Follow_Up` message and
- The current value of the `Pdelay`

to the function by the parameter `measureDataPtr`.

The struct members

- `measureDataPtr->referenceLocalTimestamp` and
- `measureDataPtr->referenceGlobalTimestamp`

shall be passed as 0.]

**Note:** The `EthTSyn` passes 0 to avoid undefined values. The `StbM` will calculate the structure members `referenceLocalTimestamp` and `referenceGlobalTimestamp` based on the `Synclocal Time Tuple` (refer to `SWS_StbM_00471` in [2]).

### 7.10.1.1 Recording of Pdelay Measurement

#### [SWS\_EthTSyn\_00218]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[If

- time recording for Time Validation is enabled for a Time Domain (refer to [SWS\_EthTSyn\_00212] and [SWS\_EthTSyn\_00213])
- and `EthTSyn` is configured as Time Master for that Time Domain

`EthTSyn` shall call `StbM_GetCurrentTime` to retrieve a Time Tuple [`TrefPDResponder`; `TVLT_refPDResponder`] before sending the `Pdelay_Resp` message (refer to `EthTSyn PdelaySequence`).]

**Note:** The Time Tuple [`TrefPDResponder`; `TVLT_refPDResponder`] will be used for coherent conversion of `t2` or `requestReceiptTimestamp` and `t3` or `responseOriginTimestamp` into Global Time values, i.e., of instances in Virtual Local Time values into instances in Global Time.

**Note:** `EthTSyn PdelaySequence` is shown in [Figure 9.3](#)

#### [SWS\_EthTSyn\_00219]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[If

- time recording for Time Validation is enabled for the Time Domain (refer to [SWS\_EthTSyn\_00212] and [SWS\_EthTSyn\_00213])
- and `EthTSyn` is configured as Time Master for that Time Domain

`EthTSyn` shall call `StbM_EthSetPdelayResponderData` after the current `Pdelay` measurement is finished, i.e., upon transmission of the `Pdelay_Resp_Follow_Up` message (refer to `EthTSyn PdelaySequence`).]

**Note:** `EthTSyn PdelaySequence` is shown in [Figure 9.3](#)

#### [SWS\_EthTSyn\_00220]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[The Time Master shall pass the following parameters

- the `sequenceId` of the received `Pdelay_Req` message and

- the `sourcePortIdentity` of the received `Pdelay_Req` message,
- the `sourcePortIdentity` of the sent `Pdelay_Resp` message
- `t2` (refer to [SWS\_EthTSyn\_00160], [SWS\_EthTSyn\_00124])
- `t3` (refer to [SWS\_EthTSyn\_00159] , [SWS\_EthTSyn\_00122]) and
- the sampled reference Time Tuple [ $T_{refPDResponder}$ ;  $T_{VLT\_refPDResponder}$ ] (refer to [SWS\_EthTSyn\_00218])

to `StbM_EthSetPdelayResponderData` upon invocation by the parameter `measureDataPtr`.]

### [SWS\_EthTSyn\_00223]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[If time recording for Time Validation is enabled for the Time Domain (refer to [SWS\_EthTSyn\_00212] and [SWS\_EthTSyn\_00213]), the Time Slave shall call `StbM_GetCurrentTime` to retrieve a Time Tuple [ $T_{refPDInitiator}$ ;  $T_{VLT\_refPDInitiator}$ ] before sending the `pDelay_Req` message (refer to `EthTSyn PdelaySequence`).]

**Note:** The Time Tuple [ $T_{refPDInitiator}$ ;  $T_{VLT\_refPDInitiator}$ ] will be used for coherent conversion of `t1` and `t4` from Virtual Local Time values into Global Time values.

**Note:** `EthTSyn PdelaySequence` is shown in [Figure 9.3](#)

### [SWS\_EthTSyn\_00221]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[If

- time recording for Time Validation is enabled for the Time Domain (refer to [SWS\_EthTSyn\_00212] and [SWS\_EthTSyn\_00213]) and
- `EthTSyn` is configured as Time Slave for that Time Domain

`EthTSyn` shall call `StbM_EthSetPdelayInitiatorData` after the current `Pdelay` measurement is finished, i.e., upon reception of the `Pdelay_Resp_Follow_Up` message (refer to `EthTSyn PdelaySequence` ).]

**Note:** `EthTSyn PdelaySequence` is shown in [Figure 9.3](#)

### [SWS\_EthTSyn\_00222]

*Upstream requirements:* [RS\\_TS\\_00034](#)

[The Time Slave shall pass the following parameters

- the `sequenceId` of the sent `Pdelay_Req` message,
- the `sourcePortIdentity` of the sent `Pdelay_Req` message,
- the `sourcePortIdentity` of the received `Pdelay_Resp` message

- t1 (refer to [SWS\_EthTSyn\_00013]),

t4 (refer to [SWS\_EthTSyn\_00049]),

- the requestReceiptTimestamp from the Pdelay\_Resp message,
- the responseOriginTimestamp from the Pdelay\_Resp\_Follow\_Up message,
- the sampled reference Time Tuple  $[T_{refPDInitiator}; T_{VLT\_refPDInitiator}]$  (refer [SWS\_EthTSyn\_00223])

to StbM\_EthSetPdelayInitiatorData upon invocation by the parameter measureDataPtr.]

## 7.11 Security Events

### [SWS\_EthTSyn\_00231]

Upstream requirements: SRS\_BSW\_00489, SRS\_BSW\_00491

[If security event reporting has been enabled for the EthTSyn module (EthTSynEnableSecurityEventReporting is set to true) the respective security events shall be reported to the IdsM [14] via the interfaces defined in BSWGeneral [3].]

The following table lists the security events which are standardized for the EthTSyn together with their trigger conditions.

### [SWS\_EthTSyn\_00261] Security events for EthTSyn

Status: DRAFT

Upstream requirements: SRS\_BSW\_00488, SRS\_BSW\_00489, SRS\_BSW\_00490

[

| Name                                 | Description                                                                                                        | ID |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------|----|
| SEV_TSYN_ETH_ICV_GENERATION_FAILED   | ICV generation for a Follow_Up message failed.                                                                     | 73 |
| SEV_TSYN_ETH_ICV_VERIFICATION_FAILED | ICV verification of a received Follow_Up message failed.                                                           | 74 |
| SEV_TSYN_ETH_FRESHNESS_NOT_AVAILABLE | Failed to get freshness value from FvM.                                                                            | 75 |
| SEV_TSYN_ETH_MSG_SEQUENCE_ERROR      | Failed to receive correct sequence of SYNC and FUP from the TimeMaster within (EthTSynGlobalTimeFollowUp Timeout). | 76 |

]

The following tables lists the security events together with their context data.

### [SWS\_EthTSyn\_92000] Security event context data definition: SEV\_TSYN\_ETH\_ICV\_GENERATION\_FAILED

Status: DRAFT

Upstream requirements: [SRS\\_BSW\\_00488](#), [SRS\\_BSW\\_00489](#)

| SEV Name             | SEV_TSYN_ETH_ICV_GENERATION_FAILED             |                |
|----------------------|------------------------------------------------|----------------|
| ID                   | 73                                             |                |
| Description          | ICV generation for a Follow_Up message failed. |                |
| Context Data Version | 1                                              |                |
| Context Data         | Data Type                                      | Allowed Values |
| GlobalTimeDomainId   | uint8                                          |                |

### [SWS\_EthTSyn\_92001] Security event context data definition: SEV\_TSYN\_ETH\_ICV\_VERIFICATION\_FAILED

Status: DRAFT

Upstream requirements: [SRS\\_BSW\\_00488](#), [SRS\\_BSW\\_00489](#)

| SEV Name             | SEV_TSYN_ETH_ICV_VERIFICATION_FAILED                     |                |
|----------------------|----------------------------------------------------------|----------------|
| ID                   | 74                                                       |                |
| Description          | ICV verification of a received Follow_Up message failed. |                |
| Context Data Version | 1                                                        |                |
| Context Data         | Data Type                                                | Allowed Values |
| GlobalTimeDomainId   | uint8                                                    |                |

### [SWS\_EthTSyn\_92002] Security event context data definition: SEV\_TSYN\_ETH\_FRESHNESS\_NOT\_AVAILABLE

Status: DRAFT

Upstream requirements: [SRS\\_BSW\\_00488](#), [SRS\\_BSW\\_00489](#)

| SEV Name             | SEV_TSYN_ETH_FRESHNESS_NOT_AVAILABLE    |                |
|----------------------|-----------------------------------------|----------------|
| ID                   | 75                                      |                |
| Description          | Failed to get freshness value from FvM. |                |
| Context Data Version | 1                                       |                |
| Context Data         | Data Type                               | Allowed Values |
| GlobalTimeDomainId   | uint8                                   |                |

### [SWS\_EthTSyn\_92003] Security event context data definition: SEV\_TSYN\_ETH\_MSG\_SEQUENCE\_ERROR

Status: DRAFT

Upstream requirements: [SRS\\_BSW\\_00488](#), [SRS\\_BSW\\_00489](#)

| [                    |                                                                                                                    |                |
|----------------------|--------------------------------------------------------------------------------------------------------------------|----------------|
| SEV Name             | SEV_TSYN_ETH_MSG_SEQUENCE_ERROR                                                                                    |                |
| ID                   | 76                                                                                                                 |                |
| Description          | Failed to receive correct sequence of SYNC and FUP from the TimeMaster within (EthTSyn GlobalTimeFollowUpTimeout). |                |
| Context Data Version | 1                                                                                                                  |                |
| Context Data         | Data Type                                                                                                          | Allowed Values |
| GlobalTimeDomainId   | uint8                                                                                                              |                |
| ]                    |                                                                                                                    |                |

## 7.12 Error Classification

Chapter [3, General Specification of Basic Software Modules] 7.2 “Error Handling” describes the error handling of the Basic Software in detail. Above all, it constitutes a classification scheme consisting of five error types which may occur in BSW modules.

Based on this foundation, the following section specifies particular errors arranged in the respective subsections below.

### [SWS\_EthTSyn\_00029]

Upstream requirements: [RS\\_TS\\_20051](#), [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00417](#)

[On errors and exceptions, the [EthTSyn](#) module shall not modify its current module state but shall simply report the error event.]

#### 7.12.1 Development Errors

The detection of development errors is configurable (refer [EthTSynDevErrorDetect](#)).

### [SWS\_EthTSyn\_00030] Definition of development errors in module EthTSyn

Upstream requirements: [SRS\\_BSW\\_00337](#), [SRS\\_BSW\\_00385](#), [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00406](#)

| [                                        |                       |             |
|------------------------------------------|-----------------------|-------------|
| Type of error                            | Related error code    | Error value |
| API service used in un-initialized state | ETHTSYN_E_UNINIT      | 0x20        |
| EthTSyn initialization failed            | ETHTSYN_E_INIT_FAILED | 0x21        |
| API called with invalid controller index | ETHTSYN_E_CTRL_IDX    | 0x22        |
| ]                                        |                       |             |





| Type of error                     | Related error code      | Error value |
|-----------------------------------|-------------------------|-------------|
| API called with invalid pointer   | ETHTSYN_E_PARAM_POINTER | 0x23        |
| API called with invalid parameter | ETHTSYN_E_PARAM         | 0x24        |

]

## 7.12.2 Runtime Errors

### [SWS\_EthTSyn\_00144] Definition of runtime errors in module EthTSyn

Upstream requirements: [SRS\\_BSW\\_00385](#)

[

| Type of error                | Related error code         | Error value |
|------------------------------|----------------------------|-------------|
| Time Master conflict         | ETHTSYN_E_TMCONFLICT       | 0x01        |
| Time Slave conflict          | ETHTSYN_E_TSCONFLICT       | 0x02        |
| No FV available from the FVM | ETHTSYN_E_FRESHNESSFAILURE | 0x03        |

]

## 7.12.3 Production Errors

No Production Errors defined.

## 7.12.4 Extended Production Errors

No Extended Production Errors defined.

## 8 API specification

### 8.1 API

#### 8.1.1 Imported types

In this section all types included from the following modules are listed:

#### [SWS\_EthTSyn\_00031] Definition of imported datatypes of module EthTSyn

Upstream requirements: [RS\\_TS\\_20048](#), [RS\\_TS\\_20059](#)

| Module  | Header File        | Imported Type                       |
|---------|--------------------|-------------------------------------|
| Comtype | ComStack_Types.h   | PduldType                           |
|         | ComStack_Types.h   | PdulInfoType                        |
|         | ComStack_Types.h   | PduLengthType                       |
|         | ComStack_Types.h   | RateDeviationStatusType (draft)     |
|         | ComStack_Types.h   | RateDeviationWithStatusType (draft) |
|         | ComStack_Types.h   | TimeStampQualType (draft)           |
|         | ComStack_Types.h   | TimeStampType (draft)               |
| Csm     | Rte_Csm_Type.h     | Crypto_OperationModeType            |
|         | Rte_Csm_Type.h     | Crypto_ResultType                   |
|         | Rte_Csm_Type.h     | Crypto_VerifyResultType             |
| EthSwt  | Eth_GeneralTypes.h | EthSwt_MgmtInfoType                 |
|         | Eth_GeneralTypes.h | EthSwt_MgmtObjectType               |
|         | Eth_GeneralTypes.h | EthSwt_MgmtObjectValidType          |
|         | Eth_GeneralTypes.h | EthSwt_MgmtOwner                    |
| EthTrcv | Eth_GeneralTypes.h | EthTrcv_LinkStateType               |
| IdsM    | IdsM.h             | IdsM_SecurityEventIdType            |
|         | Rte_IdsM_Type.h    | IdsM_TimestampDataType              |
| StbM    | Rte_StbM_Type.h    | StbM_EthTimeMasterMeasurementType   |
|         | Rte_StbM_Type.h    | StbM_EthTimeSlaveMeasurementType    |
|         | Rte_StbM_Type.h    | StbM_PdelayInitiatorMeasurementType |
|         | Rte_StbM_Type.h    | StbM_PdelayResponderMeasurementType |
|         | Rte_StbM_Type.h    | StbM_PortIdType                     |
|         | Rte_StbM_Type.h    | StbM_ProtocolParamType              |
|         | Rte_StbM_Type.h    | StbM_SynchronizedTimeBaseType       |
|         | Rte_StbM_Type.h    | StbM_TimeBaseStatusType             |
|         | Rte_StbM_Type.h    | StbM_TimeStampShortType             |
|         | Rte_StbM_Type.h    | StbM_TimeStampType                  |
|         | Rte_StbM_Type.h    | StbM_TimeSyncType                   |
|         | Rte_StbM_Type.h    | StbM_TimeTupleType                  |
|         | Rte_StbM_Type.h    | StbM_UserDataType                   |





| Module | Header File | Imported Type             |
|--------|-------------|---------------------------|
|        | StbM.h      | StbM_MeasurementType      |
|        | StbM.h      | StbM_VirtualLocalTimeType |
| Std    | Std_Types.h | Std_ReturnType            |
|        | Std_Types.h | Std_VersionInfoType       |

]

## 8.1.2 Type definitions

### 8.1.2.1 EthTSyn\_ConfigType

#### [SWS\_EthTSyn\_00032] Definition of datatype EthTSyn\_ConfigType

Upstream requirements: [RS\\_TS\\_20048](#)

[

|                      |                                                                                                                                                                                                                                                                                                                   |   |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| <b>Name</b>          | EthTSyn_ConfigType                                                                                                                                                                                                                                                                                                |   |
| <b>Kind</b>          | Structure                                                                                                                                                                                                                                                                                                         |   |
| <b>Elements</b>      | implementation specific                                                                                                                                                                                                                                                                                           |   |
|                      | <b>Type</b>                                                                                                                                                                                                                                                                                                       | – |
|                      | <b>Comment</b>                                                                                                                                                                                                                                                                                                    | – |
| <b>Description</b>   | This is the base type for the configuration of the Global Time Synchronization over Ethernet. A pointer to an instance of this structure will be used in the initialization of the Global Time Synchronization over Ethernet. The content of this structure is defined in chapter 10 Configuration specification. |   |
| <b>Available via</b> | EthTSyn.h                                                                                                                                                                                                                                                                                                         |   |

]

### 8.1.2.2 EthTSyn\_TransmissionModeType

#### [SWS\_EthTSyn\_00033] Definition of datatype EthTSyn\_TransmissionModeType

Upstream requirements: [RS\\_TS\\_20048](#)

[

|                      |                                                             |      |                       |
|----------------------|-------------------------------------------------------------|------|-----------------------|
| <b>Name</b>          | EthTSyn_TransmissionModeType                                |      |                       |
| <b>Kind</b>          | Enumeration                                                 |      |                       |
| <b>Range</b>         | ETHTSYN_TX_OFF                                              | 0x00 | Transmission Disabled |
|                      | ETHTSYN_TX_ON                                               | 0x01 | Transmission Enabled  |
| <b>Description</b>   | Handles the enabling and disabling of the transmission mode |      |                       |
| <b>Available via</b> | EthTSyn.h                                                   |      |                       |

]

## 8.1.3 Function definitions

### 8.1.3.1 EthTSyn\_Init

#### [SWS\_EthTSyn\_00035] Definition of API function EthTSyn\_Init

Upstream requirements: [RS\\_TS\\_20048](#)

[

|                           |                                                                          |                                             |
|---------------------------|--------------------------------------------------------------------------|---------------------------------------------|
| <b>Service Name</b>       | EthTSyn_Init                                                             |                                             |
| <b>Syntax</b>             | <pre>void EthTSyn_Init (     const EthTSyn_ConfigType* configPtr )</pre> |                                             |
| <b>Service ID [hex]</b>   | 0x01                                                                     |                                             |
| <b>Sync/Async</b>         | Synchronous                                                              |                                             |
| <b>Reentrancy</b>         | Non Reentrant                                                            |                                             |
| <b>Parameters (in)</b>    | configPtr                                                                | Pointer to selected configuration structure |
| <b>Parameters (inout)</b> | None                                                                     |                                             |
| <b>Parameters (out)</b>   | None                                                                     |                                             |
| <b>Return value</b>       | None                                                                     |                                             |
| <b>Description</b>        | This function initializes the Time Synchronization over Ethernet.        |                                             |
| <b>Available via</b>      | EthTSyn.h                                                                |                                             |

]

See section [7.1.1](#) for details.

### 8.1.3.2 EthTSyn\_GetVersionInfo

#### [SWS\_EthTSyn\_00036] Definition of API function EthTSyn\_GetVersionInfo

Upstream requirements: [RS\\_TS\\_20048](#)

[

|                           |                                                                                 |                                                                   |
|---------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------|
| <b>Service Name</b>       | EthTSyn_GetVersionInfo                                                          |                                                                   |
| <b>Syntax</b>             | <pre>void EthTSyn_GetVersionInfo (     Std_VersionInfoType* versioninfo )</pre> |                                                                   |
| <b>Service ID [hex]</b>   | 0x02                                                                            |                                                                   |
| <b>Sync/Async</b>         | Synchronous                                                                     |                                                                   |
| <b>Reentrancy</b>         | Non Reentrant                                                                   |                                                                   |
| <b>Parameters (in)</b>    | None                                                                            |                                                                   |
| <b>Parameters (inout)</b> | None                                                                            |                                                                   |
| <b>Parameters (out)</b>   | versioninfo                                                                     | Pointer to where to store the version information of this module. |
| <b>Return value</b>       | None                                                                            |                                                                   |
| <b>Description</b>        | Returns the version information of this module.                                 |                                                                   |
| <b>Available via</b>      | EthTSyn.h                                                                       |                                                                   |

]

### 8.1.3.3 EthTSyn\_SetTransmissionMode

#### [SWS\_EthTSyn\_00039] Definition of API function EthTSyn\_SetTransmissionMode

Upstream requirements: [RS\\_TS\\_20048](#)

[

|                           |                                                                                                          |                                  |
|---------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Service Name</b>       | EthTSyn_SetTransmissionMode                                                                              |                                  |
| <b>Syntax</b>             | <pre>void EthTSyn_SetTransmissionMode (     uint8 CtrlIdx,     EthTSyn_TransmissionModeType Mode )</pre> |                                  |
| <b>Service ID [hex]</b>   | 0x05                                                                                                     |                                  |
| <b>Sync/Async</b>         | Synchronous                                                                                              |                                  |
| <b>Reentrancy</b>         | Non Reentrant                                                                                            |                                  |
| <b>Parameters (in)</b>    | CtrlIdx                                                                                                  | Index of the Ethernet controller |
|                           | Mode                                                                                                     | ETHTSYN_TX_OFF ETHTSYN_TX_ON     |
| <b>Parameters (inout)</b> | None                                                                                                     |                                  |
| <b>Parameters (out)</b>   | None                                                                                                     |                                  |
| <b>Return value</b>       | None                                                                                                     |                                  |
| <b>Description</b>        | This API is used to turn on and off the TX capabilities of the EthTSyn.                                  |                                  |
| <b>Available via</b>      | EthTSyn.h                                                                                                |                                  |

]

#### [SWS\_EthTSyn\_00172]

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#), [SRS\\_BSW\\_00386](#), [SRS\\_BSW\\_00452](#)

[The function [EthTSyn\\_SetTransmissionMode](#) shall inform the DET, if development error detection is enabled (EthTSynDevErrorDetect (ECUC\_EthTSyn\_00002 : ) is set to TRUE) and if function call has failed because of the following reasons:

- CtrlIdx is invalid (ETHTSYN\_E\_CTRL\_IDX)
- Mode is invalid (ETHTSYN\_E\_PARAM)

]

#### 8.1.3.4 EthTSyn\_SetProtocolParam

##### [SWS\_EthTSyn\_00330] Definition of API function EthTSyn\_SetProtocolParam

Upstream requirements: [RS\\_TS\\_20069](#)

|                           |                                                                                                                                                                                                                     |                                                     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Service Name</b>       | EthTSyn_SetProtocolParam                                                                                                                                                                                            |                                                     |
| <b>Syntax</b>             | <pre>Std_ReturnType EthTSyn_SetProtocolParam (     StbM_SynchronizedTimeBaseType timeBaseId,     const StbM_ProtocolParamType* protocolParam )</pre>                                                                |                                                     |
| <b>Service ID [hex]</b>   | 0x0a                                                                                                                                                                                                                |                                                     |
| <b>Sync/Async</b>         | Synchronous                                                                                                                                                                                                         |                                                     |
| <b>Reentrancy</b>         | Non Reentrant                                                                                                                                                                                                       |                                                     |
| <b>Parameters (in)</b>    | timeBaseId                                                                                                                                                                                                          | ID of the synchronized time base                    |
|                           | protocolParam                                                                                                                                                                                                       | structure with Follow_Up information TLV parameters |
| <b>Parameters (inout)</b> | None                                                                                                                                                                                                                |                                                     |
| <b>Parameters (out)</b>   | None                                                                                                                                                                                                                |                                                     |
| <b>Return value</b>       | Std_ReturnType                                                                                                                                                                                                      | E_OK: successful<br>E_NOT_OK: failed                |
| <b>Description</b>        | This API is used to set FollowUp information TLV parameters of a Follow_Up message prior transmission. The API is called within StbM_SetBusProtocolParam which provides the content of the structure protocolParam. |                                                     |
| <b>Available via</b>      | EthTSyn.h                                                                                                                                                                                                           |                                                     |

##### [SWS\_EthTSyn\_00228]

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#), [SRS\\_BSW\\_00386](#), [SRS\\_BSW\\_00452](#)

[The function EthTSyn\_SetProtocolParam() shall inform the DET, if development error detection is enabled (EthTSynDevErrorDetect (ECUC\_EthTSyn\_00002 : ) is set to TRUE) and if function call has failed because of the following reasons:

- timeBaseId does not belong to a Time Base, which is mapped to a Time Domain with ID 0 ..127 in EthTSyn (Development Error: ETHTSYN\_E\_PARAM)
- protocolParam is NULL (Development Error: ETHTSYN\_E\_PARAM\_POINTER)

### 8.1.3.5 EthTSyn\_GetProtocolParam

#### [SWS\_EthTSyn\_00331] Definition of API function EthTSyn\_GetProtocolParam

Upstream requirements: [RS\\_TS\\_20069](#)

[

|                           |                                                                                                                                                |                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Service Name</b>       | EthTSyn_GetProtocolParam                                                                                                                       |                                                                  |
| <b>Syntax</b>             | <pre>Std_ReturnType EthTSyn_GetProtocolParam (     StbM_SynchronizedTimeBaseType timeBaseId,     StbM_ProtocolParamType* protocolParam )</pre> |                                                                  |
| <b>Service ID [hex]</b>   | 0x0b                                                                                                                                           |                                                                  |
| <b>Sync/Async</b>         | Synchronous                                                                                                                                    |                                                                  |
| <b>Reentrancy</b>         | Reentrant                                                                                                                                      |                                                                  |
| <b>Parameters (in)</b>    | timeBaseId                                                                                                                                     | ID of the synchronized time base                                 |
| <b>Parameters (inout)</b> | None                                                                                                                                           |                                                                  |
| <b>Parameters (out)</b>   | protocolParam                                                                                                                                  | structure to store received Follow_Up information TLV parameters |
| <b>Return value</b>       | Std_ReturnType                                                                                                                                 | E_OK: successful<br>E_NOT_OK: failed                             |
| <b>Description</b>        | This API is used to read FollowUp information TLV parameters from received Follow_Up message.                                                  |                                                                  |
| <b>Available via</b>      | EthTSyn.h                                                                                                                                      |                                                                  |

]

#### [SWS\_EthTSyn\_00229]

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#), [SRS\\_BSW\\_00386](#), [SRS\\_BSW\\_00452](#)

[The function EthTSyn\_GetProtocolParam() shall inform the DET, if development error detection is enabled (EthTSynDevErrorDetect (ECUC\_EthTSyn\_00002 : ) is set to TRUE) and if function call has failed because of the following reasons:

- timeBaseId does not belong to a Time Base, which is mapped to a Time Domain with ID 0 ..127 in EthTSyn (Development Error: ETHTSYN\_E\_PARAM)
- protocolParam is NULL (Development Error: ETHTSYN\_E\_PARAM\_POINTER)

]

### 8.1.4 Call-back notifications

This is a list of functions provided for other modules.

#### 8.1.4.1 EthTSyn\_RxIndication

##### [SWS\_EthTSyn\_00040] Definition of callback function EthTSyn\_RxIndication

Upstream requirements: [RS\\_TS\\_20048](#)

|                           |                                                                                                   |                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Service Name</b>       | EthTSyn_RxIndication                                                                              |                                                                                                                                                   |
| <b>Syntax</b>             | <pre>void EthTSyn_RxIndication (     PduIdType RxPduId,     const PduInfoType* PduInfoPtr )</pre> |                                                                                                                                                   |
| <b>Service ID [hex]</b>   | 0x42                                                                                              |                                                                                                                                                   |
| <b>Sync/Async</b>         | Synchronous                                                                                       |                                                                                                                                                   |
| <b>Reentrancy</b>         | Reentrant for different PduIds. Non reentrant for the same PduId.                                 |                                                                                                                                                   |
| <b>Parameters (in)</b>    | RxPduId                                                                                           | ID of the received PDU.                                                                                                                           |
|                           | PduInfoPtr                                                                                        | Contains the length (SduLength) of the received PDU, a pointer to a buffer (SduDataPtr) containing the PDU, and the MetaData related to this PDU. |
| <b>Parameters (inout)</b> | None                                                                                              |                                                                                                                                                   |
| <b>Parameters (out)</b>   | None                                                                                              |                                                                                                                                                   |
| <b>Return value</b>       | None                                                                                              |                                                                                                                                                   |
| <b>Description</b>        | Indication of a received PDU from a lower layer communication interface module.                   |                                                                                                                                                   |
| <b>Available via</b>      | EthTSyn.h                                                                                         |                                                                                                                                                   |

##### [SWS\_EthTSyn\_00041]

Upstream requirements: [SRS\\_BSW\\_00337](#), [SRS\\_BSW\\_00323](#)

[The callback function EthTSyn\_RxIndication() shall inform the DET, if development error detection is enabled (EthTSynDevErrorDetect (ECUC\_EthTSyn\_00002 : ) is set to TRUE) and if the function call has failed because of the following reasons:

- [RxPduId](#) is invalid ([ETHTSYN\\_E\\_PARAM](#))
- [PduInfoPtr](#) is invalid ([ETHTSYN\\_E\\_PARAM\\_POINTER](#))

### 8.1.4.2 EthTSyn\_TxConfirmation

#### [SWS\_EthTSyn\_00042] Definition of callback function EthTSyn\_TxConfirmation

Upstream requirements: [RS\\_TS\\_20048](#)

|                           |                                                                                                                      |                                                                          |
|---------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>Service Name</b>       | EthTSyn_TxConfirmation                                                                                               |                                                                          |
| <b>Syntax</b>             | <pre>void EthTSyn_TxConfirmation (     PduIdType TxPduId,     Std_ReturnType result )</pre>                          |                                                                          |
| <b>Service ID [hex]</b>   | 0x40                                                                                                                 |                                                                          |
| <b>Sync/Async</b>         | Synchronous                                                                                                          |                                                                          |
| <b>Reentrancy</b>         | Reentrant for different PduIds. Non reentrant for the same PduId.                                                    |                                                                          |
| <b>Parameters (in)</b>    | TxPduId                                                                                                              | ID of the PDU that has been transmitted.                                 |
|                           | result                                                                                                               | E_OK: The PDU was transmitted. E_NOT_OK: Transmission of the PDU failed. |
| <b>Parameters (inout)</b> | None                                                                                                                 |                                                                          |
| <b>Parameters (out)</b>   | None                                                                                                                 |                                                                          |
| <b>Return value</b>       | None                                                                                                                 |                                                                          |
| <b>Description</b>        | The lower layer communication interface module confirms the transmission of a PDU, or the failure to transmit a PDU. |                                                                          |
| <b>Available via</b>      | EthTSyn.h                                                                                                            |                                                                          |

#### [SWS\_EthTSyn\_00175]

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#)

[The function EthTSyn\_TxConfirmation() shall inform the DET, if development error detection is enabled (EthTSynDevErrorDetect (ECUC\_EthTSyn\_00002 : ) is set to TRUE) and if function call has failed because of the following reasons:

- TxPduId is invalid ([ETHTSYN\\_E\\_PARAM](#))

#### [SWS\_EthTSyn\_00176]

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#)

[On invocation of EthTSyn\_TxConfirmation() with parameter 'Result' equal to E\_NOT\_OK the process of collection of synchronized time distribution shall be aborted and all intermediate result variables shall be reset to default value.]

#### 8.1.4.3 EthTSyn\_TrcvLinkStateChg

##### [SWS\_EthTSyn\_00043] Definition of callback function EthTSyn\_TrcvLinkStateChg

Upstream requirements: [RS\\_TS\\_20048](#)

[

|                           |                                                                                                                     |                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <b>Service Name</b>       | EthTSyn_TrcvLinkStateChg                                                                                            |                                                   |
| <b>Syntax</b>             | <pre>void EthTSyn_TrcvLinkStateChg (<br/>    uint8 CtrlIdx,<br/>    EthTrcv_LinkStateType TrcvLinkState<br/>)</pre> |                                                   |
| <b>Service ID [hex]</b>   | 0x08                                                                                                                |                                                   |
| <b>Sync/Async</b>         | Synchronous                                                                                                         |                                                   |
| <b>Reentrancy</b>         | Non Reentrant                                                                                                       |                                                   |
| <b>Parameters (in)</b>    | CtrlIdx                                                                                                             | Index of the Ethernet controller                  |
|                           | TrcvLinkState                                                                                                       | ETHTRCV_LINK_STATE_DOWN ETHTRCV_LINK_STATE_ACTIVE |
| <b>Parameters (inout)</b> | None                                                                                                                |                                                   |
| <b>Parameters (out)</b>   | None                                                                                                                |                                                   |
| <b>Return value</b>       | None                                                                                                                |                                                   |
| <b>Description</b>        | Allows resetting state machine in case of unexpected Link loss to avoid inconsistent Sync and Follow_Up sequences   |                                                   |
| <b>Available via</b>      | EthTSyn.h                                                                                                           |                                                   |

]

##### [SWS\_EthTSyn\_00174]

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#)

[If function [EthTSyn\\_TrcvLinkStateChg](#) is called with a [CtrlIdx](#) not referenced by the [EthTSyn](#), then the [EthTSyn](#) shall ignore the call.

]

#### 8.1.4.4 EthTSyn\_IcvGenerationIndication

##### [SWS\_EthTSyn\_91001] Definition of API function EthTSyn\_IcvGenerationIndication

Upstream requirements: [RS\\_TS\\_20072](#)

[

|                         |                                                                                                                |  |
|-------------------------|----------------------------------------------------------------------------------------------------------------|--|
| <b>Service Name</b>     | EthTSyn_IcvGenerationIndication                                                                                |  |
| <b>Syntax</b>           | <pre>void EthTSyn_IcvGenerationIndication (<br/>    uint32 jobId,<br/>    Crypto_ResultType result<br/>)</pre> |  |
| <b>Service ID [hex]</b> | 0x0c                                                                                                           |  |

▽



|                           |                                                                                      |                                                     |
|---------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Sync/Async</b>         | Synchronous                                                                          |                                                     |
| <b>Reentrancy</b>         | Reentrant                                                                            |                                                     |
| <b>Parameters (in)</b>    | jobId                                                                                | JobID of the operation that caused the callback.    |
|                           | result                                                                               | Contains the result of the cryptographic operation. |
| <b>Parameters (inout)</b> | None                                                                                 |                                                     |
| <b>Parameters (out)</b>   | None                                                                                 |                                                     |
| <b>Return value</b>       | None                                                                                 |                                                     |
| <b>Description</b>        | By this API service the EthTSyn gets an indication and the result of ICV generation. |                                                     |
| <b>Available via</b>      | EthTSyn.h                                                                            |                                                     |

]

### [SWS\_EthTSyn\_00259]

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#)

[The function EthTSyn\_IcvGenerationIndication() shall inform the DET, if development error detection is enabled ([EthTSynDevErrorDetect](#) is set to TRUE) and if function call has failed because of the following reasons:

- jobId is invalid (ETHTSYN\_E\_PARAM)

]

### 8.1.4.5 EthTSyn\_IcvVerificationIndication

#### [SWS\_EthTSyn\_91002] Definition of API function EthTSyn\_IcvVerificationIndication

Upstream requirements: [RS\\_TS\\_20072](#)

[

|                           |                                                                                                      |                                                     |
|---------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Service Name</b>       | EthTSyn_IcvVerificationIndication                                                                    |                                                     |
| <b>Syntax</b>             | <pre>void EthTSyn_IcvVerificationIndication (     uint32 jobId,     Crypto_ResultType result )</pre> |                                                     |
| <b>Service ID [hex]</b>   | 0x0d                                                                                                 |                                                     |
| <b>Sync/Async</b>         | Synchronous                                                                                          |                                                     |
| <b>Reentrancy</b>         | Reentrant                                                                                            |                                                     |
| <b>Parameters (in)</b>    | jobId                                                                                                | JobID of the operation that caused the callback.    |
|                           | result                                                                                               | Contains the result of the cryptographic operation. |
| <b>Parameters (inout)</b> | None                                                                                                 |                                                     |
| <b>Parameters (out)</b>   | None                                                                                                 |                                                     |
| <b>Return value</b>       | None                                                                                                 |                                                     |
| <b>Description</b>        | By this API service the EthTSyn gets an indication and the result of ICV verification.               |                                                     |
| <b>Available via</b>      | EthTSyn.h                                                                                            |                                                     |

]

**[SWS\_EthTSyn\_00260]**

Upstream requirements: [SRS\\_BSW\\_00323](#), [SRS\\_BSW\\_00337](#)

[The function EthTSyn\_IcvVerificationIndication() shall inform the DET, if development error detection is enabled ([EthTSynDevErrorDetect](#) is set to TRUE) and if function call has failed because of the following reasons:

- jobId is invalid (ETHTSYN\_E\_PARAM)

]

**8.1.5 Scheduled functions**

The Basic Software Scheduler directly calls these functions. The following functions shall have no return value and no parameters. All functions shall be non-reentrant.

**8.1.5.1 EthTSyn\_MainFunction****[SWS\_EthTSyn\_00044] Definition of scheduled function EthTSyn\_MainFunction**

Upstream requirements: [RS\\_TS\\_20048](#)

[

|                         |                                                                                    |
|-------------------------|------------------------------------------------------------------------------------|
| <b>Service Name</b>     | EthTSyn_MainFunction                                                               |
| <b>Syntax</b>           | void EthTSyn_MainFunction (<br>void<br>)                                           |
| <b>Service ID [hex]</b> | 0x09                                                                               |
| <b>Description</b>      | Main function for cyclic call / resp. Sync, Follow_Up and Pdelay_Req transmissions |
| <b>Available via</b>    | EthTSyn_SchM.h                                                                     |

]

**[SWS\_EthTSyn\_00045]**

Upstream requirements: [RS\\_TS\\_20048](#)

[The frequency of invocations of [EthTSyn\\_MainFunction](#) is determined by the configuration parameter EthTSynMainFunctionPeriod (ECUC\_EthTSyn\_00012 : ).]

**8.1.6 Expected Interfaces**

In this section, all interfaces required from other modules are listed.

**8.1.6.1 Mandatory Interfaces**

There are no mandatory interfaces defined.

### 8.1.6.2 Optional Interfaces

This section defines all interfaces that are required to fulfill an optional functionality of the module.

#### [SWS\_EthTSyn\_00047] Definition of optional interfaces requested by module EthTSyn

Upstream requirements: [RS\\_TS\\_20048](#), [RS\\_TS\\_20059](#)

| API Function                   | Header File     | Description                                                                                                                                                                                                                                                                                                  |
|--------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Crc_CalculateCRC8H2F           | Crc.h           | This service makes a CRC8 calculation with the Polynomial 0x2F on Crc_Length                                                                                                                                                                                                                                 |
| Csm_MacGenerate                | Csm.h           | Uses the given data to perform a MAC generation and stores the MAC in the memory location pointed to by the MAC pointer.                                                                                                                                                                                     |
| Csm_MacVerify                  | Csm.h           | Verifies the given MAC by comparing if the MAC is generated with the given data.                                                                                                                                                                                                                             |
| Csm_SignatureGenerate          | Csm.h           | Uses the given data to perform the signature calculation and stores the signature in the memory location pointed by the result pointer.                                                                                                                                                                      |
| Csm_SignatureVerify            | Csm.h           | Verifies the given signature by checking if it was generated with the given data.                                                                                                                                                                                                                            |
| Det_ReportError                | Det.h           | Service to report development errors.                                                                                                                                                                                                                                                                        |
| Det_ReportRuntimeError         | Det.h           | Service to report runtime errors. If a callout has been configured then this callout shall be called.                                                                                                                                                                                                        |
| EthIf_EnableEgressTimeStamp    | EthIf.h         | Activates egress time stamping on a dedicated message object. Some HW does store once the egress time stamp marker and some HW needs it always before transmission. There will be no "disable" functionality, due to the fact, that the message type is always "time stamped" by network design.             |
| EthIf_GetEgressTimeStamp       | EthIf.h         | Reads back the egress time stamp on a dedicated message object. It must be called within the Tx Confirmation() function.                                                                                                                                                                                     |
| EthIf_GetTxMgmtObject          | EthIf.h         | Request the MgmtObject of the (in this context) unique BufIdx.                                                                                                                                                                                                                                               |
| EthIf_SetSwitchMgmtInfo        | EthIf.h         | Provides additional management information along to an Ethernet frame that requires special treatment within the Switch. For direct data provision, it has to be called before the transmit request is called. For indirect data provision, it can also be called in the context of the TriggerTransmit API. |
| EthIf_SwitchEnableTimeStamping | EthIf.h         | Activates egress time stamping on a dedicated message object, addressed addressed by the PdIdx which is associated with an Ethernet controller index and an egress queue.                                                                                                                                    |
| IdsM_ReportSecurityEvent       | IdsM.h          | This API is the interface to report security events to the IdsM.                                                                                                                                                                                                                                             |
| LSduR_EthTSynTransmit (draft)  | LSduR_EthTSyn.h | Requests transmission of a PDU.                                                                                                                                                                                                                                                                              |
| StbM_BusSetGlobalTime          | StbM.h          | Allows the Time Base Provider Modules to forward the Rx Time Tuple to the StbM.                                                                                                                                                                                                                              |



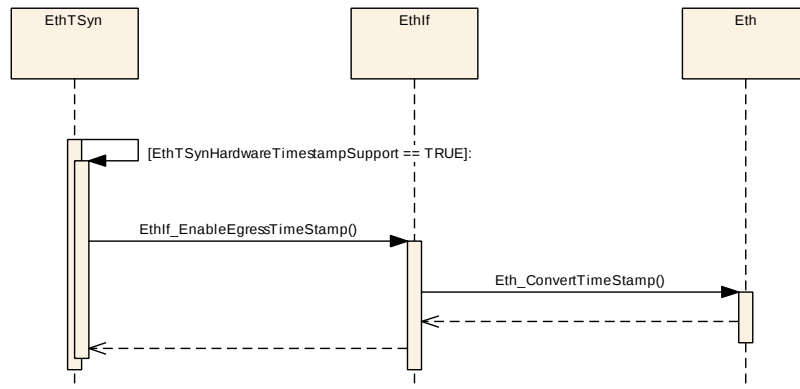


| API Function                    | Header File    | Description                                                                                                                                                                                                                                                                        |
|---------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| StbM_EthSetMasterTimingData     | StbM_EthTSyn.h | Provides Ethernet Timesyn module specific data for a Time Master to the StbM.                                                                                                                                                                                                      |
| StbM_EthSetPdelayInitiatorData  | StbM_EthTSyn.h | –                                                                                                                                                                                                                                                                                  |
| StbM_EthSetPdelayResponderData  | StbM_EthTSyn.h | –                                                                                                                                                                                                                                                                                  |
| StbM_EthSetSlaveTimingData      | StbM_EthTSyn.h | Allows the EthTSyn Module to forward Ethernet specific details to the StbM.                                                                                                                                                                                                        |
| StbM_GetCurrentTime             | StbM.h         | Returns a time tuple (Local time, Global time and Timebase status) and user data details Note: This API shall be called with locked interrupts / within an Exclusive Area to prevent interruption (i.e., the risk that the time stamp is outdated on return of the function call). |
| StbM_GetCurrentVirtualLocalTime | StbM.h         | Returns the Virtual Local Time of the referenced Time Base.                                                                                                                                                                                                                        |
| StbM_GetRxFreshness             | StbM.h         | This interface is used by the StbM to query the current freshness value.                                                                                                                                                                                                           |
| StbM_GetTimeBaseStatus          | StbM.h         | Returns detailed status information for a Synchronized (or Pure Local) Time Base.                                                                                                                                                                                                  |
| StbM_GetTimeBaseUpdateCounter   | StbM.h         | Allows the Timesync Modules to detect, whether a Time Base should be transmitted immediately in the subsequent <Bus>TSyn_MainFunction() cycle.                                                                                                                                     |
| StbM_GetTxFreshness             | StbM.h         | This API returns the freshness value from the Most Significant Bits in the first byte, of the Freshness array, in big endian format.                                                                                                                                               |
| StbM_GetTxFreshnessTruncData    | StbM.h         | This interface is used by the StbM to obtain the current freshness value. The interface function provides also the truncated freshness transmitted in the secured time sync message.                                                                                               |
| StbM_SPduTxConfirmation         | StbM.h         | This interface is used by the StbM to indicate that the Secured Time Synchronization Message has been initiated for transmission.                                                                                                                                                  |

]

## 9 Sequence diagrams

### 9.1 EthIf\_EnableEgressTimeStamp



**Figure 9.1: EnableEgressTimeStamp**

## 9.2 Time Synchronization Sequence

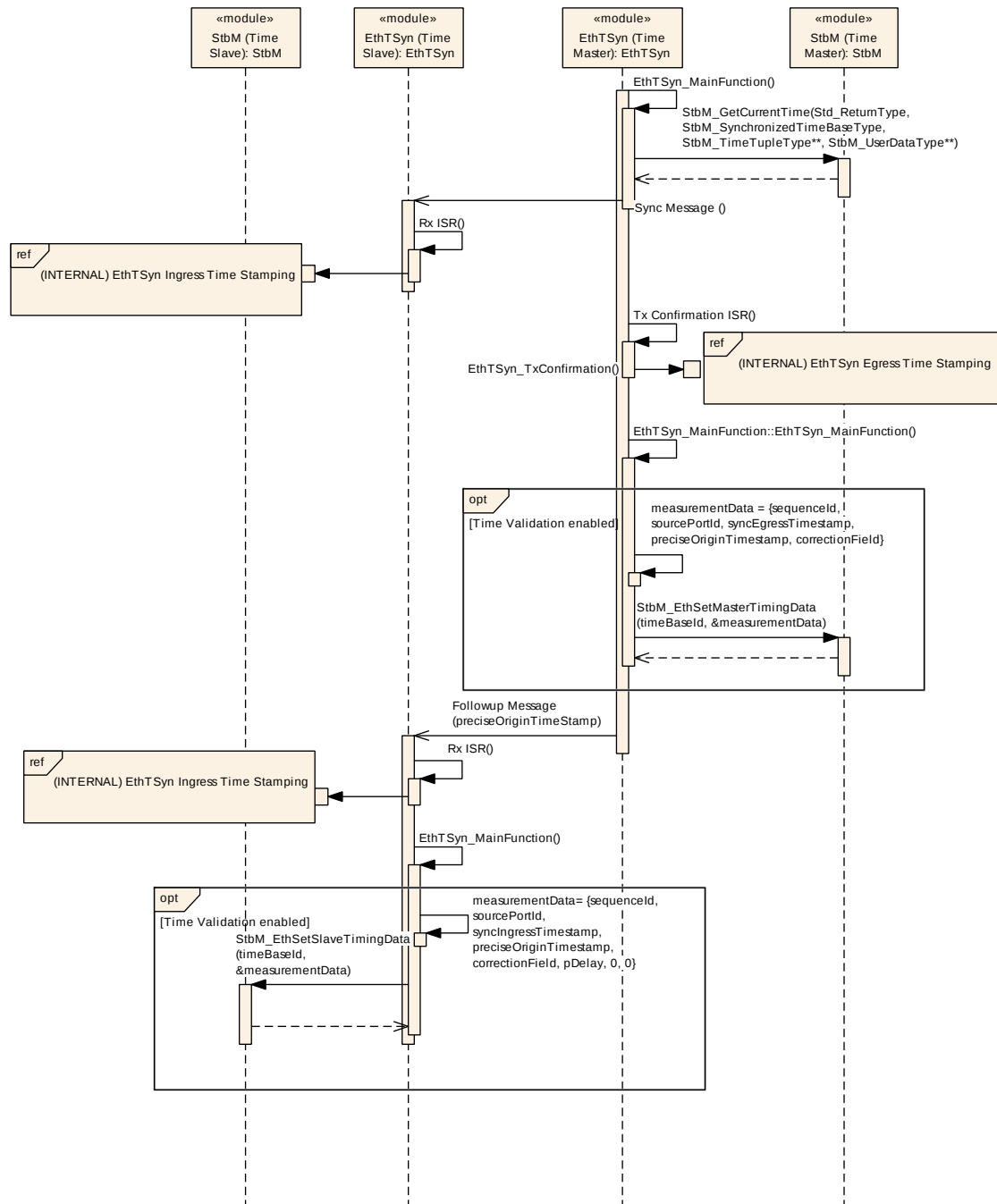


Figure 9.2: : Time Synchronization Sequence

### 9.3 Pdelay Measurement Sequence

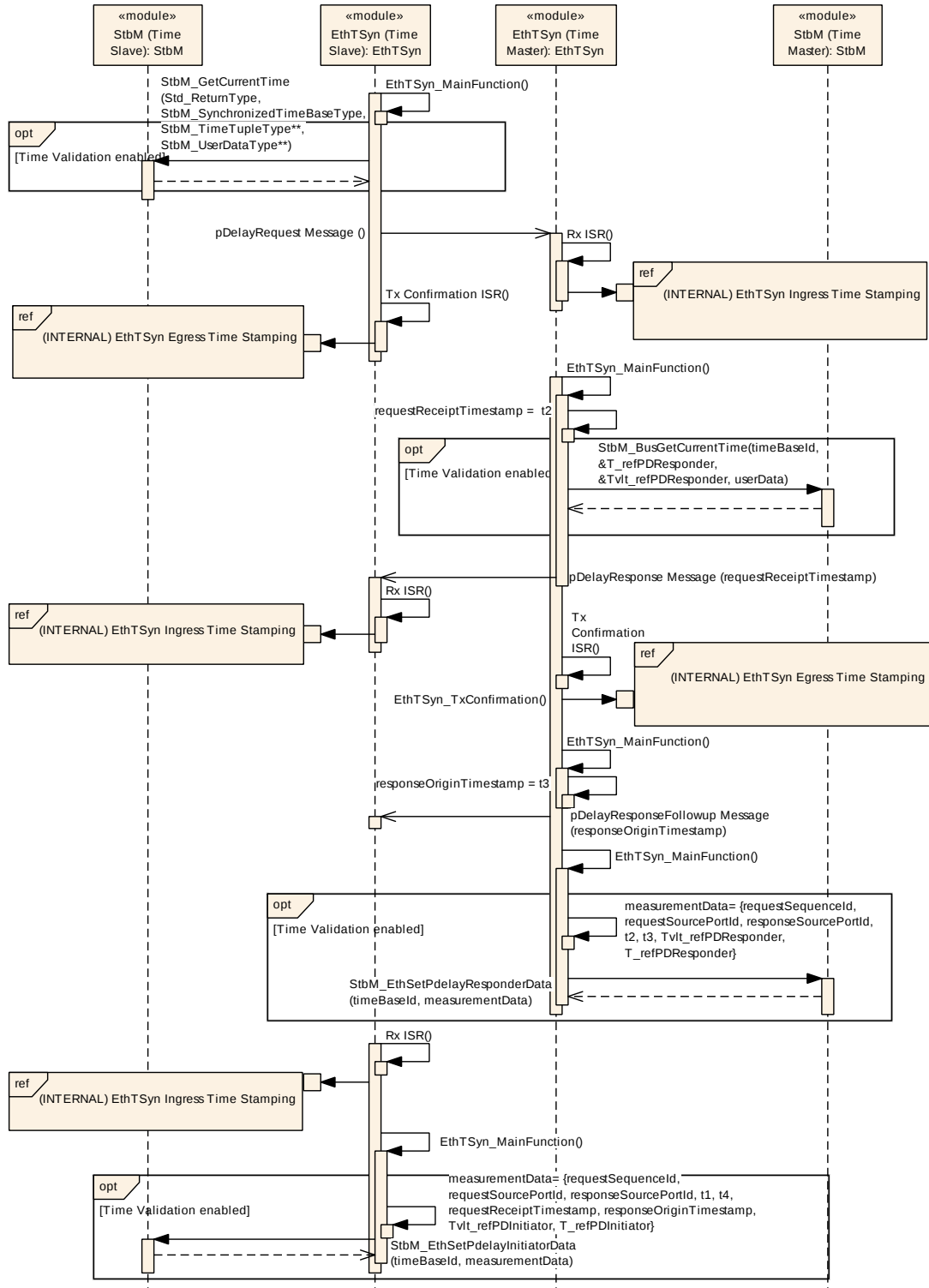


Figure 9.3: : Pdelay Sequence

## 9.4 EthTSyn Egress Timestamping

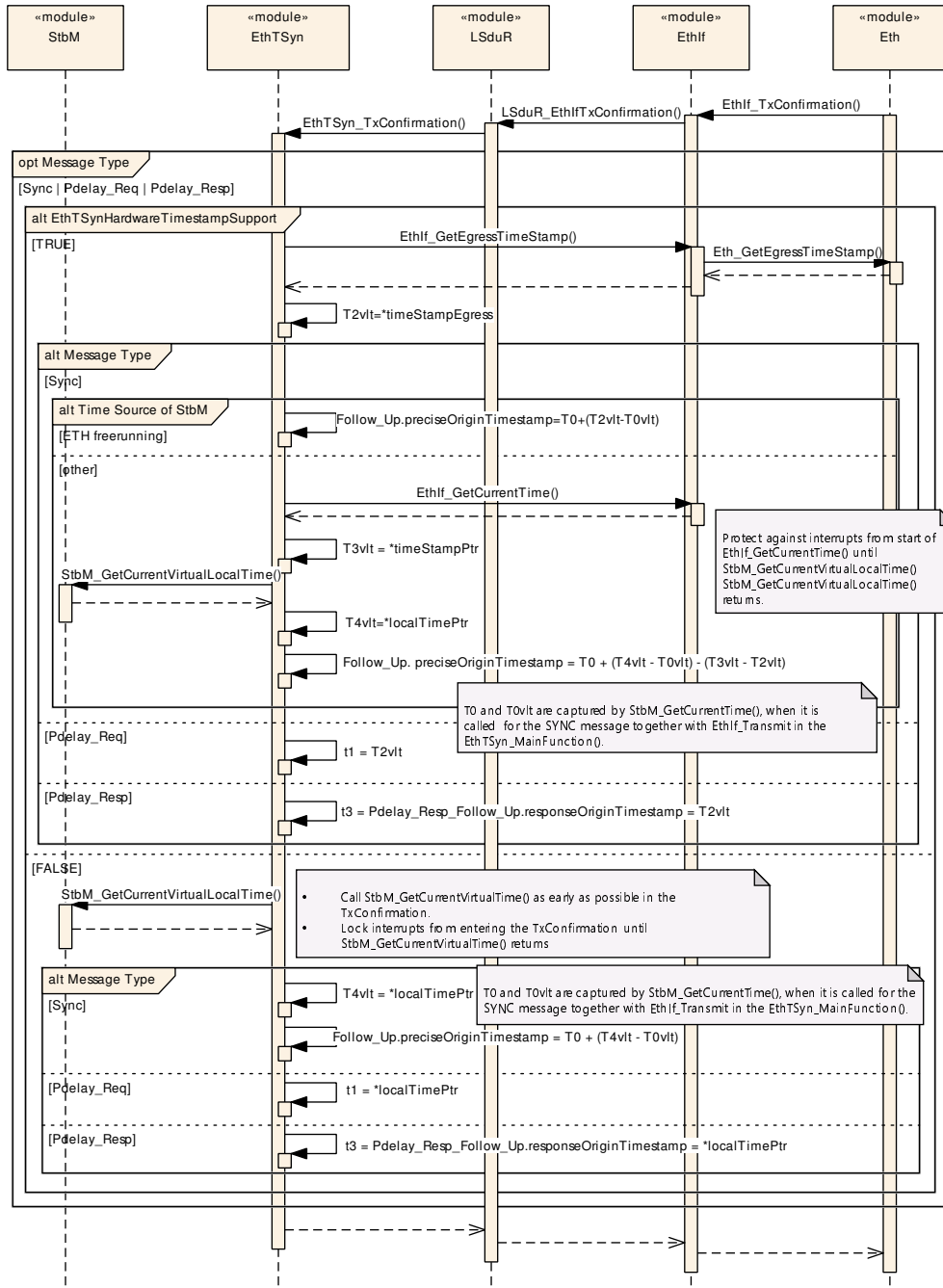


Figure 9.4: EthTSynEgressTimestamping

## 9.5 EthTSyn Ingress Timestamping

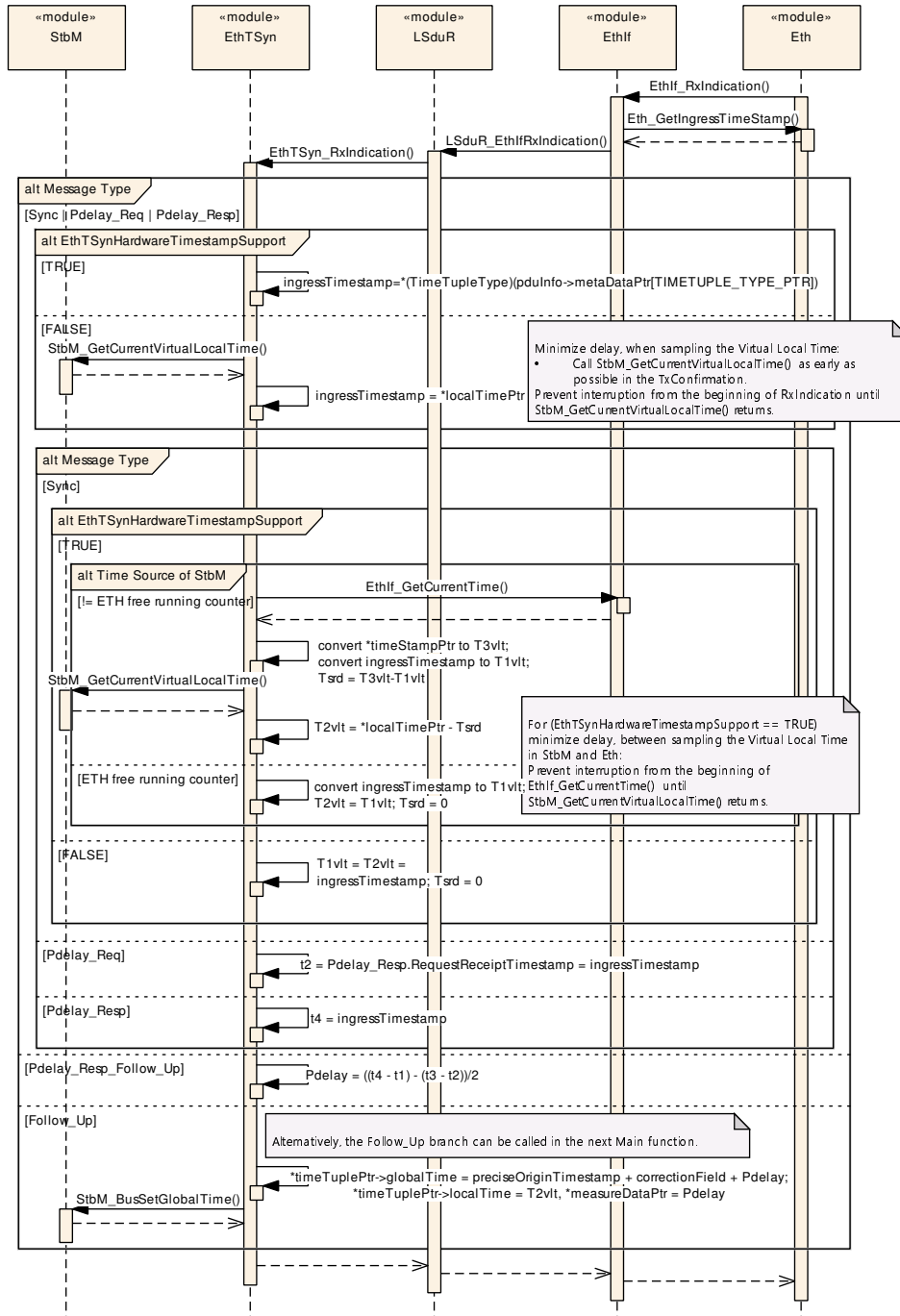


Figure 9.5: EthTSyn Ingress Timestamping

## 9.6 Time measurement with Switches

### 9.6.1 Time Aware Bridge with GTM as Management CPU - Tx

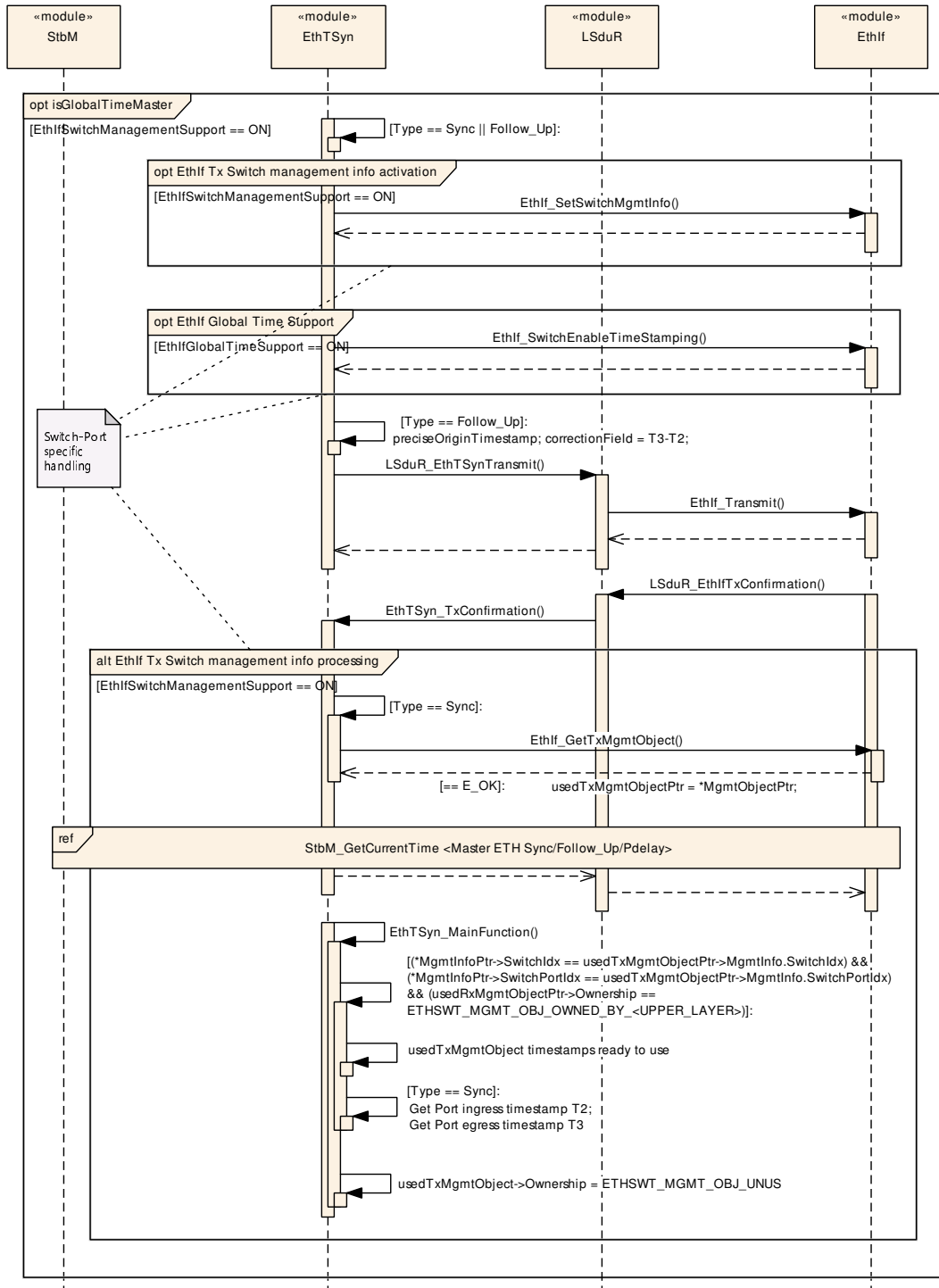


Figure 9.6: Time Aware Bridge with GTM as Management CPU Sync\_Up Follow\_Up Tx

## 9.6.2 Time Aware Bridge without GTM as Management CPU - Tx

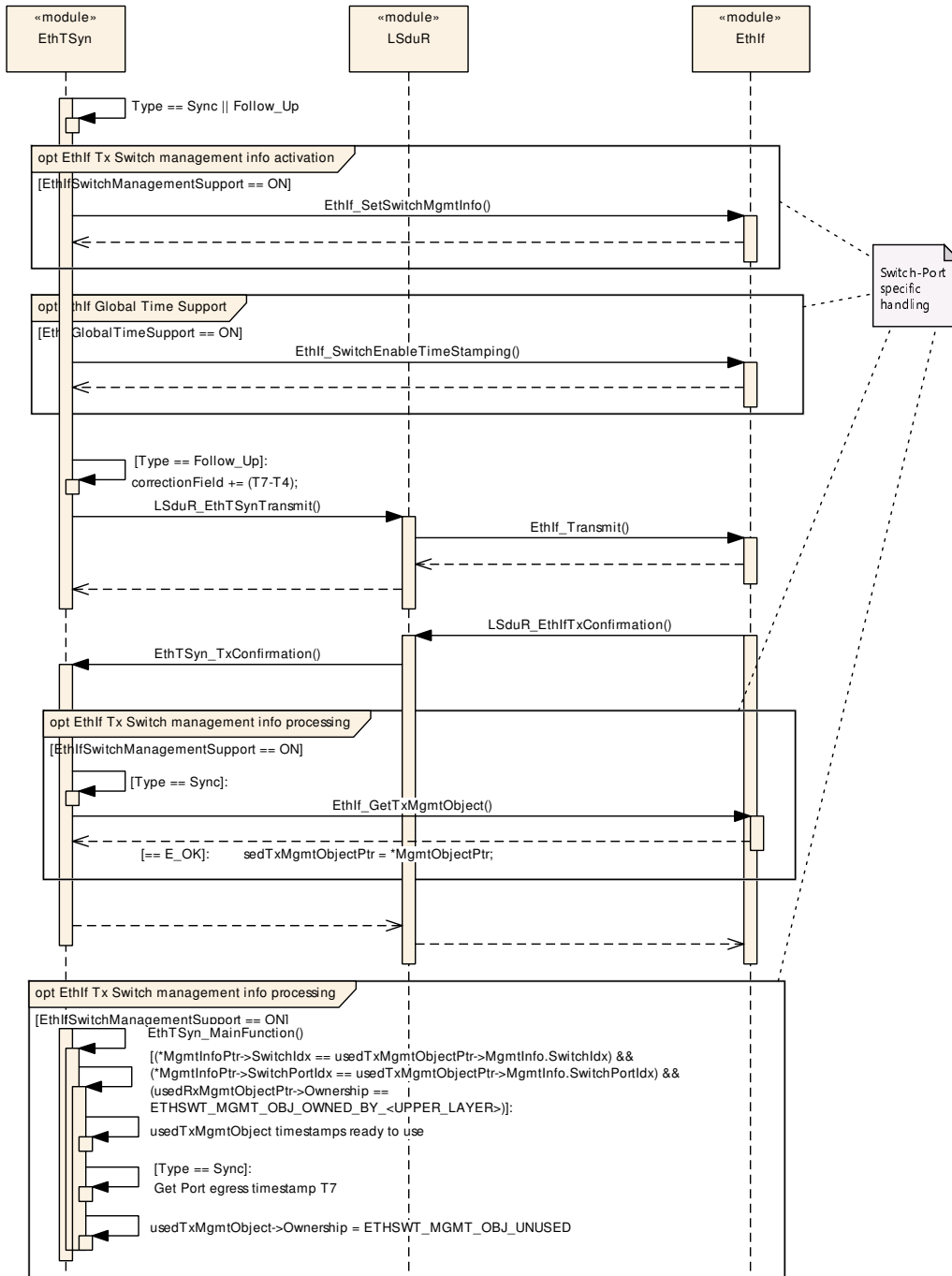


Figure 9.7: EthTSyn\_SwitchWithoutGTM\_Sync\_Follow\_Up\_Tx

### 9.6.3 Time Aware Bridge without GTM as Management CPU - Rx

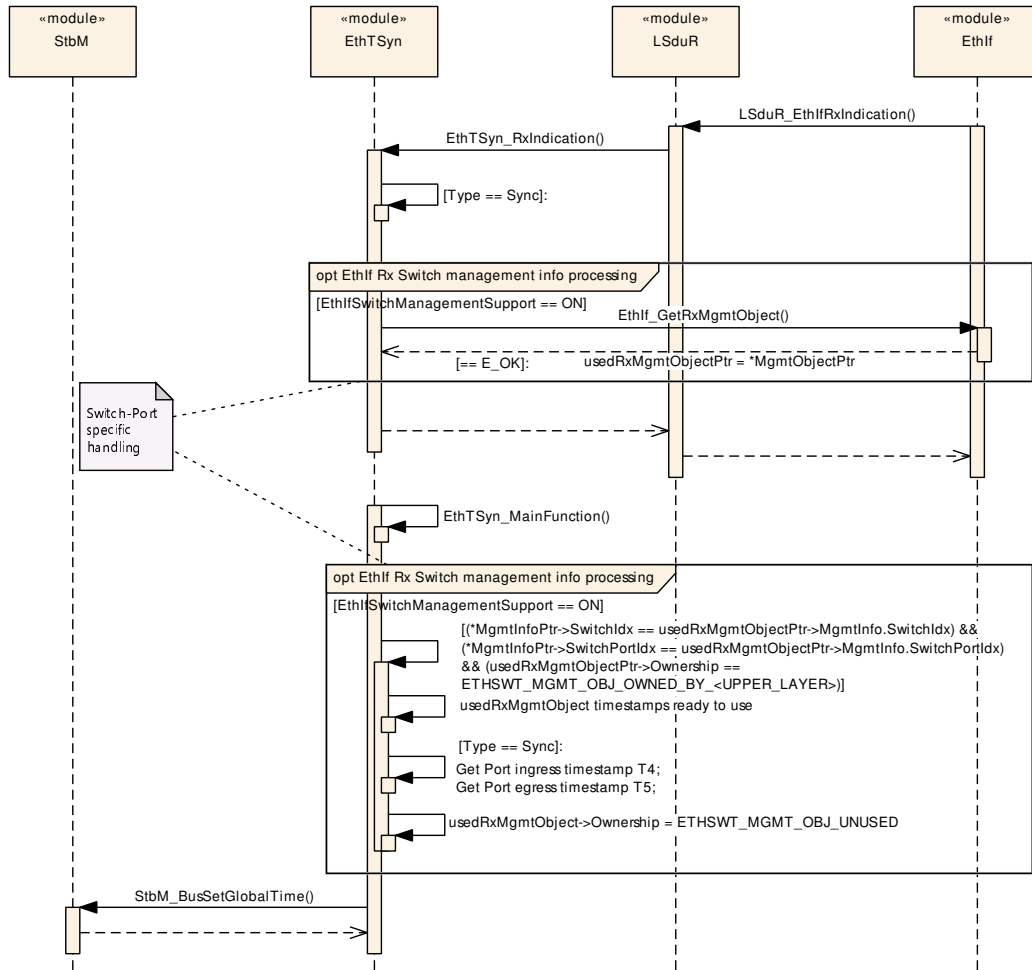


Figure 9.8: EthTSyn\_SwitchWithoutGTM\_Sync\_Follow\_Up\_Rx

## 9.7 Secure Time Synchronization Sequence

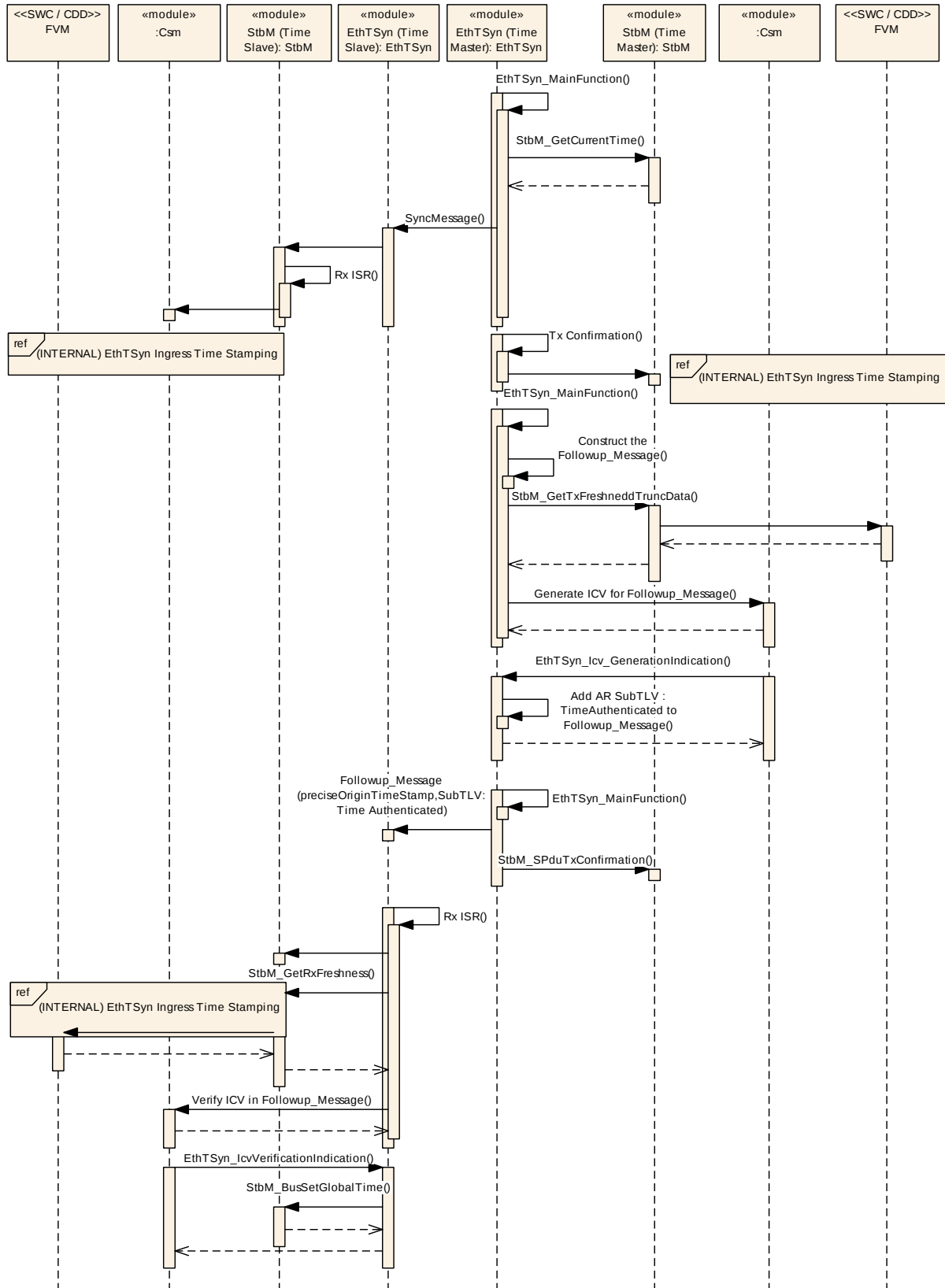


Figure 9.9: Secure Time Synchronization Sequence

## 10 Configuration specification

In general, this chapter defines configuration parameters and their clustering into containers. In order to support the specification chapter [10.1](#) describes fundamentals. It also specifies a template (table) you shall use for the parameter specification. We intend to leave chapter [10.1](#) in the specification to guarantee comprehension.

Chapter [10.2](#) specifies the structure (containers) and the parameters of the module EthTSyn.

Chapter [10.5](#) specifies published information of the module EthTSyn.

### 10.1 How to read this chapter

For details refer to [\[3\]](#) Chapter 10.1 *“Introduction to configuration specification”*.

#### [SWS\_EthTSyn\_00051]

*Upstream requirements:* [RS\\_TS\\_20052](#), [RS\\_TS\\_20053](#), [RS\\_TS\\_20054](#)

[The EthTSyn module shall support the configuration for Time Master, Time Slave and Time Gateway.]

### 10.2 Containers and configuration parameters

The following sections summarize all configuration parameters of the Global Time Synchronization over Ethernet. The detailed meaning of the parameters is described in chapters [Chapter 7](#) and [Chapter 8](#).

The module supports different post-build variants (previously known as post-build selectable configuration sets), but not post-build loadable configuration.

## 10.2.1 EthTSyn

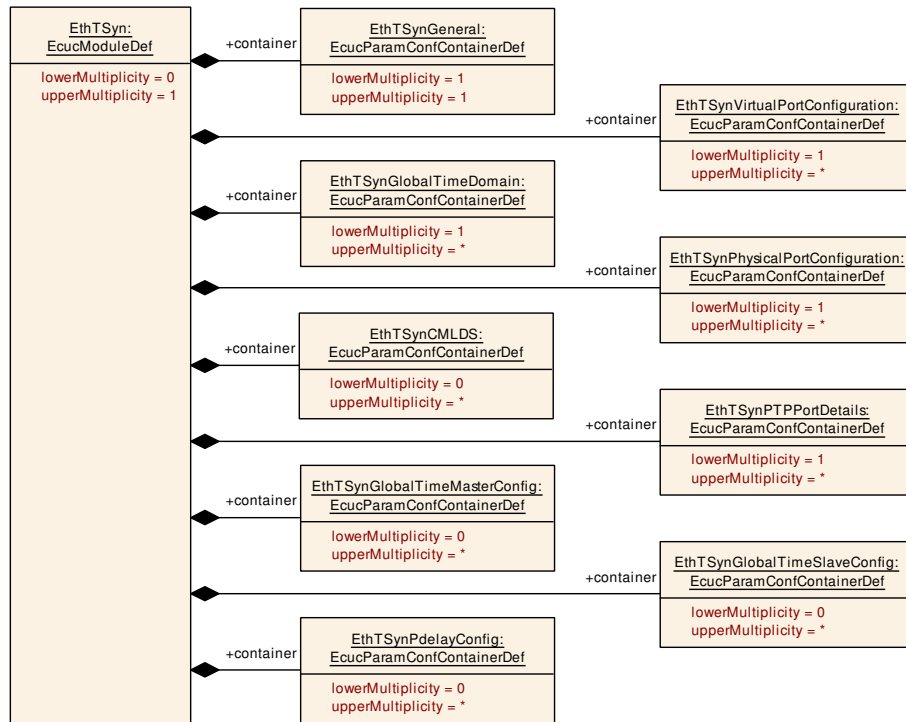
### [ECUC\_EthTSyn\_00001] Definition of EcucModuleDef EthTSyn [

|                                   |                                                                                                           |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Module Name</b>                | EthTSyn                                                                                                   |
| <b>Description</b>                | Configuration of the Timesync over Ethernet (EthTSyn) module with respect to global time synchronization. |
| <b>Post-Build Variant Support</b> | true                                                                                                      |
| <b>Supported Config Variants</b>  | VARIANT-PRE-COMPILE                                                                                       |

| Included Containers                              |              |                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Container Name                                   | Multiplicity | Dependency                                                                                                                                                                                                                                                                                                                                                  |
| <a href="#">EthTSynCMLDS</a>                     | 0..*         | Configuration of the Common Mean Link Delay Service (CMLDS).<br>There is at most one instance of the CMLDS per physical port. For each physical port the CMLDS uses a single virtual port.                                                                                                                                                                  |
| <a href="#">EthTSynGeneral</a>                   | 1            | This container holds the general parameters of the Ethernet specific timesync module (EthTSyn).                                                                                                                                                                                                                                                             |
| <a href="#">EthTSynGlobalTimeDomain</a>          | 1..*         | This represents a global time domain on Ethernet. The EthTSyn module can manage several global time domains. Only one container shall be configured per global time domain ID. If the EthTSyn exists it is assumed that at least one global time domain exists.                                                                                             |
| <a href="#">EthTSynGlobalTimeMasterConfig</a>    | 0..*         | Configuration of a global-time master.<br>The exact role of the port is defined by EthTSynPortRole. A global-time master may or may not exist on the configured ECU. Each global-time domain may have multiple ports in the time master role (see Time Gateway) to e.g. relay global-time from a global time slave port.                                    |
| <a href="#">EthTSynGlobalTimeSlaveConfig</a>     | 0..*         | Configuration of a global-time slave.<br>The exact role of the port is defined by EthTSynPortRole. A TIME_SLAVE port will exist on every configured ECU, except potentially on the SystemWideGlobalTimeMaster. Each global-time domain should have at least one port of one ECU in the TIME_MASTER role and one port of another ECU in the TIME_SLAVE role. |
| <a href="#">EthTSynPTPPortDetails</a>            | 1..*         | Configuration of a PTP Port.<br>The same configuration can be used by multiple PTP ports through referencing this configuration.                                                                                                                                                                                                                            |
| <a href="#">EthTSynPdelayConfig</a>              | 0..*         | Configuration of cyclic propagation delay measurement. This can be used by either a PTP port or the CMLDS.                                                                                                                                                                                                                                                  |
| <a href="#">EthTSynPhysicalPortConfiguration</a> | 1..*         | Configuration of a physical port.<br>The same configuration can be used by multiple physical ports through referencing this configuration.                                                                                                                                                                                                                  |
| <a href="#">EthTSynVirtualPortConfiguration</a>  | 1..*         | Configuration of a virtual port (VLAN) associated with a single physical port and used by different PTP and/or CMLDS ports to transmit and receive PTP messages.                                                                                                                                                                                            |

]

Module dependencies of the EthTSyn is shown in [Figure 5.1](#).



**Figure 10.1: EthTSyn**

## 10.2.2 EthTSynGeneral

### [ECUC\_EthTSyn\_00003] Definition of EcucParamConfContainerDef EthTSynGeneral

|                          |                                                                                                 |
|--------------------------|-------------------------------------------------------------------------------------------------|
| Container Name           | EthTSynGeneral                                                                                  |
| Parent Container         | <a href="#">EthTSyn</a>                                                                         |
| Description              | This container holds the general parameters of the Ethernet specific timesync module (EthTSyn). |
| Multiplicity             | 1                                                                                               |
| Configuration Parameters |                                                                                                 |

| Included Parameters                                   |              |                                      |
|-------------------------------------------------------|--------------|--------------------------------------|
| Parameter Name                                        | Multiplicity | ECUC ID                              |
| <a href="#">EthTSynDevErrorDetect</a>                 | 1            | <a href="#">[ECUC_EthTSyn_00002]</a> |
| <a href="#">EthTSynEnableSecurityEventReporting</a>   | 1            | <a href="#">[ECUC_EthTSyn_00089]</a> |
| <a href="#">EthTSynMainFunctionPeriod</a>             | 1            | <a href="#">[ECUC_EthTSyn_00012]</a> |
| <a href="#">EthTSynMaxNumberOfTransmitRetries</a>     | 1            | <a href="#">[ECUC_EthTSyn_00120]</a> |
| <a href="#">EthTSynSwitchMgmtRxMessageBufferCount</a> | 0..1         | <a href="#">[ECUC_EthTSyn_00059]</a> |
| <a href="#">EthTSynTimeValidationSupport</a>          | 1            | <a href="#">[ECUC_EthTSyn_00081]</a> |
| <a href="#">EthTSynVersionInfoApi</a>                 | 1            | <a href="#">[ECUC_EthTSyn_00015]</a> |
| <a href="#">EthTSynEthIffFrameType</a>                | 1            | <a href="#">[ECUC_EthTSyn_00127]</a> |

| Included Containers                      |              |                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Container Name                           | Multiplicity | Dependency                                                                                                                                                                                                                                                                                                                                                       |
| <a href="#">EthTSynSecurityEventRefs</a> | 0..1         | Container for the references to IdsMEvent elements representing the security events that the EthTSyn module shall report to the IdsM in case the corresponding security related event occurs (and if EthTSynEnableSecurityEventReportings set to "true"). The standardized security events in this container can be extended by vendor-specific security events. |

]

### [ECUC\_EthTSyn\_00002] Definition of EcucBooleanParamDef EthTSynDevErrorDetect

|                           |                                                                                                                                                                            |   |              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynDevErrorDetect                                                                                                                                                      |   |              |
| Parent Container          | <a href="#">EthTSynGeneral</a>                                                                                                                                             |   |              |
| Description               | Switches the development error detection and notification on or off.<br>• true: detection and notification is enabled.<br>• false: detection and notification is disabled. |   |              |
| Multiplicity              | 1                                                                                                                                                                          |   |              |
| Type                      | EcucBooleanParamDef                                                                                                                                                        |   |              |
| Default value             | false                                                                                                                                                                      |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                      |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                           | X | All Variants |
|                           | Link time                                                                                                                                                                  | – |              |
|                           | Post-build time                                                                                                                                                            | – |              |





|            |  |
|------------|--|
| Dependency |  |
|------------|--|

]

### [ECUC\_EthTSyn\_00089] Definition of EcucBooleanParamDef EthTSynEnableSecurityEventReporting [

|                           |                                                                                                                      |   |              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynEnableSecurityEventReporting                                                                                  |   |              |
| Parent Container          | <a href="#">EthTSynGeneral</a>                                                                                       |   |              |
| Description               | Switches the reporting of security events to the IdsM: - true: reporting is enabled. - false: reporting is disabled. |   |              |
| Multiplicity              | 1                                                                                                                    |   |              |
| Type                      | EcucBooleanParamDef                                                                                                  |   |              |
| Default value             | false                                                                                                                |   |              |
| Post-Build Variant Value  | false                                                                                                                |   |              |
| Value Configuration Class | Pre-compile time                                                                                                     | X | All Variants |
|                           | Link time                                                                                                            | – |              |
|                           | Post-build time                                                                                                      | – |              |
| Dependency                |                                                                                                                      |   |              |

]

### [ECUC\_EthTSyn\_00012] Definition of EcucFloatParamDef EthTSynMainFunctionPeriod [

|                           |                                                                              |   |              |
|---------------------------|------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynMainFunctionPeriod                                                    |   |              |
| Parent Container          | <a href="#">EthTSynGeneral</a>                                               |   |              |
| Description               | Schedule period of the main function EthTSyn_MainFunction.<br>Unit: seconds. |   |              |
| Multiplicity              | 1                                                                            |   |              |
| Type                      | EcucFloatParamDef                                                            |   |              |
| Range                     | ]0 .. INF[                                                                   |   |              |
| Default value             | –                                                                            |   |              |
| Post-Build Variant Value  | false                                                                        |   |              |
| Value Configuration Class | Pre-compile time                                                             | X | All Variants |
|                           | Link time                                                                    | – |              |
|                           | Post-build time                                                              | – |              |
| Dependency                |                                                                              |   |              |

]

## [ECUC\_EthTSyn\_00120] Definition of EcucIntegerParamDef EthTSynMaxNumberOfTransmitRetries

Status: DRAFT

|                           |                                                                                                                                                                                                                |   |              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynMaxNumberOfTransmitRetries                                                                                                                                                                              |   |              |
| Parent Container          | <a href="#">EthTSynGeneral</a>                                                                                                                                                                                 |   |              |
| Description               | Provide the max number of re-transmission of frames in case of transmission failure(i.e., no buffer available or driver busy). A value of 0 will disable the retry mechanism.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity              | 1                                                                                                                                                                                                              |   |              |
| Type                      | EcucIntegerParamDef                                                                                                                                                                                            |   |              |
| Range                     | 0 .. 20                                                                                                                                                                                                        |   |              |
| Default value             | 0                                                                                                                                                                                                              |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                                          |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                               | X | All Variants |
|                           | Link time                                                                                                                                                                                                      | — |              |
|                           | Post-build time                                                                                                                                                                                                | — |              |
| Dependency                |                                                                                                                                                                                                                |   |              |

## [ECUC\_EthTSyn\_00059] Definition of EcucIntegerParamDef EthTSynSwitchMgmtRxMessageBufferCount

|                                  |                                                                                                                                               |   |              |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynSwitchMgmtRxMessageBufferCount                                                                                                         |   |              |
| Parent Container                 | <a href="#">EthTSynGeneral</a>                                                                                                                |   |              |
| Description                      | This parameter is used to determine the amount of Rx message buffers available in the EthTSyn when EthTSyn is used in a Bridge configuration. |   |              |
| Multiplicity                     | 0..1                                                                                                                                          |   |              |
| Type                             | EcucIntegerParamDef                                                                                                                           |   |              |
| Range                            | 1 .. 254                                                                                                                                      |   |              |
| Default value                    | 10                                                                                                                                            |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                                                         |   |              |
| Post-Build Variant Value         | false                                                                                                                                         |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                              | X | All Variants |
|                                  | Link time                                                                                                                                     | – |              |
|                                  | Post-build time                                                                                                                               | – |              |
| Value Configuration Class        | Pre-compile time                                                                                                                              | X | All Variants |
|                                  | Link time                                                                                                                                     | – |              |
|                                  | Post-build time                                                                                                                               | – |              |
| Dependency                       |                                                                                                                                               |   |              |

## [ECUC\_EthTSyn\_00081] Definition of EcucBooleanParamDef EthTSynTimeValidationSupport

|                           |                                                                                                                                 |   |              |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTimeValidationSupport                                                                                                    |   |              |
| Parent Container          | <a href="#">EthTSynGeneral</a>                                                                                                  |   |              |
| Description               | Switches support for time validation on or off.<br>• true: time validation is enabled.<br>• false: time validation is disabled. |   |              |
| Multiplicity              | 1                                                                                                                               |   |              |
| Type                      | EcucBooleanParamDef                                                                                                             |   |              |
| Default value             | false                                                                                                                           |   |              |
| Post-Build Variant Value  | false                                                                                                                           |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                | X | All Variants |
|                           | Link time                                                                                                                       | – |              |
|                           | Post-build time                                                                                                                 | – |              |
| Dependency                |                                                                                                                                 |   |              |

## [ECUC\_EthTSyn\_00015] Definition of EcucBooleanParamDef EthTSynVersionInfoApi

|                           |                                                                                                                                                               |   |              |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynVersionInfoApi                                                                                                                                         |   |              |
| Parent Container          | <a href="#">EthTSynGeneral</a>                                                                                                                                |   |              |
| Description               | Activate/Deactivate the version information API (EthTSyn_GetVersionInfo). True: version information API activated False: version information API deactivated. |   |              |
| Multiplicity              | 1                                                                                                                                                             |   |              |
| Type                      | EcucBooleanParamDef                                                                                                                                           |   |              |
| Default value             | false                                                                                                                                                         |   |              |
| Post-Build Variant Value  | false                                                                                                                                                         |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                              | X | All Variants |
|                           | Link time                                                                                                                                                     | – |              |
|                           | Post-build time                                                                                                                                               | – |              |
| Dependency                |                                                                                                                                                               |   |              |

## [ECUC\_EthTSyn\_00127] Definition of EcucReferenceDef EthTSynEthIfFrameType

Status: DRAFT

|                          |                                                                                                                         |  |  |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------|--|--|
| Parameter Name           | EthTSynEthIfFrameType                                                                                                   |  |  |
| Parent Container         | <a href="#">EthTSynGeneral</a>                                                                                          |  |  |
| Description              | The chosen frame owner determines which frames (in respect to ethertype) are received.<br><b>Tags:</b> atp.Status=draft |  |  |
| Multiplicity             | 1                                                                                                                       |  |  |
| Type                     | Reference to EthIfFrameConfig                                                                                           |  |  |
| Post-Build Variant Value | false                                                                                                                   |  |  |





| Value Configuration Class | Pre-compile time | X | All Variants |
|---------------------------|------------------|---|--------------|
|                           | Link time        | – |              |
|                           | Post-build time  | – |              |
| Dependency                |                  |   |              |

]

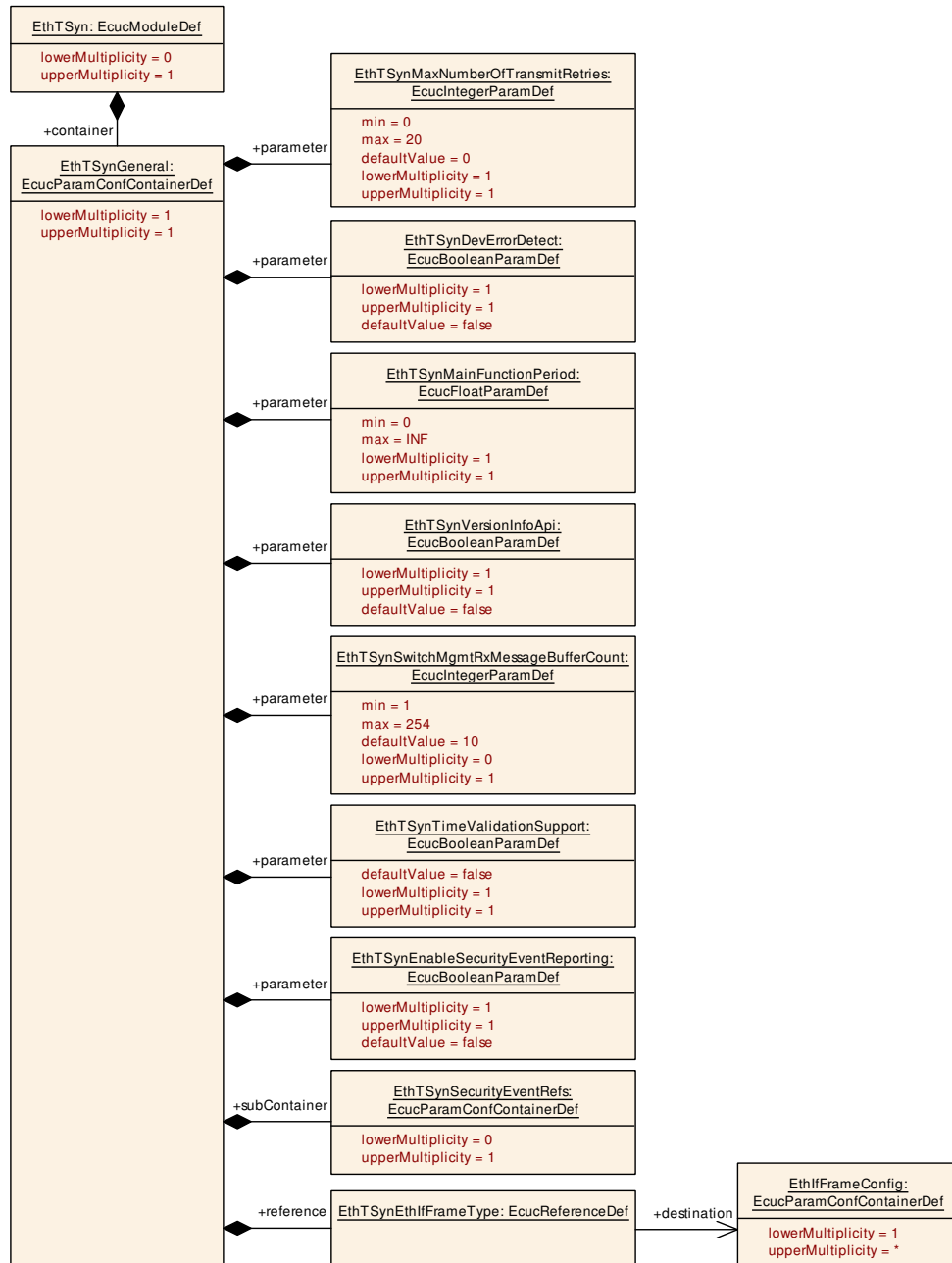


Figure 10.2: EthTSynGeneral

### 10.2.3 EthTSynSecurityEventRefs

#### [ECUC\_EthTSyn\_00090] Definition of EcucParamConfContainerDef EthTSynSecurityEventRefs

|                                  |                                                                                                                                                                                                                                                                                                                                                                  |   |              |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynSecurityEventRefs                                                                                                                                                                                                                                                                                                                                         |   |              |
| Parent Container                 | <a href="#">EthTSynGeneral</a>                                                                                                                                                                                                                                                                                                                                   |   |              |
| Description                      | Container for the references to IdsMEvent elements representing the security events that the EthTSyn module shall report to the IdsM in case the corresponding security related event occurs (and if EthTSynEnableSecurityEventReportings set to "true"). The standardized security events in this container can be extended by vendor-specific security events. |   |              |
| Multiplicity                     | 0..1                                                                                                                                                                                                                                                                                                                                                             |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                                                                                                                                                                                                                                                                            |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                                                                                                                                                                                                 | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                                                                                                                                                        | – |              |
|                                  | Post-build time                                                                                                                                                                                                                                                                                                                                                  | – |              |
| Configuration Parameters         |                                                                                                                                                                                                                                                                                                                                                                  |   |              |

| Included Parameters                                  |              |                      |
|------------------------------------------------------|--------------|----------------------|
| Parameter Name                                       | Multiplicity | ECUC ID              |
| <a href="#">SEV_TSYN_ETH_FRESHNESS_NOT_AVAILABLE</a> | 0..1         | [ECUC_EthTSyn_00093] |
| <a href="#">SEV_TSYN_ETH_ICV_GENERATION_FAILED</a>   | 0..1         | [ECUC_EthTSyn_00091] |
| <a href="#">SEV_TSYN_ETH_ICV_VERIFICATION_FAILED</a> | 0..1         | [ECUC_EthTSyn_00092] |
| <a href="#">SEV_TSYN_ETH_SYNC_FUP_SEQUENCE_ERROR</a> | 0..1         | [ECUC_EthTSyn_00114] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

#### [ECUC\_EthTSyn\_00093] Definition of EcucReferenceDef SEV\_TSYN\_ETH\_FRESHNESS\_NOT\_AVAILABLE

|                                  |                                                                            |   |              |
|----------------------------------|----------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | SEV_TSYN_ETH_FRESHNESS_NOT_AVAILABLE                                       |   |              |
| Parent Container                 | <a href="#">EthTSynSecurityEventRefs</a>                                   |   |              |
| Description                      | FV not available from FVM. Context data provides the respective domain ID. |   |              |
| Multiplicity                     | 0..1                                                                       |   |              |
| Type                             | Symbolic name reference to IdsMEvent                                       |   |              |
| Post-Build Variant Multiplicity  | false                                                                      |   |              |
| Post-Build Variant Value         | false                                                                      |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                           | X | All Variants |
|                                  | Link time                                                                  | – |              |
|                                  | Post-build time                                                            | – |              |
| Value Configuration Class        | Pre-compile time                                                           | X | All Variants |
|                                  | Link time                                                                  | – |              |
|                                  | Post-build time                                                            | – |              |
| Dependency                       |                                                                            |   |              |

]

### [ECUC\_EthTSyn\_00091] Definition of EcucReferenceDef SEV\_TSYN\_ETH\_ICV\_GENERATION\_FAILED

|                                  |                                                                                             |   |              |
|----------------------------------|---------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | SEV_TSYN_ETH_ICV_GENERATION_FAILED                                                          |   |              |
| Parent Container                 | <a href="#">EthTSynSecurityEventRefs</a>                                                    |   |              |
| Description                      | ICV generation for Follow_Up message failed. Context data provides the respective domain ID |   |              |
| Multiplicity                     | 0..1                                                                                        |   |              |
| Type                             | Symbolic name reference to IdsMEvent                                                        |   |              |
| Post-Build Variant Multiplicity  | false                                                                                       |   |              |
| Post-Build Variant Value         | false                                                                                       |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                            | X | All Variants |
|                                  | Link time                                                                                   | – |              |
|                                  | Post-build time                                                                             | – |              |
| Value Configuration Class        | Pre-compile time                                                                            | X | All Variants |
|                                  | Link time                                                                                   | – |              |
|                                  | Post-build time                                                                             | – |              |
| Dependency                       |                                                                                             |   |              |

### [ECUC\_EthTSyn\_00092] Definition of EcucReferenceDef SEV\_TSYN\_ETH\_ICV\_VERIFICATION\_FAILED

|                                  |                                                                                                |   |              |
|----------------------------------|------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | SEV_TSYN_ETH_ICV_VERIFICATION_FAILED                                                           |   |              |
| Parent Container                 | <a href="#">EthTSynSecurityEventRefs</a>                                                       |   |              |
| Description                      | ICV verification for Follow_Up message failed. Context data provides the respective domain ID. |   |              |
| Multiplicity                     | 0..1                                                                                           |   |              |
| Type                             | Symbolic name reference to IdsMEvent                                                           |   |              |
| Post-Build Variant Multiplicity  | false                                                                                          |   |              |
| Post-Build Variant Value         | false                                                                                          |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                               | X | All Variants |
|                                  | Link time                                                                                      | – |              |
|                                  | Post-build time                                                                                | – |              |
| Value Configuration Class        | Pre-compile time                                                                               | X | All Variants |
|                                  | Link time                                                                                      | – |              |
|                                  | Post-build time                                                                                | – |              |
| Dependency                       |                                                                                                |   |              |

### [ECUC\_EthTSyn\_00114] Definition of EcucReferenceDef SEV\_TSYN\_ETH\_SYNC\_FUP\_SEQUENCE\_ERROR

|                  |                                                                                                                         |  |  |
|------------------|-------------------------------------------------------------------------------------------------------------------------|--|--|
| Parameter Name   | SEV_TSYN_ETH_SYNC_FUP_SEQUENCE_ERROR                                                                                    |  |  |
| Parent Container | <a href="#">EthTSynSecurityEventRefs</a>                                                                                |  |  |
| Description      | Failed to receive correct sequence of SYNC and Follow_Up from the TimeMaster within (EthTSynGlobalTimeFollowUpTimeout). |  |  |
| Multiplicity     | 0..1                                                                                                                    |  |  |





|                                         |                                      |   |              |
|-----------------------------------------|--------------------------------------|---|--------------|
| <b>Type</b>                             | Symbolic name reference to IdsMEvent |   |              |
| <b>Post-Build Variant Multiplicity</b>  | false                                |   |              |
| <b>Post-Build Variant Value</b>         | false                                |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b>              | X | All Variants |
|                                         | <b>Link time</b>                     | – |              |
|                                         | <b>Post-build time</b>               | – |              |
| <b>Value Configuration Class</b>        | <b>Pre-compile time</b>              | X | All Variants |
|                                         | <b>Link time</b>                     | – |              |
|                                         | <b>Post-build time</b>               | – |              |
| <b>Dependency</b>                       |                                      |   |              |

]

## 10.2.4 EthTSynGlobalTimeDomain

### [ECUC\_EthTSyn\_00004] Definition of EcucParamConfContainerDef EthTSynGlobalTimeDomain [

|                                  |                                                                                                                                                                                                                                                                    |   |              |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynGlobalTimeDomain                                                                                                                                                                                                                                            |   |              |
| Parent Container                 | EthTSyn                                                                                                                                                                                                                                                            |   |              |
| Description                      | This represents a global time domain on Ethernet. The EthTSyn module can manage several global time domains. Only one container shall be configured per global time domain ID.<br>If the EthTSyn exists it is assumed that at least one global time domain exists. |   |              |
| Multiplicity                     | 1..*                                                                                                                                                                                                                                                               |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                                                                                                                                                               |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                                                                                                   | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                                                          | – |              |
|                                  | Post-build time                                                                                                                                                                                                                                                    | – |              |
| Configuration Parameters         |                                                                                                                                                                                                                                                                    |   |              |

| Included Parameters             |              |                      |
|---------------------------------|--------------|----------------------|
| Parameter Name                  | Multiplicity | ECUC ID              |
| EthTSynGlobalTimeDebounceTime   | 0..1         | [ECUC_EthTSyn_00048] |
| EthTSynGlobalTimeDomainId       | 1            | [ECUC_EthTSyn_00005] |
| EthTSynGlobalTimeRxDebounceTime | 0..1         | [ECUC_EthTSyn_00094] |
| EthTSynSynchronizedTimeBaseRef  | 1            | [ECUC_EthTSyn_00013] |

| Included Containers                 |              |                                                                                                                                             |
|-------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Container Name                      | Multiplicity | Dependency                                                                                                                                  |
| EthTSynGlobalTimeFollowUpDataIDList | 0..1         | The DataIDList for Follow_Up message ensures the identification of data elements due to CRC calculation and message authentication process. |
| EthTSynPTPPort                      | 1..*         | Configuration of the EthTSyn-Ports within the TimeDomain.                                                                                   |

]

### [ECUC\_EthTSyn\_00048] Definition of EcucFloatParamDef EthTSynGlobalTimeDebounceTime [

|                           |                                                                                                                                                                 |   |              |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimeDebounceTime                                                                                                                                   |   |              |
| Parent Container          | EthTSynGlobalTimeDomain                                                                                                                                         |   |              |
| Description               | This represents the configuration of a TX debounce time for Sync, Follow_Up, and p Delay messages compared to a message before with the same PDU. Unit: seconds |   |              |
| Multiplicity              | 0..1                                                                                                                                                            |   |              |
| Type                      | EcucFloatParamDef                                                                                                                                               |   |              |
| Range                     | [0 .. 4]                                                                                                                                                        |   |              |
| Default value             | –                                                                                                                                                               |   |              |
| Post-Build Variant Value  | true                                                                                                                                                            |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                | X | All Variants |
|                           | Link time                                                                                                                                                       | – |              |
|                           | Post-build time                                                                                                                                                 | – |              |





|            |  |
|------------|--|
| Dependency |  |
|------------|--|

]

### [ECUC\_EthTSyn\_00005] Definition of EcucIntegerParamDef EthTSynGlobalTimeDomainId [

|                           |                                         |   |              |
|---------------------------|-----------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimeDomainId               |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeDomain</a> |   |              |
| Description               | The global time domain ID.              |   |              |
| Multiplicity              | 1                                       |   |              |
| Type                      | EcucIntegerParamDef                     |   |              |
| Range                     | 0 .. 255                                |   |              |
| Default value             | –                                       |   |              |
| Post-Build Variant Value  | true                                    |   |              |
| Value Configuration Class | Pre-compile time                        | X | All Variants |
|                           | Link time                               | – |              |
|                           | Post-build time                         | – |              |
| Dependency                |                                         |   |              |

]

### [ECUC\_EthTSyn\_00094] Definition of EcucFloatParamDef EthTSynGlobalTimeRxDebounceTime [

|                                  |                                                                                               |   |              |
|----------------------------------|-----------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynGlobalTimeRxDebounceTime                                                               |   |              |
| Parent Container                 | <a href="#">EthTSynGlobalTimeDomain</a>                                                       |   |              |
| Description                      | This represents the configuration of a RX debounce time for Sync and Follow_Up. Unit: seconds |   |              |
| Multiplicity                     | 0..1                                                                                          |   |              |
| Type                             | EcucFloatParamDef                                                                             |   |              |
| Range                            | [0 .. 4]                                                                                      |   |              |
| Default value                    | –                                                                                             |   |              |
| Post-Build Variant Multiplicity  | false                                                                                         |   |              |
| Post-Build Variant Value         | true                                                                                          |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                              | X | All Variants |
|                                  | Link time                                                                                     | – |              |
|                                  | Post-build time                                                                               | – |              |
| Value Configuration Class        | Pre-compile time                                                                              | X | All Variants |
|                                  | Link time                                                                                     | – |              |
|                                  | Post-build time                                                                               | – |              |
| Dependency                       |                                                                                               |   |              |

]

## [ECUC\_EthTSyn\_00013] Definition of EcucReferenceDef EthTSynSynchronizedTimeBaseRef

| Parameter Name            | EthTSynSynchronizedTimeBaseRef                              |   |              |
|---------------------------|-------------------------------------------------------------|---|--------------|
| Parent Container          | EthTSynGlobalTimeDomain                                     |   |              |
| Description               | Mandatory reference to the required synchronized time-base. |   |              |
| Multiplicity              | 1                                                           |   |              |
| Type                      | Symbolic name reference to StbMSynchronizedTimeBase         |   |              |
| Post-Build Variant Value  | false                                                       |   |              |
| Value Configuration Class | Pre-compile time                                            | X | All Variants |
|                           | Link time                                                   | – |              |
|                           | Post-build time                                             | – |              |
| Dependency                |                                                             |   |              |

]

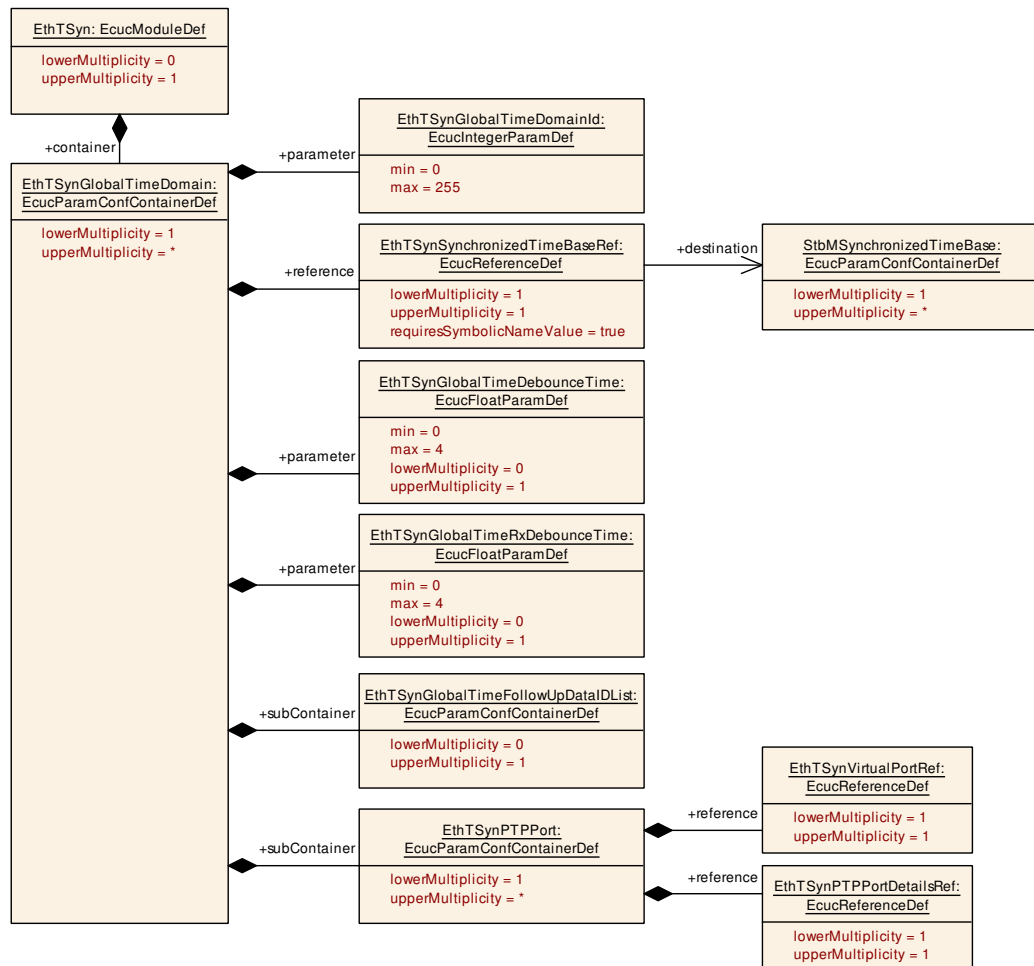


Figure 10.3: EthTSynGlobalTimeDomain

## 10.2.5 EthTSynGlobalTimeFollowUpDataIDList

### [ECUC\_EthTSyn\_00030] Definition of EcucParamConfContainerDef EthTSynGlobalTimeFollowUpDataIDList

|                                  |                                                                                                                                             |   |              |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynGlobalTimeFollowUpDataIDList                                                                                                         |   |              |
| Parent Container                 | EthTSynGlobalTimeDomain                                                                                                                     |   |              |
| Description                      | The DataIDList for Follow_Up message ensures the identification of data elements due to CRC calculation and message authentication process. |   |              |
| Multiplicity                     | 0..1                                                                                                                                        |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                                        |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                            | X | All Variants |
|                                  | Link time                                                                                                                                   | – |              |
|                                  | Post-build time                                                                                                                             | – |              |
| Configuration Parameters         |                                                                                                                                             |   |              |

No Included Parameters

| Included Containers                        |              |                                                                                                                                                        |
|--------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Container Name                             | Multiplicity | Dependency                                                                                                                                             |
| EthTSynGlobalTimeFollowUpDataIDListElement | 16           | Element of the DataIDList for Follow_Up message ensures the identification of data elements due to CRC calculation and message authentication process. |

]

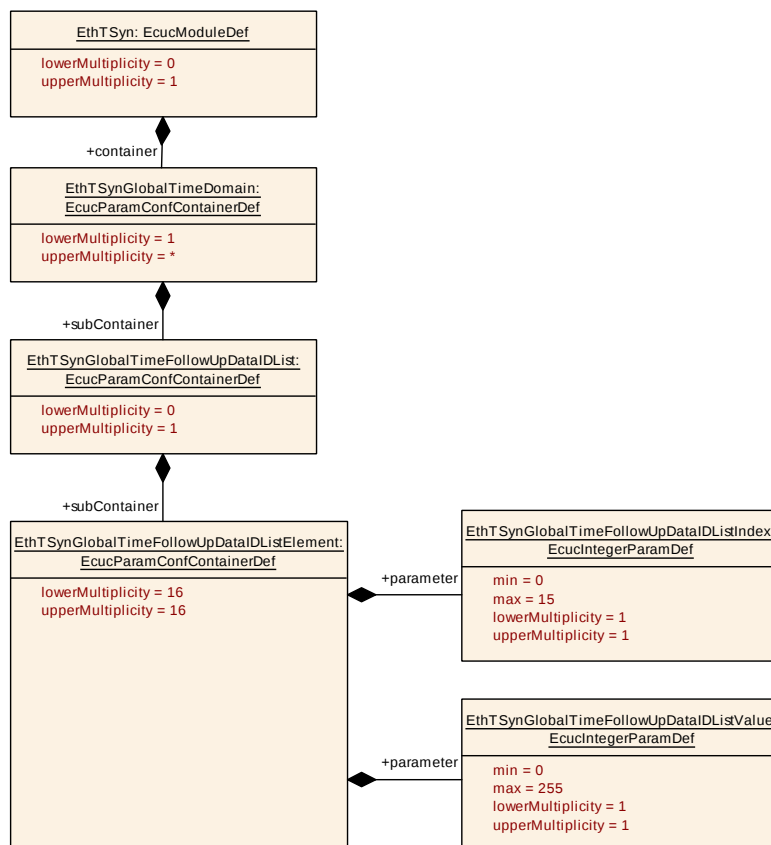


Figure 10.4: EthTSyn\_GlobalTimeFollowUpDataIDList

## 10.2.6 EthTSynGlobalTimeFollowUpDataIDListElement

**[ECUC\_EthTSyn\_00031] Definition of EcucParamConfContainerDef EthTSynGlobalTimeFollowUpDataIDListElement** [

|                                 |                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Container Name</b>           | EthTSynGlobalTimeFollowUpDataIDListElement                                                                                                             |
| <b>Parent Container</b>         | <a href="#">EthTSynGlobalTimeFollowUpDataIDList</a>                                                                                                    |
| <b>Description</b>              | Element of the DataIDList for Follow_Up message ensures the identification of data elements due to CRC calculation and message authentication process. |
| <b>Multiplicity</b>             | 16                                                                                                                                                     |
| <b>Configuration Parameters</b> |                                                                                                                                                        |

| Included Parameters                                      |              |                                      |
|----------------------------------------------------------|--------------|--------------------------------------|
| Parameter Name                                           | Multiplicity | ECUC ID                              |
| <a href="#">EthTSynGlobalTimeFollowUpDataIDListIndex</a> | 1            | <a href="#">[ECUC_EthTSyn_00032]</a> |
| <a href="#">EthTSynGlobalTimeFollowUpDataIDListValue</a> | 1            | <a href="#">[ECUC_EthTSyn_00033]</a> |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

**[ECUC\_EthTSyn\_00032] Definition of EcucIntegerParamDef EthTSynGlobalTimeFollowUpDataIDListIndex** [

|                                  |                                                                                                                                                      |   |              |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Parameter Name</b>            | EthTSynGlobalTimeFollowUpDataIDListIndex                                                                                                             |   |              |
| <b>Parent Container</b>          | <a href="#">EthTSynGlobalTimeFollowUpDataIDListElement</a>                                                                                           |   |              |
| <b>Description</b>               | Index of the DataIDList for Follow_Up message ensures the identification of data elements due to CRC calculation and message authentication process. |   |              |
| <b>Multiplicity</b>              | 1                                                                                                                                                    |   |              |
| <b>Type</b>                      | EcucIntegerParamDef                                                                                                                                  |   |              |
| <b>Range</b>                     | 0 .. 15                                                                                                                                              |   |              |
| <b>Default value</b>             | –                                                                                                                                                    |   |              |
| <b>Post-Build Variant Value</b>  | true                                                                                                                                                 |   |              |
| <b>Value Configuration Class</b> | <b>Pre-compile time</b>                                                                                                                              | X | All Variants |
|                                  | <b>Link time</b>                                                                                                                                     | – |              |
|                                  | <b>Post-build time</b>                                                                                                                               | – |              |
| <b>Dependency</b>                |                                                                                                                                                      |   |              |

]

**[ECUC\_EthTSyn\_00033] Definition of EcucIntegerParamDef EthTSynGlobalTimeFollowUpDataIDListValue** [

|                         |                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameter Name</b>   | EthTSynGlobalTimeFollowUpDataIDListValue                                                                                                             |
| <b>Parent Container</b> | <a href="#">EthTSynGlobalTimeFollowUpDataIDListElement</a>                                                                                           |
| <b>Description</b>      | Value of the DataIDList for Follow_Up message ensures the identification of data elements due to CRC calculation and message authentication process. |
| <b>Multiplicity</b>     | 1                                                                                                                                                    |
| <b>Type</b>             | EcucIntegerParamDef                                                                                                                                  |





|                           |                  |   |              |
|---------------------------|------------------|---|--------------|
| Range                     | 0 .. 255         |   |              |
| Default value             | –                |   |              |
| Post-Build Variant Value  | true             |   |              |
| Value Configuration Class | Pre-compile time | X | All Variants |
|                           | Link time        | – |              |
|                           | Post-build time  | – |              |
| Dependency                |                  |   |              |

」

### 10.2.7 EthTSynPTPPort

#### [ECUC\_EthTSyn\_00063] Definition of EcucParamConfContainerDef EthTSynPTPPort 「

|                                  |                                                           |   |              |
|----------------------------------|-----------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynPTPPort                                            |   |              |
| Parent Container                 | <a href="#">EthTSynGlobalTimeDomain</a>                   |   |              |
| Description                      | Configuration of the EthTSyn-Ports within the TimeDomain. |   |              |
| Multiplicity                     | 1..*                                                      |   |              |
| Post-Build Variant Multiplicity  | true                                                      |   |              |
| Multiplicity Configuration Class | Pre-compile time                                          | X | All Variants |
|                                  | Link time                                                 | – |              |
|                                  | Post-build time                                           | – |              |
| Configuration Parameters         |                                                           |   |              |

| Included Parameters                                       |              |                      |
|-----------------------------------------------------------|--------------|----------------------|
| Parameter Name                                            | Multiplicity | ECUC ID              |
| <a href="#">EthTSynConfiguredMasterSourcePortIdentity</a> | 0..1         | [ECUC_EthTSyn_00128] |
| <a href="#">EthTSynLinkDelayConfig</a>                    | 1            | [ECUC_EthTSyn_00131] |
| <a href="#">EthTSynNeighbourRateRatioConfig</a>           | 1            | [ECUC_EthTSyn_00130] |
| <a href="#">EthTSynPortRole</a>                           | 1            | [ECUC_EthTSyn_00116] |
| <a href="#">EthTSynPTPPortDetailsRef</a>                  | 1            | [ECUC_EthTSyn_00132] |
| <a href="#">EthTSynVirtualPortRef</a>                     | 1            | [ECUC_EthTSyn_00133] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

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## [ECUC\_EthTSyn\_00128] Definition of EcucStringParamDef EthTSynConfiguredMasterSourcePortIdentity

Status: DRAFT

|                                  |                                                                                                                                                                                                                                                                       |   |              |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynConfiguredMasterSourcePortIdentity                                                                                                                                                                                                                             |   |              |
| Parent Container                 | <a href="#">EthTSynPTPPort</a>                                                                                                                                                                                                                                        |   |              |
| Description                      | The SourcePortIdentity (clockIdentity + portNumber) which the sourcePortIdentity of the received Sync frame is compared to. Input format has to match xx:xx:xx:xx:xx:xx:xx:xx:xx:xx, where x stands for a hex value between 0 and F.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity                     | 0..1                                                                                                                                                                                                                                                                  |   |              |
| Type                             | EcucStringParamDef                                                                                                                                                                                                                                                    |   |              |
| Default value                    | –                                                                                                                                                                                                                                                                     |   |              |
| Regular Expression               | [0-9a-fA-F]{2}(:[0-9a-fA-F]{2}){9}                                                                                                                                                                                                                                    |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                                                                                                                                                                                 |   |              |
| Post-Build Variant Value         | false                                                                                                                                                                                                                                                                 |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                                                                                                      | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                                                             | – |              |
|                                  | Post-build time                                                                                                                                                                                                                                                       | – |              |
| Value Configuration Class        | Pre-compile time                                                                                                                                                                                                                                                      | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                                                             | – |              |
|                                  | Post-build time                                                                                                                                                                                                                                                       | – |              |
| Dependency                       |                                                                                                                                                                                                                                                                       |   |              |

## [ECUC\_EthTSyn\_00131] Definition of EcucEnumerationParamDef EthTSynLinkDelayConfig

|                                 |                                                                                                                                                                |                                                                                                        |              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------|
| Parameter Name                  | EthTSynLinkDelayConfig                                                                                                                                         |                                                                                                        |              |
| Parent Container                | <a href="#">EthTSynPTPPort</a>                                                                                                                                 |                                                                                                        |              |
| Description                     | Selects the mechanism through which this PTPPort determines the LinkDelay. Different mechanisms may use the same configuration as given in the PTPPortDetails. |                                                                                                        |              |
| Multiplicity                    | 1                                                                                                                                                              |                                                                                                        |              |
| Type                            | EcucEnumerationParamDef                                                                                                                                        |                                                                                                        |              |
| Range                           | CMLDS                                                                                                                                                          | The link delay is determined through the Common Mean Link Delay Service (CMLDS) for this virtual port. |              |
|                                 | OFF                                                                                                                                                            | No LinkDelay is determined for this PTPPort.                                                           |              |
|                                 | TransportSpecific                                                                                                                                              | The LinkDelay is determined through the TransportSpecific pDelay mechanism.                            |              |
| Post-Build Variant Multiplicity | false                                                                                                                                                          |                                                                                                        |              |
| Post-Build Variant Value        | true                                                                                                                                                           |                                                                                                        |              |
| Value Configuration Class       | Pre-compile time                                                                                                                                               | X                                                                                                      | All Variants |
|                                 | Link time                                                                                                                                                      | –                                                                                                      |              |
|                                 | Post-build time                                                                                                                                                | –                                                                                                      |              |
| Dependency                      |                                                                                                                                                                |                                                                                                        |              |

## [ECUC\_EthTSyn\_00130] Definition of EcucEnumerationParamDef EthTSynNeighbourRateRatioConfig

|                                 |                                                                        |                                                                                          |              |
|---------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------|
| Parameter Name                  | EthTSynNeighbourRateRatioConfig                                        |                                                                                          |              |
| Parent Container                | <a href="#">EthTSynPTPPort</a>                                         |                                                                                          |              |
| Description                     | Sets the mechanism through which the NeighbourRateRatio is determined. |                                                                                          |              |
| Multiplicity                    | 1                                                                      |                                                                                          |              |
| Type                            | EcucEnumerationParamDef                                                |                                                                                          |              |
| Range                           | CMLDS                                                                  | The NeighbourRateRatio is determined through the Common Mean Link Delay Service (CMLDS). |              |
|                                 | DriftTrackingTLV                                                       | The NeighbourRateRatio is determined through the DriftTrackingTLV mechanism.             |              |
|                                 | OFF                                                                    | No NeighbourRateRatio is determined on this PTPPort.                                     |              |
|                                 | PHC                                                                    | The NeighbourRateRatio is determined through a mechanism for a PHC.                      |              |
|                                 | TransportSpecific                                                      | The NeighbourRateRatio is determined through the TransportSpecific pDelay mechanism.     |              |
| Post-Build Variant Multiplicity | false                                                                  |                                                                                          |              |
| Post-Build Variant Value        | true                                                                   |                                                                                          |              |
| Value Configuration Class       | Pre-compile time                                                       | X                                                                                        | All Variants |
|                                 | Link time                                                              | –                                                                                        |              |
|                                 | Post-build time                                                        | –                                                                                        |              |
| Dependency                      |                                                                        |                                                                                          |              |

## [ECUC\_EthTSyn\_00116] Definition of EcucEnumerationParamDef EthTSynPortRole

|                                 |                                                                                                                                 |                                                                                                                                                                   |              |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Parameter Name                  | EthTSynPortRole                                                                                                                 |                                                                                                                                                                   |              |
| Parent Container                | <a href="#">EthTSynPTPPort</a>                                                                                                  |                                                                                                                                                                   |              |
| Description                     | Parameter to set the port's role to TimeSlave, TimeMaster, or Dynamic (i.e., TimeSlave or TimeMaster is determined at runtime). |                                                                                                                                                                   |              |
| Multiplicity                    | 1                                                                                                                               |                                                                                                                                                                   |              |
| Type                            | EcucEnumerationParamDef                                                                                                         |                                                                                                                                                                   |              |
| Range                           | DYNAMIC                                                                                                                         | The port's role is determined at runtime to be either TIME_MASTER or TIME_SLAVE.                                                                                  |              |
|                                 | TIME_MASTER                                                                                                                     | This PTPPort transmits timing information for the Domain it is associated with.                                                                                   |              |
|                                 | TIME_SLAVE                                                                                                                      | This PTPPort receives timing information for the Domain it is associated with. A Domain can only receive timing information on one single Port on a specific ECU. |              |
| Default value                   | <a href="#">DYNAMIC</a>                                                                                                         |                                                                                                                                                                   |              |
| Post-Build Variant Multiplicity | false                                                                                                                           |                                                                                                                                                                   |              |
| Post-Build Variant Value        | true                                                                                                                            |                                                                                                                                                                   |              |
| Value Configuration Class       | Pre-compile time                                                                                                                | X                                                                                                                                                                 | All Variants |
|                                 | Link time                                                                                                                       | –                                                                                                                                                                 |              |
|                                 | Post-build time                                                                                                                 | –                                                                                                                                                                 |              |
| Dependency                      |                                                                                                                                 |                                                                                                                                                                   |              |

## [ECUC\_EthTSyn\_00132] Definition of EcucReferenceDef EthTSynPTPPortDetailsRef

|                           |                                                                                                                                                                                                                                                                                  |   |              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynPTPPortDetailsRef                                                                                                                                                                                                                                                         |   |              |
| Parent Container          | <a href="#">EthTSynPTPPort</a>                                                                                                                                                                                                                                                   |   |              |
| Description               | This represents the reference to the Ethernet interface taken to fetch the global time information.<br>If EthTSynPortRole = DYNAMIC, then two EthTSynPTPPortDetails may be referenced in parallel to reflect dedicated configurations for the TimeMaster and the TimeSlave role. |   |              |
| Multiplicity              | 1                                                                                                                                                                                                                                                                                |   |              |
| Type                      | Reference to <a href="#">EthTSynPTPPortDetails</a>                                                                                                                                                                                                                               |   |              |
| Post-Build Variant Value  | true                                                                                                                                                                                                                                                                             |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                                                                                                 | X | All Variants |
|                           | Link time                                                                                                                                                                                                                                                                        | – |              |
|                           | Post-build time                                                                                                                                                                                                                                                                  | – |              |
| Dependency                |                                                                                                                                                                                                                                                                                  |   |              |

]

## [ECUC\_EthTSyn\_00133] Definition of EcucReferenceDef EthTSynVirtualPortRef

|                           |                                                                                                             |   |              |
|---------------------------|-------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynVirtualPortRef                                                                                       |   |              |
| Parent Container          | <a href="#">EthTSynPTPPort</a>                                                                              |   |              |
| Description               | This represents the reference to the virtual Ethernet interface taken to fetch the global time information. |   |              |
| Multiplicity              | 1                                                                                                           |   |              |
| Type                      | Reference to <a href="#">EthTSynVirtualPortConfiguration</a>                                                |   |              |
| Post-Build Variant Value  | false                                                                                                       |   |              |
| Value Configuration Class | Pre-compile time                                                                                            | X | All Variants |
|                           | Link time                                                                                                   | – |              |
|                           | Post-build time                                                                                             | – |              |
| Dependency                |                                                                                                             |   |              |

]

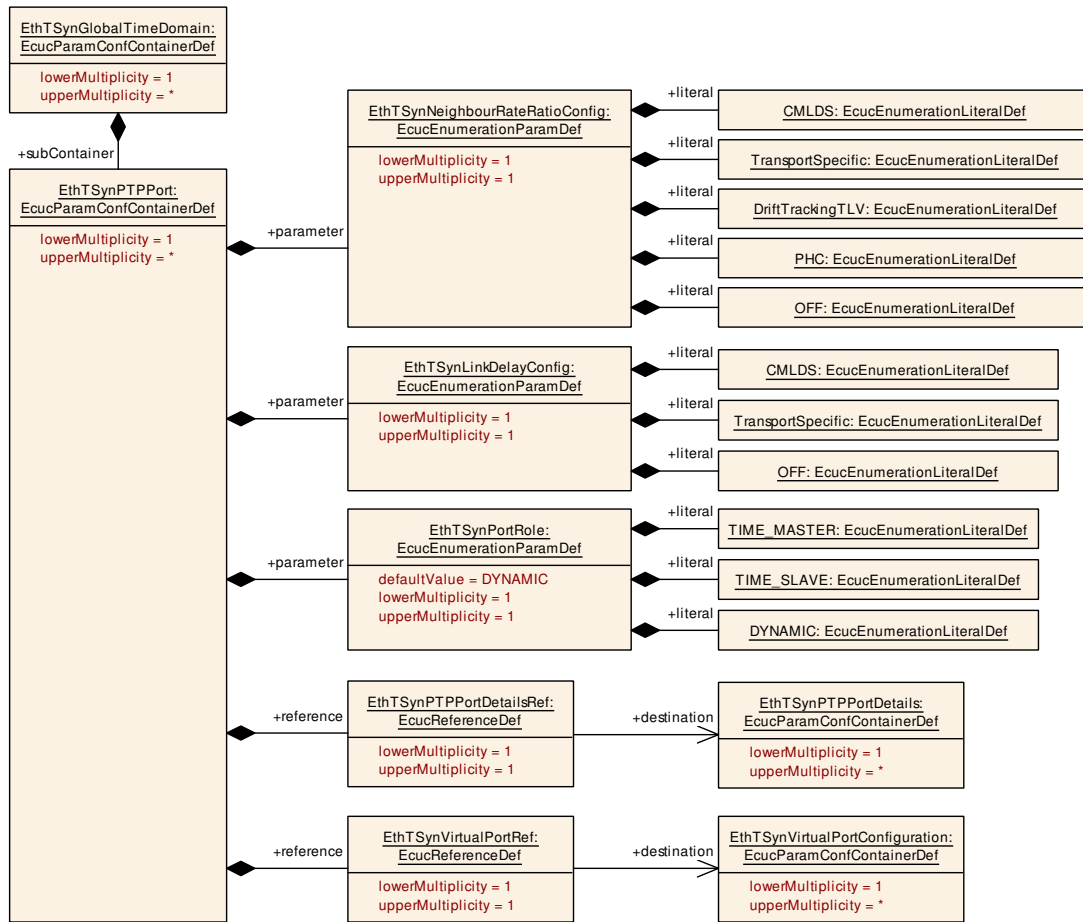


Figure 10.5: EthTSynPTPPort

## 10.2.8 EthTSynPTPPortDetails

### [ECUC\_EthTSyn\_00145] Definition of EcucParamConfContainerDef EthTSynPTPPortDetails

|                                  |                                                                                                                                  |   |              |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynPTPPortDetails                                                                                                            |   |              |
| Parent Container                 | <a href="#">EthTSyn</a>                                                                                                          |   |              |
| Description                      | Configuration of a PTP Port.<br>The same configuration can be used by multiple PTP ports through referencing this configuration. |   |              |
| Multiplicity                     | 1..*                                                                                                                             |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                             |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                 | X | All Variants |
|                                  | Link time                                                                                                                        | — |              |
|                                  | Post-build time                                                                                                                  | — |              |
| Configuration Parameters         |                                                                                                                                  |   |              |

| Included Parameters                                 |              |                      |
|-----------------------------------------------------|--------------|----------------------|
| Parameter Name                                      | Multiplicity | ECUC ID              |
| <a href="#">EthTSynDestPhyAddr</a>                  | 1            | [ECUC_EthTSyn_00058] |
| <a href="#">EthTSynEnableTimeValidation</a>         | 1            | [ECUC_EthTSyn_00082] |
| <a href="#">EthTSynFramePrio</a>                    | 0..1         | [ECUC_EthTSyn_00034] |
| <a href="#">EthTSynMasterSlaveConflictDetection</a> | 1            | [ECUC_EthTSyn_00075] |
| <a href="#">EthTSynMessageCompliance</a>            | 1            | [ECUC_EthTSyn_00029] |
| <a href="#">EthTSynClkUnitRef</a>                   | 0..1         | [ECUC_EthTSyn_00119] |
| <a href="#">EthTSynPdelayConfigRef</a>              | 0..1         | [ECUC_EthTSyn_00134] |
| <a href="#">EthTSynTimeMasterConfigRef</a>          | 0..1         | [ECUC_EthTSyn_00135] |
| <a href="#">EthTSynTimeSlaveConfigRef</a>           | 0..1         | [ECUC_EthTSyn_00136] |

| Included Containers                                 |              |                                                                                |
|-----------------------------------------------------|--------------|--------------------------------------------------------------------------------|
| Container Name                                      | Multiplicity | Dependency                                                                     |
| <a href="#">EthTSynGlobalTimeRxIcv Verification</a> | 0..1         | This container collects configuration that shall be used for ICV verification. |
| <a href="#">EthTSynGlobalTimeTxIcv Generation</a>   | 0..1         | This container collects configuration that shall be used for ICV generation.   |

]

## [ECUC\_EthTSyn\_00058] Definition of EcucStringParamDef EthTSynDestPhyAddr [

|                           |                                                                                                                                                                                                                            |   |              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynDestPhyAddr                                                                                                                                                                                                         |   |              |
| Parent Container          | <a href="#">EthTSynPTPPortDetails</a>                                                                                                                                                                                      |   |              |
| Description               | Destination Physical Address (MAC-Address).<br>Destination Physical Hardware Address (MAC-Address) of EthTSyn-gPTP Frames.<br>Input format has to match xx:xx:xx:xx:xx:xx, where x stands for a hex value between 0 and F. |   |              |
| Multiplicity              | 1                                                                                                                                                                                                                          |   |              |
| Type                      | EcucStringParamDef                                                                                                                                                                                                         |   |              |
| Default value             | 01:80:C2:00:00:0E                                                                                                                                                                                                          |   |              |
| Regular Expression        | –                                                                                                                                                                                                                          |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                                                      |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                                           | X | All Variants |
|                           | Link time                                                                                                                                                                                                                  | – |              |
|                           | Post-build time                                                                                                                                                                                                            | – |              |
| Dependency                |                                                                                                                                                                                                                            |   |              |

]

## [ECUC\_EthTSyn\_00082] Definition of EcucBooleanParamDef EthTSynEnableTimeValidation [

|                  |                                                                                                                                                               |  |  |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Parameter Name   | EthTSynEnableTimeValidation                                                                                                                                   |  |  |
| Parent Container | <a href="#">EthTSynPTPPortDetails</a>                                                                                                                         |  |  |
| Description      | Enables/disables time recording for time validation for a port of a specific Time Domain.<br>• true: recording is enabled.<br>• false: recording is disabled. |  |  |





|                                  |                         |   |              |
|----------------------------------|-------------------------|---|--------------|
| <b>Multiplicity</b>              | 1                       |   |              |
| <b>Type</b>                      | EcucBooleanParamDef     |   |              |
| <b>Default value</b>             | false                   |   |              |
| <b>Post-Build Variant Value</b>  | false                   |   |              |
| <b>Value Configuration Class</b> | <b>Pre-compile time</b> | X | All Variants |
|                                  | <b>Link time</b>        | – |              |
|                                  | <b>Post-build time</b>  | – |              |
| <b>Dependency</b>                |                         |   |              |

]

### [ECUC\_EthTSyn\_00034] Definition of EcucIntegerParamDef EthTSynFramePrio

[

|                                         |                                                                                                                                                                                                                             |   |              |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Parameter Name</b>                   | EthTSynFramePrio                                                                                                                                                                                                            |   |              |
| <b>Parent Container</b>                 | <a href="#">EthTSynPTPPortDetails</a>                                                                                                                                                                                       |   |              |
| <b>Description</b>                      | This optional parameter, if present, indicates the priority of outgoing EthTSyn message (i.e., it equals the 3-bit PCP field of a tagged VLAN message). If a VLAN is not configured, this parameter is also not configured. |   |              |
| <b>Multiplicity</b>                     | 0..1                                                                                                                                                                                                                        |   |              |
| <b>Type</b>                             | EcucIntegerParamDef                                                                                                                                                                                                         |   |              |
| <b>Range</b>                            | 0 .. 7                                                                                                                                                                                                                      |   |              |
| <b>Default value</b>                    | –                                                                                                                                                                                                                           |   |              |
| <b>Post-Build Variant Multiplicity</b>  | true                                                                                                                                                                                                                        |   |              |
| <b>Post-Build Variant Value</b>         | true                                                                                                                                                                                                                        |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b>                                                                                                                                                                                                     | X | All Variants |
|                                         | <b>Link time</b>                                                                                                                                                                                                            | – |              |
|                                         | <b>Post-build time</b>                                                                                                                                                                                                      | – |              |
| <b>Value Configuration Class</b>        | <b>Pre-compile time</b>                                                                                                                                                                                                     | X | All Variants |
|                                         | <b>Link time</b>                                                                                                                                                                                                            | – |              |
|                                         | <b>Post-build time</b>                                                                                                                                                                                                      | – |              |
| <b>Dependency</b>                       |                                                                                                                                                                                                                             |   |              |

]

### [ECUC\_EthTSyn\_00075] Definition of EcucBooleanParamDef EthTSynMasterSlaveConflictDetection

[

|                                  |                                                                                                                                                                   |   |              |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Parameter Name</b>            | EthTSynMasterSlaveConflictDetection                                                                                                                               |   |              |
| <b>Parent Container</b>          | <a href="#">EthTSynPTPPortDetails</a>                                                                                                                             |   |              |
| <b>Description</b>               | Enables master / slave conflict detection and notification.<br>• true: detection and notification is enabled.<br>• false: detection and notification is disabled. |   |              |
| <b>Multiplicity</b>              | 1                                                                                                                                                                 |   |              |
| <b>Type</b>                      | EcucBooleanParamDef                                                                                                                                               |   |              |
| <b>Default value</b>             | false                                                                                                                                                             |   |              |
| <b>Post-Build Variant Value</b>  | false                                                                                                                                                             |   |              |
| <b>Value Configuration Class</b> | <b>Pre-compile time</b>                                                                                                                                           | X | All Variants |
|                                  | <b>Link time</b>                                                                                                                                                  | – |              |





|            |                 |   |  |
|------------|-----------------|---|--|
|            | Post-build time | – |  |
| Dependency |                 |   |  |

## [ECUC\_EthTSyn\_00029] Definition of EcucBooleanParamDef EthTSynMessage Compliance

|                           |                                                                                                                                                                                                  |   |              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynMessageCompliance                                                                                                                                                                         |   |              |
| Parent Container          | <a href="#">EthTSynPTPPortDetails</a>                                                                                                                                                            |   |              |
| Description               | <ul style="list-style-type: none"> <li>• true: IEEE 802.1AS compliant message format will be used.</li> <li>• false: IEEE 802.1AS message format with AUTOSAR extension will be used.</li> </ul> |   |              |
| Multiplicity              | 1                                                                                                                                                                                                |   |              |
| Type                      | EcucBooleanParamDef                                                                                                                                                                              |   |              |
| Default value             | –                                                                                                                                                                                                |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                            |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                 | X | All Variants |
|                           | Link time                                                                                                                                                                                        | – |              |
|                           | Post-build time                                                                                                                                                                                  | – |              |
| Dependency                |                                                                                                                                                                                                  |   |              |

## [ECUC\_EthTSyn\_00119] Definition of EcucReferenceDef EthTSynClkUnitRef

Status: DRAFT

|                                  |                                                                                                          |   |              |
|----------------------------------|----------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynClkUnitRef                                                                                        |   |              |
| Parent Container                 | <a href="#">EthTSynPTPPortDetails</a>                                                                    |   |              |
| Description                      | Reference to a HW clock unit used for time stamping PTP event messages.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity                     | 0..1                                                                                                     |   |              |
| Type                             | Symbolic name reference to EthIfClkUnit                                                                  |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                    |   |              |
| Post-Build Variant Value         | false                                                                                                    |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                         | X | All Variants |
|                                  | Link time                                                                                                | – |              |
|                                  | Post-build time                                                                                          | – |              |
| Value Configuration Class        | Pre-compile time                                                                                         | X | All Variants |
|                                  | Link time                                                                                                | – |              |
|                                  | Post-build time                                                                                          | – |              |
| Dependency                       |                                                                                                          |   |              |

### [ECUC\_EthTSyn\_00134] Definition of EcucReferenceDef EthTSynPdelayConfigRef

|                                  |                                                                                   |   |              |
|----------------------------------|-----------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynPdelayConfigRef                                                            |   |              |
| Parent Container                 | <a href="#">EthTSynPTPPortDetails</a>                                             |   |              |
| Description                      | This represents the reference to the configuration for the pDelay mechanism used. |   |              |
| Multiplicity                     | 0..1                                                                              |   |              |
| Type                             | Reference to <a href="#">EthTSynPdelayConfig</a>                                  |   |              |
| Post-Build Variant Multiplicity  | false                                                                             |   |              |
| Post-Build Variant Value         | false                                                                             |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                  | X | All Variants |
|                                  | Link time                                                                         | – |              |
|                                  | Post-build time                                                                   | – |              |
| Value Configuration Class        | Pre-compile time                                                                  | X | All Variants |
|                                  | Link time                                                                         | – |              |
|                                  | Post-build time                                                                   | – |              |
| Dependency                       |                                                                                   |   |              |

### [ECUC\_EthTSyn\_00135] Definition of EcucReferenceDef EthTSynTimeMasterConfigRef

|                                  |                                                                                                               |   |              |
|----------------------------------|---------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynTimeMasterConfigRef                                                                                    |   |              |
| Parent Container                 | <a href="#">EthTSynPTPPortDetails</a>                                                                         |   |              |
| Description                      | This represents the reference to the configuration used by the port that ends up running in TIME_MASTER role. |   |              |
| Multiplicity                     | 0..1                                                                                                          |   |              |
| Type                             | Reference to <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                    |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                         |   |              |
| Post-Build Variant Value         | false                                                                                                         |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                              | X | All Variants |
|                                  | Link time                                                                                                     | – |              |
|                                  | Post-build time                                                                                               | – |              |
| Value Configuration Class        | Pre-compile time                                                                                              | X | All Variants |
|                                  | Link time                                                                                                     | – |              |
|                                  | Post-build time                                                                                               | – |              |
| Dependency                       |                                                                                                               |   |              |

### [ECUC\_EthTSyn\_00136] Definition of EcucReferenceDef EthTSynTimeSlaveConfigRef

|                  |                                                                                                              |  |  |
|------------------|--------------------------------------------------------------------------------------------------------------|--|--|
| Parameter Name   | EthTSynTimeSlaveConfigRef                                                                                    |  |  |
| Parent Container | <a href="#">EthTSynPTPPortDetails</a>                                                                        |  |  |
| Description      | This represents the reference to the configuration used by the port that ends up running in TIME_SLAVE role. |  |  |
| Multiplicity     | 0..1                                                                                                         |  |  |
| Type             | Reference to <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                                    |  |  |



△

|                                         |                         |   |              |
|-----------------------------------------|-------------------------|---|--------------|
| <b>Post-Build Variant Multiplicity</b>  | false                   |   |              |
| <b>Post-Build Variant Value</b>         | false                   |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b> | X | All Variants |
|                                         | <b>Link time</b>        | – |              |
|                                         | <b>Post-build time</b>  | – |              |
| <b>Value Configuration Class</b>        | <b>Pre-compile time</b> | X | All Variants |
|                                         | <b>Link time</b>        | – |              |
|                                         | <b>Post-build time</b>  | – |              |
| <b>Dependency</b>                       |                         |   |              |

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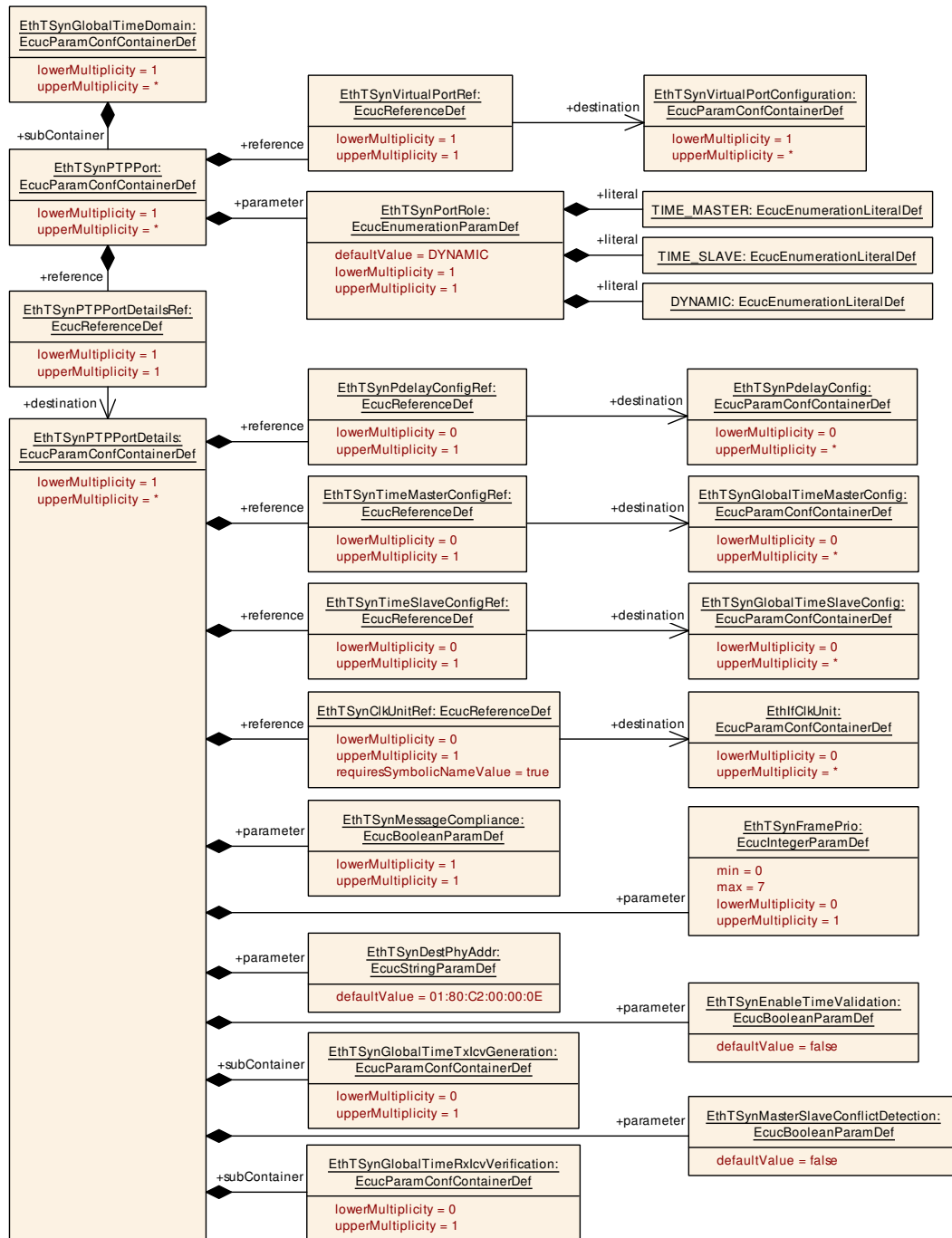


Figure 10.6: EthTSynPTPPortDetails

### 10.2.9 EthTSynCMLDS

[ECUC\_EthTSyn\_00141] Definition of EcucParamConfContainerDef EthTSyn CMLDS

|                                  |                                                                                                                                                                                               |   |              |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynCMLDS                                                                                                                                                                                  |   |              |
| Parent Container                 | <a href="#">EthTSyn</a>                                                                                                                                                                       |   |              |
| Description                      | Configuration of the Common Mean Link Delay Service (CMLDS).<br>There is at most one instance of the CMLDS per physical port.<br>For each physical port the CMLDS uses a single virtual port. |   |              |
| Multiplicity                     | 0..*                                                                                                                                                                                          |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                                                                                          |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                              | X | All Variants |
|                                  | Link time                                                                                                                                                                                     | – |              |
|                                  | Post-build time                                                                                                                                                                               | – |              |
| Configuration Parameters         |                                                                                                                                                                                               |   |              |

| Included Parameters                         |              |                      |
|---------------------------------------------|--------------|----------------------|
| Parameter Name                              | Multiplicity | ECUC ID              |
| <a href="#">EthTSynCMLDSPdelayConfigRef</a> | 1            | [ECUC_EthTSyn_00142] |
| <a href="#">EthTSynCMLDSVirtualPortRef</a>  | 1            | [ECUC_EthTSyn_00143] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

## [ECUC\_EthTSyn\_00142] Definition of EcucReferenceDef EthTSynCMLDSPdelay ConfigRef [

|                           |                                                                                                                                                                                            |   |              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynCMLDSPdelayConfigRef                                                                                                                                                                |   |              |
| Parent Container          | <a href="#">EthTSynCMLDS</a>                                                                                                                                                               |   |              |
| Description               | Reference to the pDelay configuration used for the CMLDS.<br>Using a reference here allows to not have to change the pDelay configuration, when changing from transport specific to CMLDS. |   |              |
| Multiplicity              | 1                                                                                                                                                                                          |   |              |
| Type                      | Reference to <a href="#">EthTSynPdelayConfig</a>                                                                                                                                           |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                      |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                           | X | All Variants |
|                           | Link time                                                                                                                                                                                  | – |              |
|                           | Post-build time                                                                                                                                                                            | – |              |
| Dependency                |                                                                                                                                                                                            |   |              |

]

## [ECUC\_EthTSyn\_00143] Definition of EcucReferenceDef EthTSynCMLDSVirtual PortRef [

|                          |                                                                                                                                                                      |  |  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Parameter Name           | EthTSynCMLDSVirtualPortRef                                                                                                                                           |  |  |
| Parent Container         | <a href="#">EthTSynCMLDS</a>                                                                                                                                         |  |  |
| Description              | This represents the reference to the virtual port (VLAN) used to transmit and receive p Delay messages. For each physical port the CMLDS uses a single virtual port. |  |  |
| Multiplicity             | 1                                                                                                                                                                    |  |  |
| Type                     | Reference to <a href="#">EthTSynVirtualPortConfiguration</a>                                                                                                         |  |  |
| Post-Build Variant Value | false                                                                                                                                                                |  |  |





| Value Configuration Class | Pre-compile time | X | All Variants |
|---------------------------|------------------|---|--------------|
|                           | Link time        | – |              |
|                           | Post-build time  | – |              |
| Dependency                |                  |   |              |

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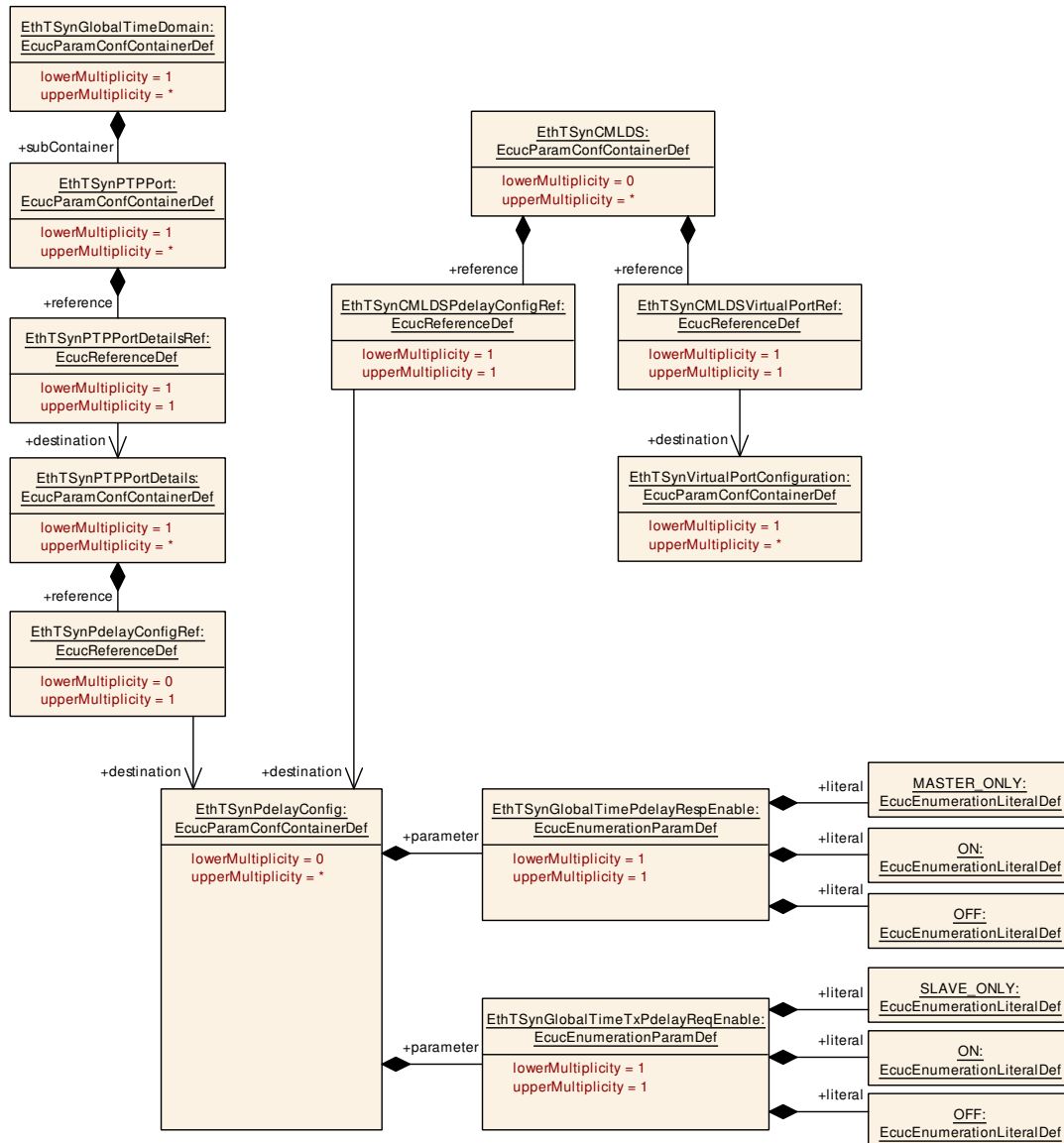


Figure 10.7: EthTSynCMLDS

### 10.2.10 EthTSynPhysicalPortConfiguration

[ECUC\_EthTSyn\_00139] Definition of EcucParamConfContainerDef EthTSynPhysicalPortConfiguration [

|                                         |                                                                                                                                            |   |              |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Container Name</b>                   | EthTSynPhysicalPortConfiguration                                                                                                           |   |              |
| <b>Parent Container</b>                 | <a href="#">EthTSyn</a>                                                                                                                    |   |              |
| <b>Description</b>                      | Configuration of a physical port.<br>The same configuration can be used by multiple physical ports through referencing this configuration. |   |              |
| <b>Multiplicity</b>                     | 1..*                                                                                                                                       |   |              |
| <b>Post-Build Variant Multiplicity</b>  | true                                                                                                                                       |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b>                                                                                                                    | X | All Variants |
|                                         | <b>Link time</b>                                                                                                                           | – |              |
|                                         | <b>Post-build time</b>                                                                                                                     | – |              |
| <b>Configuration Parameters</b>         |                                                                                                                                            |   |              |

| Included Parameters                                            |              |                      |
|----------------------------------------------------------------|--------------|----------------------|
| Parameter Name                                                 | Multiplicity | ECUC ID              |
| <a href="#">EthTSynGlobalTimeRxToUplinkSwitchResidenceTime</a> | 0..1         | [ECUC_EthTSyn_00060] |
| <a href="#">EthTSynGlobalTimeUplinkToTxSwitchResidenceTime</a> | 0..1         | [ECUC_EthTSyn_00061] |
| <a href="#">EthTSynHardwareTimestampSupport</a>                | 1            | [ECUC_EthTSyn_00018] |
| <a href="#">EthTSynPhysicalPortType</a>                        | 1            | [ECUC_EthTSyn_00140] |
| <a href="#">EthTSynSwitchManagementEthSwitchPortRef</a>        | 0..1         | [ECUC_EthTSyn_00066] |

|                               |
|-------------------------------|
| <b>No Included Containers</b> |
|-------------------------------|

]

## [ECUC\_EthTSyn\_00060] Definition of EcucFloatParamDef EthTSynGlobalTimeRxToUplinkSwitchResidenceTime [

|                                         |                                                                                                                                                                                                                               |   |              |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Parameter Name</b>                   | EthTSynGlobalTimeRxToUplinkSwitchResidenceTime                                                                                                                                                                                |   |              |
| <b>Parent Container</b>                 | <a href="#">EthTSynPhysicalPortConfiguration</a>                                                                                                                                                                              |   |              |
| <b>Description</b>                      | This parameter is specifying the default value used for the residence time of the Ethernet Switch [Ingress to Uplink].<br>This value is used by the EthTSyn if the calculation of the residence time failed.<br>Unit: seconds |   |              |
| <b>Multiplicity</b>                     | 0..1                                                                                                                                                                                                                          |   |              |
| <b>Type</b>                             | EcucFloatParamDef                                                                                                                                                                                                             |   |              |
| <b>Range</b>                            | [0 .. 4[                                                                                                                                                                                                                      |   |              |
| <b>Default value</b>                    | 0                                                                                                                                                                                                                             |   |              |
| <b>Post-Build Variant Multiplicity</b>  | false                                                                                                                                                                                                                         |   |              |
| <b>Post-Build Variant Value</b>         | false                                                                                                                                                                                                                         |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b>                                                                                                                                                                                                       | X | All Variants |
|                                         | <b>Link time</b>                                                                                                                                                                                                              | – |              |
|                                         | <b>Post-build time</b>                                                                                                                                                                                                        | – |              |
| <b>Value Configuration Class</b>        | <b>Pre-compile time</b>                                                                                                                                                                                                       | X | All Variants |
|                                         | <b>Link time</b>                                                                                                                                                                                                              | – |              |
|                                         | <b>Post-build time</b>                                                                                                                                                                                                        | – |              |
| <b>Dependency</b>                       |                                                                                                                                                                                                                               |   |              |

]

## [ECUC\_EthTSyn\_00061] Definition of EcucFloatParamDef EthTSynGlobalTimeUplinkToTxSwitchResidenceTime

|                                  |                                                                                                                                                                                                                              |   |              |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynGlobalTimeUplinkToTxSwitchResidenceTime                                                                                                                                                                               |   |              |
| Parent Container                 | <a href="#">EthTSynPhysicalPortConfiguration</a>                                                                                                                                                                             |   |              |
| Description                      | This parameter is specifying the default value used for the residence time of the Ethernet Switch [Uplink to Egress].<br>This value is used by the EthTSyn if the calculation of the residence time failed.<br>Unit: seconds |   |              |
| Multiplicity                     | 0..1                                                                                                                                                                                                                         |   |              |
| Type                             | EcucFloatParamDef                                                                                                                                                                                                            |   |              |
| Range                            | [0 .. 4[                                                                                                                                                                                                                     |   |              |
| Default value                    | 0                                                                                                                                                                                                                            |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                                                                                                                                        |   |              |
| Post-Build Variant Value         | false                                                                                                                                                                                                                        |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                                                             | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                    | – |              |
|                                  | Post-build time                                                                                                                                                                                                              | – |              |
| Value Configuration Class        | Pre-compile time                                                                                                                                                                                                             | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                    | – |              |
|                                  | Post-build time                                                                                                                                                                                                              | – |              |
| Dependency                       |                                                                                                                                                                                                                              |   |              |

]

## [ECUC\_EthTSyn\_00018] Definition of EcucBooleanParamDef EthTSynHardwareTimestampSupport

|                           |                                                                                                                                                                                               |   |              |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynHardwareTimestampSupport                                                                                                                                                               |   |              |
| Parent Container          | <a href="#">EthTSynPhysicalPortConfiguration</a>                                                                                                                                              |   |              |
| Description               | Activate/Deactivate the hardware time stamping functionality of the Ethernet hardware.<br>True: Timestamp is retrieved from the Ethernet hardware False: Timestamp is retrieved from the StbM |   |              |
| Multiplicity              | 1                                                                                                                                                                                             |   |              |
| Type                      | EcucBooleanParamDef                                                                                                                                                                           |   |              |
| Default value             | –                                                                                                                                                                                             |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                         |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                              | X | All Variants |
|                           | Link time                                                                                                                                                                                     | – |              |
|                           | Post-build time                                                                                                                                                                               | – |              |
| Dependency                |                                                                                                                                                                                               |   |              |

]

## [ECUC\_EthTSyn\_00140] Definition of EcucEnumerationParamDef EthTSynPhysicalPortType

|                  |                                                  |  |  |
|------------------|--------------------------------------------------|--|--|
| Parameter Name   | EthTSynPhysicalPortType                          |  |  |
| Parent Container | <a href="#">EthTSynPhysicalPortConfiguration</a> |  |  |
| Description      | Definition of the physical port type.            |  |  |
| Multiplicity     | 1                                                |  |  |





|                           |                         |             |              |
|---------------------------|-------------------------|-------------|--------------|
| Type                      | EcucEnumerationParamDef |             |              |
| Range                     | FullDuplex              | Full duplex |              |
|                           | HalfDuplex              | Half duplex |              |
| Post-Build Variant Value  | true                    |             |              |
| Value Configuration Class | Pre-compile time        | X           | All Variants |
|                           | Link time               | —           |              |
|                           | Post-build time         | —           |              |
| Dependency                |                         |             |              |

]

### [ECUC\_EthTSyn\_00066] Definition of EcucReferenceDef EthTSynSwitchManagementEthSwitchPortRef [

|                                  |                                                                                                        |   |              |
|----------------------------------|--------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynSwitchManagementEthSwitchPortRef                                                                |   |              |
| Parent Container                 | <a href="#">EthTSynPhysicalPortConfiguration</a>                                                       |   |              |
| Description                      | In an AVB-Bridge config, this reference is used to assign the EthTSyn-Port to an Ethernet Switch-Port. |   |              |
| Multiplicity                     | 0..1                                                                                                   |   |              |
| Type                             | Symbolic name reference to EthSwtPort                                                                  |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                  |   |              |
| Post-Build Variant Value         | false                                                                                                  |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                       | X | All Variants |
|                                  | Link time                                                                                              | – |              |
|                                  | Post-build time                                                                                        | – |              |
| Value Configuration Class        | Pre-compile time                                                                                       | X | All Variants |
|                                  | Link time                                                                                              | – |              |
|                                  | Post-build time                                                                                        | – |              |
| Dependency                       |                                                                                                        |   |              |

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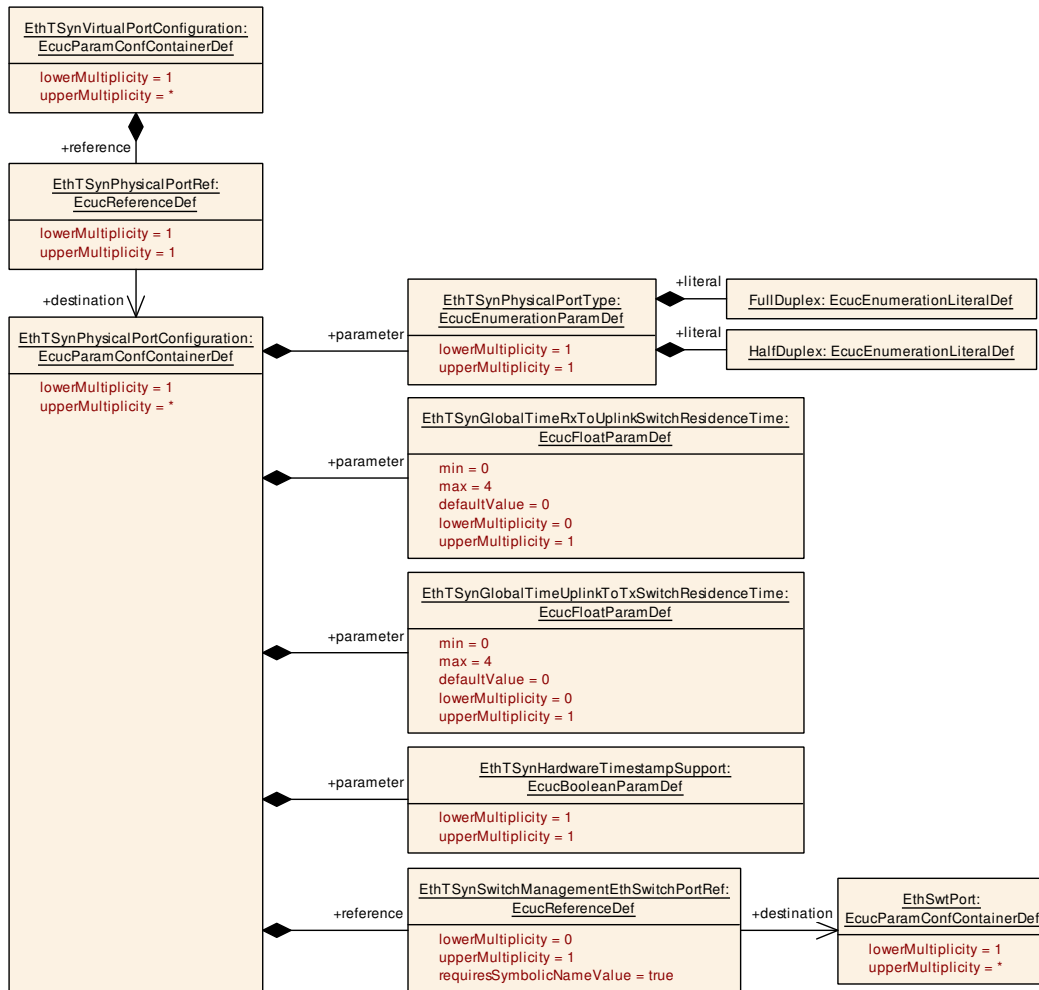


Figure 10.8: EthTSynPhysicalPortConfiguration

### 10.2.11 EthTSynVirtualPortConfiguration

[ECUC\_EthTSyn\_00137] Definition of EcucParamConfContainerDef EthTSynVirtualPortConfiguration

|                                  |                                                                                                                                                                  |   |              |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynVirtualPortConfiguration                                                                                                                                  |   |              |
| Parent Container                 | EthTSyn                                                                                                                                                          |   |              |
| Description                      | Configuration of a virtual port (VLAN) associated with a single physical port and used by different PTP and/or CMLDS ports to transmit and receive PTP messages. |   |              |
| Multiplicity                     | 1..*                                                                                                                                                             |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                                                             |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                 | X | All Variants |
|                                  | Link time                                                                                                                                                        | — |              |
|                                  | Post-build time                                                                                                                                                  | — |              |
| Configuration Parameters         |                                                                                                                                                                  |   |              |

| Included Parameters                       |              |                      |
|-------------------------------------------|--------------|----------------------|
| Parameter Name                            | Multiplicity | ECUC ID              |
| <a href="#">EthTSynGlobalTimeEthIfRef</a> | 1            | [ECUC_EthTSyn_00065] |
| <a href="#">EthTSynPhysicalPortRef</a>    | 1            | [ECUC_EthTSyn_00138] |

| Included Containers          |              |                                                                                                          |
|------------------------------|--------------|----------------------------------------------------------------------------------------------------------|
| Container Name               | Multiplicity | Dependency                                                                                               |
| <a href="#">EthTSynRxPdu</a> | 0..1         | PDU used for reception.<br>Supported MetaData entry: TIMETUPLE_TYPE_PTR<br><b>Tags:</b> atp.Status=draft |
| <a href="#">EthTSynTxPdu</a> | 0..1         | PDU used for transmission.<br><b>Tags:</b> atp.Status=draft                                              |

]

### [ECUC\_EthTSyn\_00065] Definition of EcucReferenceDef EthTSynGlobalTimeEthIfRef [

|                           |                                                                                                   |   |              |
|---------------------------|---------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimeEthIfRef                                                                         |   |              |
| Parent Container          | <a href="#">EthTSynVirtualPortConfiguration</a>                                                   |   |              |
| Description               | This represents the reference to the Ethernet interface used to exchange global time information. |   |              |
| Multiplicity              | 1                                                                                                 |   |              |
| Type                      | Symbolic name reference to EthIfController                                                        |   |              |
| Post-Build Variant Value  | false                                                                                             |   |              |
| Value Configuration Class | Pre-compile time                                                                                  | X | All Variants |
|                           | Link time                                                                                         | – |              |
|                           | Post-build time                                                                                   | – |              |
| Dependency                |                                                                                                   |   |              |

]

### [ECUC\_EthTSyn\_00138] Definition of EcucReferenceDef EthTSynPhysicalPortRef [

|                           |                                                               |   |              |
|---------------------------|---------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynPhysicalPortRef                                        |   |              |
| Parent Container          | <a href="#">EthTSynVirtualPortConfiguration</a>               |   |              |
| Description               | Reference to the physical port configuration.                 |   |              |
| Multiplicity              | 1                                                             |   |              |
| Type                      | Reference to <a href="#">EthTSynPhysicalPortConfiguration</a> |   |              |
| Post-Build Variant Value  | false                                                         |   |              |
| Value Configuration Class | Pre-compile time                                              | X | All Variants |
|                           | Link time                                                     | – |              |
|                           | Post-build time                                               | – |              |
| Dependency                |                                                               |   |              |

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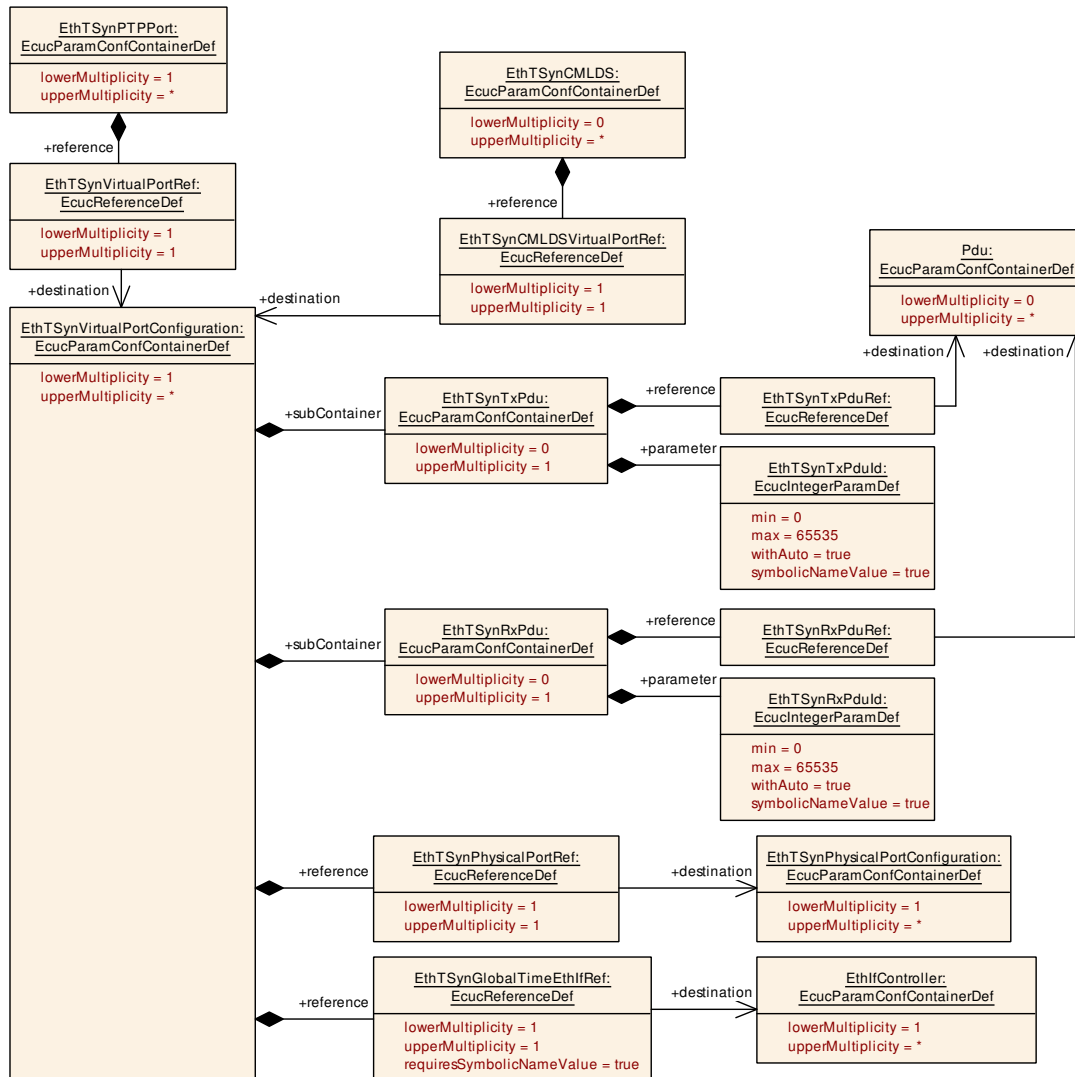


Figure 10.9: EthTSynVirtualPortConfiguration

### 10.2.12 EthTSynGlobalTimeTxIcvGeneration

[ECUC\_EthTSyn\_00096] Definition of EcucParamConfContainerDef EthTSynGlobalTimeTxIcvGeneration

|                                  |                                                                              |   |              |
|----------------------------------|------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynGlobalTimeTxIcvGeneration                                             |   |              |
| Parent Container                 | <a href="#">EthTSynPTPPortDetails</a>                                        |   |              |
| Description                      | This container collects configuration that shall be used for ICV generation. |   |              |
| Multiplicity                     | 0..1                                                                         |   |              |
| Post-Build Variant Multiplicity  | false                                                                        |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                             | X | All Variants |
|                                  | Link time                                                                    | — |              |





|                          |                 |   |  |
|--------------------------|-----------------|---|--|
|                          | Post-build time | – |  |
| Configuration Parameters |                 |   |  |

| Included Parameters                                  |              |                      |
|------------------------------------------------------|--------------|----------------------|
| Parameter Name                                       | Multiplicity | ECUC ID              |
| <a href="#">EthTSynIcvGenerationBase</a>             | 1            | [ECUC_EthTSyn_00098] |
| <a href="#">EthTSynIcvGenerationTimeout</a>          | 1            | [ECUC_EthTSyn_00101] |
| <a href="#">EthTSynIcvTxLength</a>                   | 1            | [ECUC_EthTSyn_00099] |
| <a href="#">EthTSynTxAuthenticationBuildAttempts</a> | 1            | [ECUC_EthTSyn_00113] |
| <a href="#">EthTSynIcvGenerationFvldRef</a>          | 0..1         | [ECUC_EthTSyn_00097] |
| <a href="#">EthTSynIcvGenerationJobRef</a>           | 1            | [ECUC_EthTSyn_00100] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

## [ECUC\_EthTSyn\_00098] Definition of EcucEnumerationParamDef EthTSynIcvGenerationBase [

|                           |                                                                       |                                                           |              |
|---------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------|--------------|
| Parameter Name            | EthTSynIcvGenerationBase                                              |                                                           |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeTxIcvGeneration</a>                      |                                                           |              |
| Description               | Symmetric or asymmetric cryptography selection for the ICV generation |                                                           |              |
| Multiplicity              | 1                                                                     |                                                           |              |
| Type                      | EcucEnumerationParamDef                                               |                                                           |              |
| Range                     | ICV_MAC                                                               | Symmetric cryptography selection for the ICV generation.  |              |
|                           | ICV_SIGNATURE                                                         | Asymmetric cryptography selection for the ICV generation. |              |
| Post-Build Variant Value  | false                                                                 |                                                           |              |
| Value Configuration Class | Pre-compile time                                                      | X                                                         | All Variants |
|                           | Link time                                                             | —                                                         |              |
|                           | Post-build time                                                       | —                                                         |              |
| Dependency                |                                                                       |                                                           |              |

]

## [ECUC\_EthTSyn\_00101] Definition of EcucFloatParamDef EthTSynIcvGenerationTimeout [

|                          |                                                                                                                                                      |  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Parameter Name           | EthTSynIcvGenerationTimeout                                                                                                                          |  |
| Parent Container         | <a href="#">EthTSynGlobalTimeTxIcvGeneration</a>                                                                                                     |  |
| Description              | Timeout of ICV generation (respective CSM job completion in asynchronous behaviour). A value of 0 disables the ICV timeout monitoring. Unit: Seconds |  |
| Multiplicity             | 1                                                                                                                                                    |  |
| Type                     | EcucFloatParamDef                                                                                                                                    |  |
| Range                    | [0 .. INF[                                                                                                                                           |  |
| Default value            | —                                                                                                                                                    |  |
| Post-Build Variant Value | false                                                                                                                                                |  |





|                           |                  |   |              |
|---------------------------|------------------|---|--------------|
| Value Configuration Class | Pre-compile time | X | All Variants |
|                           | Link time        | – |              |
|                           | Post-build time  | – |              |
| Dependency                |                  |   |              |

]

### [ECUC\_EthTSyn\_00099] Definition of EcucIntegerParamDef EthTSynIcvTxLength

|                           |                                                                                 |   |              |
|---------------------------|---------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynIcvTxLength                                                              |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeTxIcvGeneration</a>                                |   |              |
| Description               | Length of ICV to be transmitted within Follow_Up Message on the bus (in bytes). |   |              |
| Multiplicity              | 1                                                                               |   |              |
| Type                      | EcucIntegerParamDef                                                             |   |              |
| Range                     | 0 .. 1061                                                                       |   |              |
| Default value             | –                                                                               |   |              |
| Post-Build Variant Value  | false                                                                           |   |              |
| Value Configuration Class | Pre-compile time                                                                | X | All Variants |
|                           | Link time                                                                       | – |              |
|                           | Post-build time                                                                 | – |              |
| Dependency                |                                                                                 |   |              |

]

### [ECUC\_EthTSyn\_00113] Definition of EcucIntegerParamDef EthTSynTxAuthenticationBuildAttempts

|                           |                                                                                                                                                                                                                                    |   |              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTxAuthenticationBuildAttempts                                                                                                                                                                                               |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeTxIcvGeneration</a>                                                                                                                                                                                   |   |              |
| Description               | This parameter specifies the number of authentication build attempts that are to be carried out when the generation of the ICV failed for a given Follow_Up message. If zero is set, then only one ICV generation attempt is done. |   |              |
| Multiplicity              | 1                                                                                                                                                                                                                                  |   |              |
| Type                      | EcucIntegerParamDef                                                                                                                                                                                                                |   |              |
| Range                     | 0 .. 65535                                                                                                                                                                                                                         |   |              |
| Default value             | 0                                                                                                                                                                                                                                  |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                                                              |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                                                   | X | All Variants |
|                           | Link time                                                                                                                                                                                                                          | – |              |
|                           | Post-build time                                                                                                                                                                                                                    | – |              |
| Dependency                |                                                                                                                                                                                                                                    |   |              |

]

### [ECUC\_EthTSyn\_00097] Definition of EcucReferenceDef EthTSynIcvGeneration FvldRef [

|                                  |                                                                               |   |              |
|----------------------------------|-------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynIcvGenerationFvldRef                                                   |   |              |
| Parent Container                 | <a href="#">EthTSynGlobalTimeTxIcvGeneration</a>                              |   |              |
| Description                      | This represents the reference to the FV taken to generate the ICV generation. |   |              |
| Multiplicity                     | 0..1                                                                          |   |              |
| Type                             | Symbolic name reference to StbMFreshnessValue                                 |   |              |
| Post-Build Variant Multiplicity  | false                                                                         |   |              |
| Post-Build Variant Value         | false                                                                         |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                              | X | All Variants |
|                                  | Link time                                                                     | – |              |
|                                  | Post-build time                                                               | – |              |
| Value Configuration Class        | Pre-compile time                                                              | X | All Variants |
|                                  | Link time                                                                     | – |              |
|                                  | Post-build time                                                               | – |              |
| Dependency                       |                                                                               |   |              |

]

### [ECUC\_EthTSyn\_00100] Definition of EcucReferenceDef EthTSynIcvGeneration JobRef [

|                           |                                                                       |   |              |
|---------------------------|-----------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynIcvGenerationJobRef                                            |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeTxIcvGeneration</a>                      |   |              |
| Description               | This represents the reference to the CSM job to fetch the CSM job ID. |   |              |
| Multiplicity              | 1                                                                     |   |              |
| Type                      | Symbolic name reference to CsmJob                                     |   |              |
| Post-Build Variant Value  | false                                                                 |   |              |
| Value Configuration Class | Pre-compile time                                                      | X | All Variants |
|                           | Link time                                                             | – |              |
|                           | Post-build time                                                       | – |              |
| Dependency                |                                                                       |   |              |

]

## 10.2.13 EthTSynGlobalTimeRxIcvVerification

### [ECUC\_EthTSyn\_00104] Definition of EcucParamConfContainerDef EthTSynGlobalTimeRxIcvVerification [

|                                  |                                                                                |   |              |
|----------------------------------|--------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynGlobalTimeRxIcvVerification                                             |   |              |
| Parent Container                 | <a href="#">EthTSynPTPPortDetails</a>                                          |   |              |
| Description                      | This container collects configuration that shall be used for ICV verification. |   |              |
| Multiplicity                     | 0..1                                                                           |   |              |
| Post-Build Variant Multiplicity  | false                                                                          |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                               | X | All Variants |





|                          |                 |   |  |
|--------------------------|-----------------|---|--|
|                          | Link time       | – |  |
|                          | Post-build time | – |  |
| Configuration Parameters |                 |   |  |

| Included Parameters                                  |              |                      |
|------------------------------------------------------|--------------|----------------------|
| Parameter Name                                       | Multiplicity | ECUC ID              |
| <a href="#">EthTSynIcvRxLength</a>                   | 1            | [ECUC_EthTSyn_00107] |
| <a href="#">EthTSynIcvVerificationAttempts</a>       | 1            | [ECUC_EthTSyn_00110] |
| <a href="#">EthTSynIcvVerificationBase</a>           | 1            | [ECUC_EthTSyn_00106] |
| <a href="#">EthTSynIcvVerificationTimeout</a>        | 1            | [ECUC_EthTSyn_00109] |
| <a href="#">EthTSynRxAuthenticationBuildAttempts</a> | 1            | [ECUC_EthTSyn_00112] |
| <a href="#">EthTSynIcvVerificationFvldRef</a>        | 0..1         | [ECUC_EthTSyn_00105] |
| <a href="#">EthTSynIcvVerificationJobRef</a>         | 1            | [ECUC_EthTSyn_00108] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

## [ECUC\_EthTSyn\_00107] Definition of EcucIntegerParamDef EthTSynIcvRxLength [

|                           |                                                                                 |   |              |
|---------------------------|---------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynIcvRxLength                                                              |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeRxIcvVerification</a>                              |   |              |
| Description               | Length of ICV to be transmitted within Follow_Up Message on the bus (in bytes). |   |              |
| Multiplicity              | 1                                                                               |   |              |
| Type                      | EcucIntegerParamDef                                                             |   |              |
| Range                     | 0 .. 1061                                                                       |   |              |
| Default value             | –                                                                               |   |              |
| Post-Build Variant Value  | false                                                                           |   |              |
| Value Configuration Class | Pre-compile time                                                                | X | All Variants |
|                           | Link time                                                                       | – |              |
|                           | Post-build time                                                                 | – |              |
| Dependency                |                                                                                 |   |              |

]

## [ECUC\_EthTSyn\_00110] Definition of EcucIntegerParamDef EthTSynIcvVerificationAttempts [

|                  |                                                                                                                                                                                                                                            |  |  |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Parameter Name   | EthTSynIcvVerificationAttempts                                                                                                                                                                                                             |  |  |
| Parent Container | <a href="#">EthTSynGlobalTimeRxIcvVerification</a>                                                                                                                                                                                         |  |  |
| Description      | This parameter specifies the number of ICV verification attempts that are to be carried out when the verification of the ICV failed for a given secured Follow_Up message. If zero is set, then only one ICV verification attempt is done. |  |  |
| Multiplicity     | 1                                                                                                                                                                                                                                          |  |  |
| Type             | EcucIntegerParamDef                                                                                                                                                                                                                        |  |  |
| Range            | 0 .. 65535                                                                                                                                                                                                                                 |  |  |
| Default value    | 0                                                                                                                                                                                                                                          |  |  |





|                           |                  |   |              |
|---------------------------|------------------|---|--------------|
| Post-Build Variant Value  | false            |   |              |
| Value Configuration Class | Pre-compile time | X | All Variants |
|                           | Link time        | – |              |
|                           | Post-build time  | – |              |
| Dependency                |                  |   |              |

]

### [ECUC\_EthTSyn\_00106] Definition of EcucEnumerationParamDef EthTSynIcvVerificationBase [

|                           |                                                                       |                                                           |              |
|---------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------|--------------|
| Parameter Name            | EthTSynIcvVerificationBase                                            |                                                           |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeRxIcvVerification</a>                    |                                                           |              |
| Description               | Symmetric or asymmetric cryptography selection for the ICV generation |                                                           |              |
| Multiplicity              | 1                                                                     |                                                           |              |
| Type                      | EcucEnumerationParamDef                                               |                                                           |              |
| Range                     | ICV_MAC                                                               | Symmetric cryptography selection for the ICV generation.  |              |
|                           | ICV_SIGNATURE                                                         | Asymmetric cryptography selection for the ICV generation. |              |
| Post-Build Variant Value  | false                                                                 |                                                           |              |
| Value Configuration Class | Pre-compile time                                                      | X                                                         | All Variants |
|                           | Link time                                                             | —                                                         |              |
|                           | Post-build time                                                       | —                                                         |              |
| Dependency                |                                                                       |                                                           |              |

]

### [ECUC\_EthTSyn\_00109] Definition of EcucFloatParamDef EthTSynIcvVerificationTimeout [

|                           |                                                                                                                                                       |   |              |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynIcvVerificationTimeout                                                                                                                         |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeRxIcvVerification</a>                                                                                                    |   |              |
| Description               | Timeout of ICV verification (respective CSM job completion in asynchronous behavior). A value of 0 disables the ICV timeout monitoring. Unit: Seconds |   |              |
| Multiplicity              | 1                                                                                                                                                     |   |              |
| Type                      | EcucFloatParamDef                                                                                                                                     |   |              |
| Range                     | [0 .. INF[                                                                                                                                            |   |              |
| Default value             | –                                                                                                                                                     |   |              |
| Post-Build Variant Value  | false                                                                                                                                                 |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                      | X | All Variants |
|                           | Link time                                                                                                                                             | – |              |
|                           | Post-build time                                                                                                                                       | – |              |
| Dependency                |                                                                                                                                                       |   |              |

]

## [ECUC\_EthTSyn\_00112] Definition of EcucIntegerParamDef EthTSynRxAuthenticationBuildAttempts

|                           |                                                                                                                                                                                                                                        |   |              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynRxAuthenticationBuildAttempts                                                                                                                                                                                                   |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeRxIcvVerification</a>                                                                                                                                                                                     |   |              |
| Description               | This parameter specifies the number of authentication build attempts that are to be carried out when the verification of the ICV failed for a given Follow_Up message. If zero is set, then only one ICV verification attempt is done. |   |              |
| Multiplicity              | 1                                                                                                                                                                                                                                      |   |              |
| Type                      | EcucIntegerParamDef                                                                                                                                                                                                                    |   |              |
| Range                     | 0 .. 65535                                                                                                                                                                                                                             |   |              |
| Default value             | 0                                                                                                                                                                                                                                      |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                                                                  |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                                                       | X | All Variants |
|                           | Link time                                                                                                                                                                                                                              | – |              |
|                           | Post-build time                                                                                                                                                                                                                        | – |              |
| Dependency                |                                                                                                                                                                                                                                        |   |              |

## [ECUC\_EthTSyn\_00105] Definition of EcucReferenceDef EthTSynIcvVerificationFvIdRef

|                                  |                                                                  |   |              |
|----------------------------------|------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynIcvVerificationFvIdRef                                    |   |              |
| Parent Container                 | <a href="#">EthTSynGlobalTimeRxIcvVerification</a>               |   |              |
| Description                      | This represents the reference to the FV taken to verify the ICV. |   |              |
| Multiplicity                     | 0..1                                                             |   |              |
| Type                             | Symbolic name reference to StbMFreshnessValue                    |   |              |
| Post-Build Variant Multiplicity  | false                                                            |   |              |
| Post-Build Variant Value         | false                                                            |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                 | X | All Variants |
|                                  | Link time                                                        | – |              |
|                                  | Post-build time                                                  | – |              |
| Value Configuration Class        | Pre-compile time                                                 | X | All Variants |
|                                  | Link time                                                        | – |              |
|                                  | Post-build time                                                  | – |              |
| Dependency                       |                                                                  |   |              |

## [ECUC\_EthTSyn\_00108] Definition of EcucReferenceDef EthTSynIcvVerificationJobRef

|                           |                                                                       |   |              |
|---------------------------|-----------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynIcvVerificationJobRef                                          |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeRxIcvVerification</a>                    |   |              |
| Description               | This represents the reference to the CSM job to fetch the CSM job ID. |   |              |
| Multiplicity              | 1                                                                     |   |              |
| Type                      | Symbolic name reference to CsmJob                                     |   |              |
| Post-Build Variant Value  | false                                                                 |   |              |
| Value Configuration Class | Pre-compile time                                                      | X | All Variants |





|            |                 |   |  |
|------------|-----------------|---|--|
|            | Link time       | – |  |
|            | Post-build time | – |  |
| Dependency |                 |   |  |

]

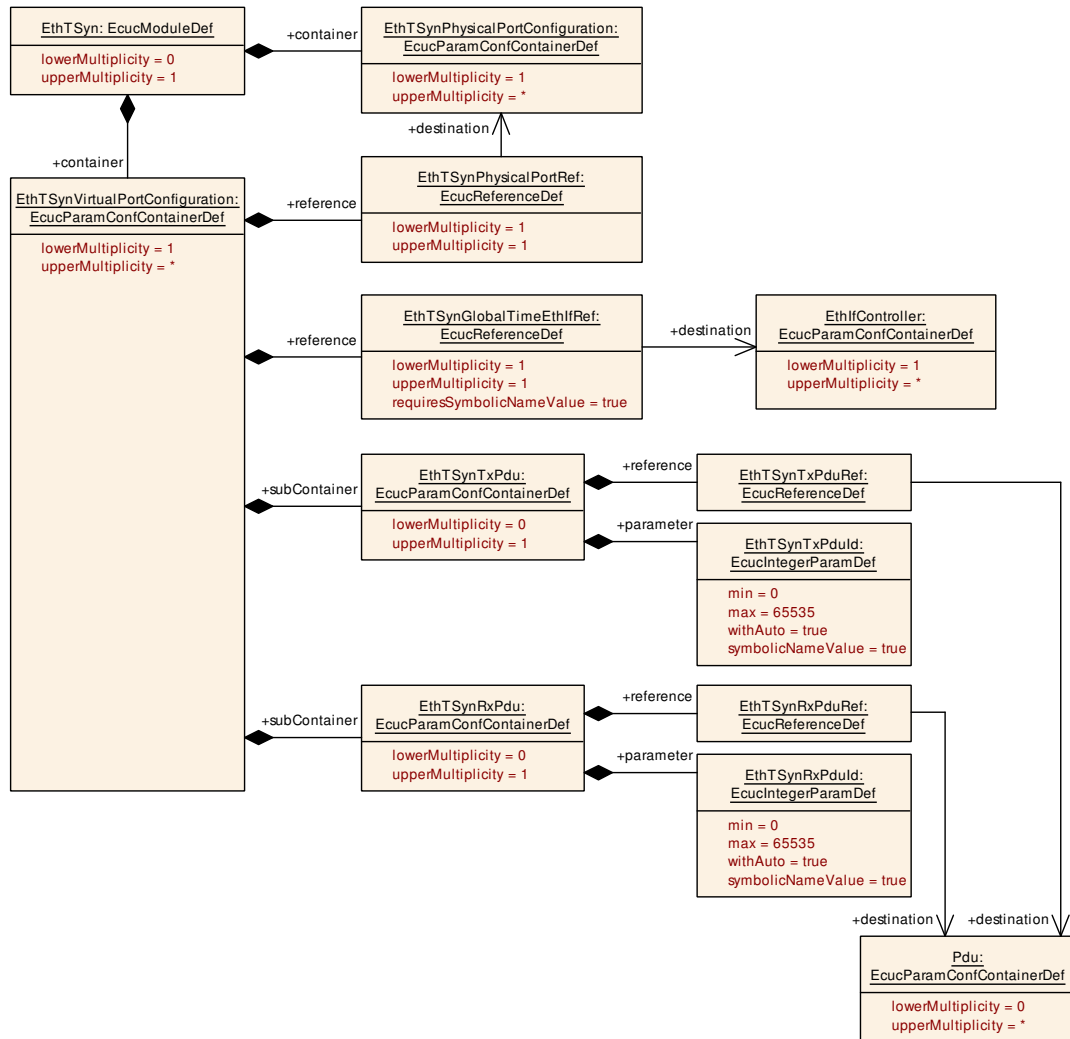


Figure 10.10: EthTSyn\_GlobalTimePdu

#### 10.2.14 EthTSynTxPdu

#### [ECUC\_EthTSyn\_00122] Definition of EcucParamConfContainerDef EthTSynTxPdu

Status: DRAFT

[

|                                  |                                                             |   |              |
|----------------------------------|-------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynTxPdu                                                |   |              |
| Parent Container                 | <a href="#">EthTSynVirtualPortConfiguration</a>             |   |              |
| Description                      | PDU used for transmission.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity                     | 0..1                                                        |   |              |
| Post-Build Variant Multiplicity  | false                                                       |   |              |
| Multiplicity Configuration Class | Pre-compile time                                            | X | All Variants |
|                                  | Link time                                                   | – |              |
|                                  | Post-build time                                             | – |              |
| Configuration Parameters         |                                                             |   |              |

| Included Parameters             |              |                      |
|---------------------------------|--------------|----------------------|
| Parameter Name                  | Multiplicity | ECUC ID              |
| <a href="#">EthTSynTxPduld</a>  | 1            | [ECUC_EthTSyn_00121] |
| <a href="#">EthTSynTxPduRef</a> | 1            | [ECUC_EthTSyn_00123] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

## [ECUC\_EthTSyn\_00121] Definition of EcucIntegerParamDef EthTSynTxPduld

Status: DRAFT

[

|                           |                                                                                     |   |              |
|---------------------------|-------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTxPduld                                                                      |   |              |
| Parent Container          | <a href="#">EthTSynTxPdu</a>                                                        |   |              |
| Description               | PDU identifier used for TxConfirmation from LSduR.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity              | 1                                                                                   |   |              |
| Type                      | EcucIntegerParamDef (Symbolic Name generated for this parameter)                    |   |              |
| Range                     | 0 .. 65535                                                                          |   |              |
| Default value             | –                                                                                   |   |              |
| Post-Build Variant Value  | false                                                                               |   |              |
| Value Configuration Class | Pre-compile time                                                                    | X | All Variants |
|                           | Link time                                                                           | – |              |
|                           | Post-build time                                                                     | – |              |
| Dependency                | withAuto = true                                                                     |   |              |

]

## [ECUC\_EthTSyn\_00123] Definition of EcucReferenceDef EthTSynTxPduRef

Status: DRAFT

[

|                           |                                                                                    |   |              |
|---------------------------|------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTxPduRef                                                                    |   |              |
| Parent Container          | <a href="#">EthTSynTxPdu</a>                                                       |   |              |
| Description               | Reference to the Pdu object representing the PDU.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity              | 1                                                                                  |   |              |
| Type                      | Reference to Pdu                                                                   |   |              |
| Post-Build Variant Value  | false                                                                              |   |              |
| Value Configuration Class | Pre-compile time                                                                   | X | All Variants |
|                           | Link time                                                                          | – |              |
|                           | Post-build time                                                                    | – |              |
| Dependency                |                                                                                    |   |              |

]

### 10.2.15 EthTSynRxPdu

## [ECUC\_EthTSyn\_00124] Definition of EcucParamConfContainerDef EthTSynRxPdu

Status: DRAFT

[

|                                  |                                                                                                          |   |              |
|----------------------------------|----------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynRxPdu                                                                                             |   |              |
| Parent Container                 | <a href="#">EthTSynVirtualPortConfiguration</a>                                                          |   |              |
| Description                      | PDU used for reception.<br>Supported MetaData entry: TIMETUPLE_TYPE_PTR<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity                     | 0..1                                                                                                     |   |              |
| Post-Build Variant Multiplicity  | false                                                                                                    |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                         | X | All Variants |
|                                  | Link time                                                                                                | – |              |
|                                  | Post-build time                                                                                          | – |              |
| Configuration Parameters         |                                                                                                          |   |              |

| Included Parameters             |              |                      |
|---------------------------------|--------------|----------------------|
| Parameter Name                  | Multiplicity | ECUC ID              |
| <a href="#">EthTSynRxPduId</a>  | 1            | [ECUC_EthTSyn_00125] |
| <a href="#">EthTSynRxPduRef</a> | 1            | [ECUC_EthTSyn_00126] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

## [ECUC\_EthTSyn\_00125] Definition of EcucIntegerParamDef EthTSynRxPduld

Status: DRAFT

[

|                           |                                                                                   |   |              |
|---------------------------|-----------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynRxPduld                                                                    |   |              |
| Parent Container          | <a href="#">EthTSynRxPdu</a>                                                      |   |              |
| Description               | PDU identifier used for RxIndication from LSduR.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity              | 1                                                                                 |   |              |
| Type                      | EcucIntegerParamDef (Symbolic Name generated for this parameter)                  |   |              |
| Range                     | 0 .. 65535                                                                        |   |              |
| Default value             | –                                                                                 |   |              |
| Post-Build Variant Value  | false                                                                             |   |              |
| Value Configuration Class | Pre-compile time                                                                  | X | All Variants |
|                           | Link time                                                                         | – |              |
|                           | Post-build time                                                                   | – |              |
| Dependency                | withAuto = true                                                                   |   |              |

]

## [ECUC\_EthTSyn\_00126] Definition of EcucReferenceDef EthTSynRxPduRef

Status: DRAFT

[

|                           |                                                                                    |   |              |
|---------------------------|------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynRxPduRef                                                                    |   |              |
| Parent Container          | <a href="#">EthTSynRxPdu</a>                                                       |   |              |
| Description               | Reference to the Pdu object representing the PDU.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity              | 1                                                                                  |   |              |
| Type                      | Reference to Pdu                                                                   |   |              |
| Post-Build Variant Value  | false                                                                              |   |              |
| Value Configuration Class | Pre-compile time                                                                   | X | All Variants |
|                           | Link time                                                                          | – |              |
|                           | Post-build time                                                                    | – |              |
| Dependency                |                                                                                    |   |              |

]

### 10.2.16 EthTSynPdelayConfig

## [ECUC\_EthTSyn\_00068] Definition of EcucParamConfContainerDef EthTSynPdelayConfig [

|                                  |                                                                                                               |   |              |
|----------------------------------|---------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynPdelayConfig                                                                                           |   |              |
| Parent Container                 | EthTSyn                                                                                                       |   |              |
| Description                      | Configuration of cyclic propagation delay measurement.<br>This can be used by either a PTP port or the CMLDS. |   |              |
| Multiplicity                     | 0..*                                                                                                          |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                          |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                              | X | All Variants |
|                                  | Link time                                                                                                     | – |              |
|                                  | Post-build time                                                                                               | – |              |
| Configuration Parameters         |                                                                                                               |   |              |

| Included Parameters                     |              |                      |
|-----------------------------------------|--------------|----------------------|
| Parameter Name                          | Multiplicity | ECUC ID              |
| EthTSynGlobalTimePdelayRespEnable       | 1            | [ECUC_EthTSyn_00129] |
| EthTSynGlobalTimePropagationDelay       | 1            | [ECUC_EthTSyn_00070] |
| EthTSynGlobalTimeTxPdelayReqEnable      | 1            | [ECUC_EthTSyn_00144] |
| EthTSynGlobalTimeTxPdelayReqPeriod      | 1            | [ECUC_EthTSyn_00071] |
| EthTSynPdelayLatencyThreshold           | 0..1         | [ECUC_EthTSyn_00076] |
| EthTSynPdelayRespAndRespFollowUpTimeout | 1            | [ECUC_EthTSyn_00074] |
| EthTSynRateRatioMeasurementCount        | 1            | [ECUC_EthTSyn_00117] |

|                        |
|------------------------|
| No Included Containers |
|------------------------|

]

## [ECUC\_EthTSyn\_00129] Definition of EcucEnumerationParamDef EthTSynGlobalTimePdelayRespEnable [

|                           |                                                                                                    |                                    |              |
|---------------------------|----------------------------------------------------------------------------------------------------|------------------------------------|--------------|
| Parameter Name            | EthTSynGlobalTimePdelayRespEnable                                                                  |                                    |              |
| Parent Container          | <a href="#">EthTSynPdelayConfig</a>                                                                |                                    |              |
| Description               | Determines if a Pdelay Response message is transmitted upon reception of a Pdelay Request message. |                                    |              |
| Multiplicity              | 1                                                                                                  |                                    |              |
| Type                      | EcucEnumerationParamDef                                                                            |                                    |              |
| Range                     | MASTER_ONLY                                                                                        | only if Port is in TimeMaster role |              |
|                           | OFF                                                                                                | never                              |              |
|                           | ON                                                                                                 | always                             |              |
| Post-Build Variant Value  | true                                                                                               |                                    |              |
| Value Configuration Class | Pre-compile time                                                                                   | X                                  | All Variants |
|                           | Link time                                                                                          | —                                  |              |
|                           | Post-build time                                                                                    | —                                  |              |
| Dependency                |                                                                                                    |                                    |              |

]

### [ECUC\_EthTSyn\_00070] Definition of EcucFloatParamDef EthTSynGlobalTimePropagationDelay

|                           |                                                                                                                                                                                                                                                                                                                                            |   |              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimePropagationDelay                                                                                                                                                                                                                                                                                                          |   |              |
| Parent Container          | <a href="#">EthTSynPdelayConfig</a>                                                                                                                                                                                                                                                                                                        |   |              |
| Description               | If cyclic propagation delay measurement is enabled, this parameter represents the default value of the propagation delay until the first actually measured propagation delay is available.<br>If cyclic propagation delay measurement is disabled, this parameter replaces a measured propagation delay by a fixed value.<br>Unit: seconds |   |              |
| Multiplicity              | 1                                                                                                                                                                                                                                                                                                                                          |   |              |
| Type                      | EcucFloatParamDef                                                                                                                                                                                                                                                                                                                          |   |              |
| Range                     | [0 .. 4]                                                                                                                                                                                                                                                                                                                                   |   |              |
| Default value             | 0                                                                                                                                                                                                                                                                                                                                          |   |              |
| Post-Build Variant Value  | true                                                                                                                                                                                                                                                                                                                                       |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                                                                                                                                                           | X | All Variants |
|                           | Link time                                                                                                                                                                                                                                                                                                                                  | – |              |
|                           | Post-build time                                                                                                                                                                                                                                                                                                                            | – |              |
| Dependency                |                                                                                                                                                                                                                                                                                                                                            |   |              |

### [ECUC\_EthTSyn\_00144] Definition of EcucEnumerationParamDef EthTSynGlobalTimeTxPdelayReqEnable

|                           |                                                        |                                   |              |
|---------------------------|--------------------------------------------------------|-----------------------------------|--------------|
| Parameter Name            | EthTSynGlobalTimeTxPdelayReqEnable                     |                                   |              |
| Parent Container          | <a href="#">EthTSynPdelayConfig</a>                    |                                   |              |
| Description               | Determines if Pdelay Request messages are transmitted. |                                   |              |
| Multiplicity              | 1                                                      |                                   |              |
| Type                      | EcucEnumerationParamDef                                |                                   |              |
| Range                     | OFF                                                    | never                             |              |
|                           | ON                                                     | always                            |              |
|                           | SLAVE_ONLY                                             | only if Port is in TimeSlave role |              |
| Post-Build Variant Value  | true                                                   |                                   |              |
| Value Configuration Class | Pre-compile time                                       | X                                 | All Variants |
|                           | Link time                                              | –                                 |              |
|                           | Post-build time                                        | –                                 |              |
| Dependency                |                                                        |                                   |              |

### [ECUC\_EthTSyn\_00071] Definition of EcucFloatParamDef EthTSynGlobalTimeTxPdelayReqPeriod

|                  |                                                                                                                                                                 |  |  |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Parameter Name   | EthTSynGlobalTimeTxPdelayReqPeriod                                                                                                                              |  |  |
| Parent Container | <a href="#">EthTSynPdelayConfig</a>                                                                                                                             |  |  |
| Description      | <p>This represents configuration of the TX period for Pdelay_Req messages.</p> <p>A value of 0 disables the cyclic Pdelay measurement.</p> <p>Unit: seconds</p> |  |  |
| Multiplicity     | 1                                                                                                                                                               |  |  |





|                           |                   |   |              |
|---------------------------|-------------------|---|--------------|
| Type                      | EcucFloatParamDef |   |              |
| Range                     | [0 .. 4]          |   |              |
| Default value             | 0                 |   |              |
| Post-Build Variant Value  | true              |   |              |
| Value Configuration Class | Pre-compile time  | X | All Variants |
|                           | Link time         | – |              |
|                           | Post-build time   | – |              |
| Dependency                |                   |   |              |

]

### [ECUC\_EthTSyn\_00076] Definition of EcucFloatParamDef EthTSynPdelayLatencyThreshold [

|                           |                                                                                                                                         |   |              |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynPdelayLatencyThreshold                                                                                                           |   |              |
| Parent Container          | <a href="#">EthTSynPdelayConfig</a>                                                                                                     |   |              |
| Description               | Threshold for calculated Pdelay. If a measured Pdelay exceeds EthTSynPdelayLatency Threshold, this value is discarded.<br>Unit: seconds |   |              |
| Multiplicity              | 0..1                                                                                                                                    |   |              |
| Type                      | EcucFloatParamDef                                                                                                                       |   |              |
| Range                     | ]0 .. INF[                                                                                                                              |   |              |
| Default value             | 1E-5                                                                                                                                    |   |              |
| Post-Build Variant Value  | true                                                                                                                                    |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                        | X | All Variants |
|                           | Link time                                                                                                                               | – |              |
|                           | Post-build time                                                                                                                         | – |              |
| Dependency                |                                                                                                                                         |   |              |

]

### [ECUC\_EthTSyn\_00074] Definition of EcucFloatParamDef EthTSynPdelayRespAndRespFollowUpTimeout [

|                           |                                                                                                                                                                                                               |   |              |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynPdelayRespAndRespFollowUpTimeout                                                                                                                                                                       |   |              |
| Parent Container          | <a href="#">EthTSynPdelayConfig</a>                                                                                                                                                                           |   |              |
| Description               | Timeout value for Pdelay_Resp and Pdelay_Resp_Follow_Up after a Pdelay_Req has been transmitted resp. a Pdelay_Resp has been received.<br>A value of 0 deactivates this timeout observation.<br>Unit: seconds |   |              |
| Multiplicity              | 1                                                                                                                                                                                                             |   |              |
| Type                      | EcucFloatParamDef                                                                                                                                                                                             |   |              |
| Range                     | [0 .. 4]                                                                                                                                                                                                      |   |              |
| Default value             | –                                                                                                                                                                                                             |   |              |
| Post-Build Variant Value  | true                                                                                                                                                                                                          |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                              | X | All Variants |
|                           | Link time                                                                                                                                                                                                     | – |              |
|                           | Post-build time                                                                                                                                                                                               | – |              |
| Dependency                |                                                                                                                                                                                                               |   |              |

]

## [ECUC\_EthTSyn\_00117] Definition of EcucIntegerParamDef EthTSynRateRatioMeasurementCount

Status: DRAFT

|                           |                                                                                                                                                                           |   |              |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynRateRatioMeasurementCount                                                                                                                                          |   |              |
| Parent Container          | <a href="#">EthTSynPdelayConfig</a>                                                                                                                                       |   |              |
| Description               | This parameter defines the number of successful pDelay measurements used to calculate the neighbor rate ratio according to IEEE 802.1AS.<br><b>Tags:</b> atp.Status=draft |   |              |
| Multiplicity              | 1                                                                                                                                                                         |   |              |
| Type                      | EcucIntegerParamDef                                                                                                                                                       |   |              |
| Range                     | 1 .. 255                                                                                                                                                                  |   |              |
| Default value             | –                                                                                                                                                                         |   |              |
| Post-Build Variant Value  | true                                                                                                                                                                      |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                          | X | All Variants |
|                           | Link time                                                                                                                                                                 | – |              |
|                           | Post-build time                                                                                                                                                           | – |              |
| Dependency                |                                                                                                                                                                           |   |              |

## 10.2.17 EthTSynGlobalTimeMasterConfig

### [ECUC\_EthTSyn\_00008] Definition of EcucParamConfContainerDef EthTSynGlobalTimeMasterConfig

|                                  |                                                                                                                                                                                                                                                                                                                             |   |              |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynGlobalTimeMasterConfig                                                                                                                                                                                                                                                                                               |   |              |
| Parent Container                 | <a href="#">EthTSyn</a>                                                                                                                                                                                                                                                                                                     |   |              |
| Description                      | Configuration of a global-time master.<br>The exact role of the port is defined by EthTSynPortRole. A global-time master may or may not exist on the configured ECU.<br>Each global-time domain may have multiple ports in the time master role (see Time Gateway) to e.g. relay global-time from a global time slave port. |   |              |
| Multiplicity                     | 0..*                                                                                                                                                                                                                                                                                                                        |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                                                                                                                                                                                                                        |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                                                                                                                                                            | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                                                                                                                   | – |              |
|                                  | Post-build time                                                                                                                                                                                                                                                                                                             | – |              |
| Configuration Parameters         |                                                                                                                                                                                                                                                                                                                             |   |              |

| Included Parameters                            |              |                      |
|------------------------------------------------|--------------|----------------------|
| Parameter Name                                 | Multiplicity | ECUC ID              |
| <a href="#">EthTSynCyclicMsgResumeTime</a>     | 1            | [ECUC_EthTSyn_00047] |
| <a href="#">EthTSynGlobalTimeTx_crcSecured</a> | 1            | [ECUC_EthTSyn_00039] |
| <a href="#">EthTSynGlobalTimeTxPeriod</a>      | 0..1         | [ECUC_EthTSyn_00010] |
| <a href="#">EthTSynHoldOverTime</a>            | 0..1         | [ECUC_EthTSyn_00115] |





| Included Parameters                         |              |                                      |
|---------------------------------------------|--------------|--------------------------------------|
| Parameter Name                              | Multiplicity | ECUC ID                              |
| <a href="#">EthTSynImmediateTimeSync</a>    | 1            | <a href="#">[ECUC_EthTSyn_00046]</a> |
| <a href="#">EthTSynTLVFollowUpICVSubTLV</a> | 1            | <a href="#">[ECUC_EthTSyn_00095]</a> |
| <a href="#">EthTSynTxSubTLVStatus</a>       | 1            | <a href="#">[ECUC_EthTSyn_00036]</a> |
| <a href="#">EthTSynTxSubTLVTime</a>         | 1            | <a href="#">[ECUC_EthTSyn_00035]</a> |
| <a href="#">EthTSynTxSubTLVUserData</a>     | 1            | <a href="#">[ECUC_EthTSyn_00037]</a> |

| Included Containers                          |              |                                                                                                                      |
|----------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------|
| Container Name                               | Multiplicity | Dependency                                                                                                           |
| <a href="#">EthTSynCrcTimeFlagsTxSecured</a> | 0..1         | This container collects definitions which parts of the Follow_Up message elements shall be used for CRC calculation. |

└

### **[ECUC\_EthTSyn\_00047] Definition of EcucFloatParamDef EthTSynCyclicMsgResumeTime** ┌

|                           |                                                                                                                                                 |   |              |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynCyclicMsgResumeTime                                                                                                                      |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                                                                   |   |              |
| Description               | Defines the time where the 1st regular cycle time based message transmission takes place, after an immediate transmission before. Unit: seconds |   |              |
| Multiplicity              | 1                                                                                                                                               |   |              |
| Type                      | EcucFloatParamDef                                                                                                                               |   |              |
| Range                     | [0 .. INF[                                                                                                                                      |   |              |
| Default value             | –                                                                                                                                               |   |              |
| Post-Build Variant Value  | true                                                                                                                                            |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                | X | All Variants |
|                           | Link time                                                                                                                                       | – |              |
|                           | Post-build time                                                                                                                                 | – |              |
| Dependency                |                                                                                                                                                 |   |              |

└

### **[ECUC\_EthTSyn\_00039] Definition of EcucEnumerationParamDef EthTSynGlobalTimeTxCrcSecured** ┌

|                           |                                                                       |                                                             |              |
|---------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------|--------------|
| Parameter Name            | EthTSynGlobalTimeTxCrcSecured                                         |                                                             |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                         |                                                             |              |
| Description               | This represents the configuration of whether or not CRC is supported. |                                                             |              |
| Multiplicity              | 1                                                                     |                                                             |              |
| Type                      | EcucEnumerationParamDef                                               |                                                             |              |
| Range                     | CRC_NOT_SUPPORTED                                                     | This represents a configuration where CRC is not supported. |              |
|                           | CRC_SUPPORTED                                                         | This represents a configuration where CRC is supported.     |              |
| Post-Build Variant Value  | true                                                                  |                                                             |              |
| Value Configuration Class | Pre-compile time                                                      | X                                                           | All Variants |





|            |                 |   |  |
|------------|-----------------|---|--|
|            | Link time       | – |  |
|            | Post-build time | – |  |
| Dependency |                 |   |  |

]

### [ECUC\_EthTSyn\_00010] Definition of EcucFloatParamDef EthTSynGlobalTimeTxPeriod

|                           |                                                               |   |              |
|---------------------------|---------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimeTxPeriod                                     |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                 |   |              |
| Description               | This represents configuration of the TX period. Unit: seconds |   |              |
| Multiplicity              | 0..1                                                          |   |              |
| Type                      | EcucFloatParamDef                                             |   |              |
| Range                     | [0 .. INF[                                                    |   |              |
| Default value             | –                                                             |   |              |
| Post-Build Variant Value  | true                                                          |   |              |
| Value Configuration Class | Pre-compile time                                              | X | All Variants |
|                           | Link time                                                     | – |              |
|                           | Post-build time                                               | – |              |
| Dependency                |                                                               |   |              |

]

### [ECUC\_EthTSyn\_00115] Definition of EcucFloatParamDef EthTSynHoldOverTime

|                                  |                                                                                                                                                                                 |   |              |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynHoldOverTime                                                                                                                                                             |   |              |
| Parent Container                 | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                                                                                                   |   |              |
| Description                      | Parameter to define timeout for transmission of Sync and Follow_Up messages on Master ports in absence of reception of Sync and Follow_Up messages on Slave port. Unit: seconds |   |              |
| Multiplicity                     | 0..1                                                                                                                                                                            |   |              |
| Type                             | EcucFloatParamDef                                                                                                                                                               |   |              |
| Range                            | [0 .. INF[                                                                                                                                                                      |   |              |
| Default value                    | 3                                                                                                                                                                               |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                                                                            |   |              |
| Post-Build Variant Value         | true                                                                                                                                                                            |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                | X | All Variants |
|                                  | Link time                                                                                                                                                                       | – |              |
|                                  | Post-build time                                                                                                                                                                 | – |              |
| Value Configuration Class        | Pre-compile time                                                                                                                                                                | X | All Variants |
|                                  | Link time                                                                                                                                                                       | – |              |
|                                  | Post-build time                                                                                                                                                                 | – |              |
| Dependency                       |                                                                                                                                                                                 |   |              |

]

### [ECUC\_EthTSyn\_00046] Definition of EcucBooleanParamDef EthTSynImmediateTimeSync

|                           |                                                                                                       |   |              |
|---------------------------|-------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynImmediateTimeSync                                                                              |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                         |   |              |
| Description               | Enables/Disables the cyclic polling of StbM_GetTimeBaseUpdateCounter() within EthTSyn_MainFunction(). |   |              |
| Multiplicity              | 1                                                                                                     |   |              |
| Type                      | EcucBooleanParamDef                                                                                   |   |              |
| Default value             | –                                                                                                     |   |              |
| Post-Build Variant Value  | true                                                                                                  |   |              |
| Value Configuration Class | Pre-compile time                                                                                      | X | All Variants |
|                           | Link time                                                                                             | – |              |
|                           | Post-build time                                                                                       | – |              |
| Dependency                |                                                                                                       |   |              |

]

### [ECUC\_EthTSyn\_00095] Definition of EcucBooleanParamDef EthTSynTLVFollowUpICVSubTLV

|                           |                                                                                                                                                                                                                                                                                    |   |              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTLVFollowUpICVSubTLV                                                                                                                                                                                                                                                        |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                                                                                                                                                                                                      |   |              |
| Description               | This represents the configuration of whether an AUTOSAR Follow_Up ICV Sub-TLV is used or not. - true: This represents a configuration where an AUTOSAR Follow_Up ICV Sub-TLV is used. - false: This represents a configuration where an AUTOSAR Follow_Up ICV Sub-TLV is not used. |   |              |
| Multiplicity              | 1                                                                                                                                                                                                                                                                                  |   |              |
| Type                      | EcucBooleanParamDef                                                                                                                                                                                                                                                                |   |              |
| Default value             | –                                                                                                                                                                                                                                                                                  |   |              |
| Post-Build Variant Value  | false                                                                                                                                                                                                                                                                              |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                                                                                                   | X | All Variants |
|                           | Link time                                                                                                                                                                                                                                                                          | – |              |
|                           | Post-build time                                                                                                                                                                                                                                                                    | – |              |
| Dependency                |                                                                                                                                                                                                                                                                                    |   |              |

]

### [ECUC\_EthTSyn\_00036] Definition of EcucBooleanParamDef EthTSynTxSubTLVStatus

|                           |                                                                                                                                                             |   |              |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTxSubTLVStatus                                                                                                                                       |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                                                                               |   |              |
| Description               | Definition of whether (true) or not (false) a Sub-TLV:Status Secured or Sub-TLV:Status Not Secured shall be sent in the AUTOSAR TLV of a Follow_Up message. |   |              |
| Multiplicity              | 1                                                                                                                                                           |   |              |
| Type                      | EcucBooleanParamDef                                                                                                                                         |   |              |
| Default value             | –                                                                                                                                                           |   |              |
| Post-Build Variant Value  | true                                                                                                                                                        |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                            | X | All Variants |
|                           | Link time                                                                                                                                                   | – |              |





|            |                 |   |  |
|------------|-----------------|---|--|
|            | Post-build time | – |  |
| Dependency |                 |   |  |

]

### [ECUC\_EthTSyn\_00035] Definition of EcucBooleanParamDef EthTSynTxSubTLV-Time [

|                           |                                                                                                                             |   |              |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTxSubTLVTime                                                                                                         |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                                               |   |              |
| Description               | Definition of whether (true) or not (false) a Sub-TLV:Time Secured shall be sent in the AUTOSAR TLV of a Follow_Up message. |   |              |
| Multiplicity              | 1                                                                                                                           |   |              |
| Type                      | EcucBooleanParamDef                                                                                                         |   |              |
| Default value             | –                                                                                                                           |   |              |
| Post-Build Variant Value  | true                                                                                                                        |   |              |
| Value Configuration Class | Pre-compile time                                                                                                            | X | All Variants |
|                           | Link time                                                                                                                   | – |              |
|                           | Post-build time                                                                                                             | – |              |
| Dependency                |                                                                                                                             |   |              |

]

### [ECUC\_EthTSyn\_00037] Definition of EcucBooleanParamDef EthTSynTxSubTLVUserData [

|                           |                                                                                                                                                                  |   |              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynTxSubTLVUserData                                                                                                                                          |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                                                                                    |   |              |
| Description               | Definition of whether (true) or not (false) a Sub-TLV:UserData Secured or Sub-TLV:User Data Not Secured shall be sent in the AUTOSAR TLV of a Follow_Up message. |   |              |
| Multiplicity              | 1                                                                                                                                                                |   |              |
| Type                      | EcucBooleanParamDef                                                                                                                                              |   |              |
| Default value             | –                                                                                                                                                                |   |              |
| Post-Build Variant Value  | true                                                                                                                                                             |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                 | X | All Variants |
|                           | Link time                                                                                                                                                        | – |              |
|                           | Post-build time                                                                                                                                                  | – |              |
| Dependency                |                                                                                                                                                                  |   |              |

]

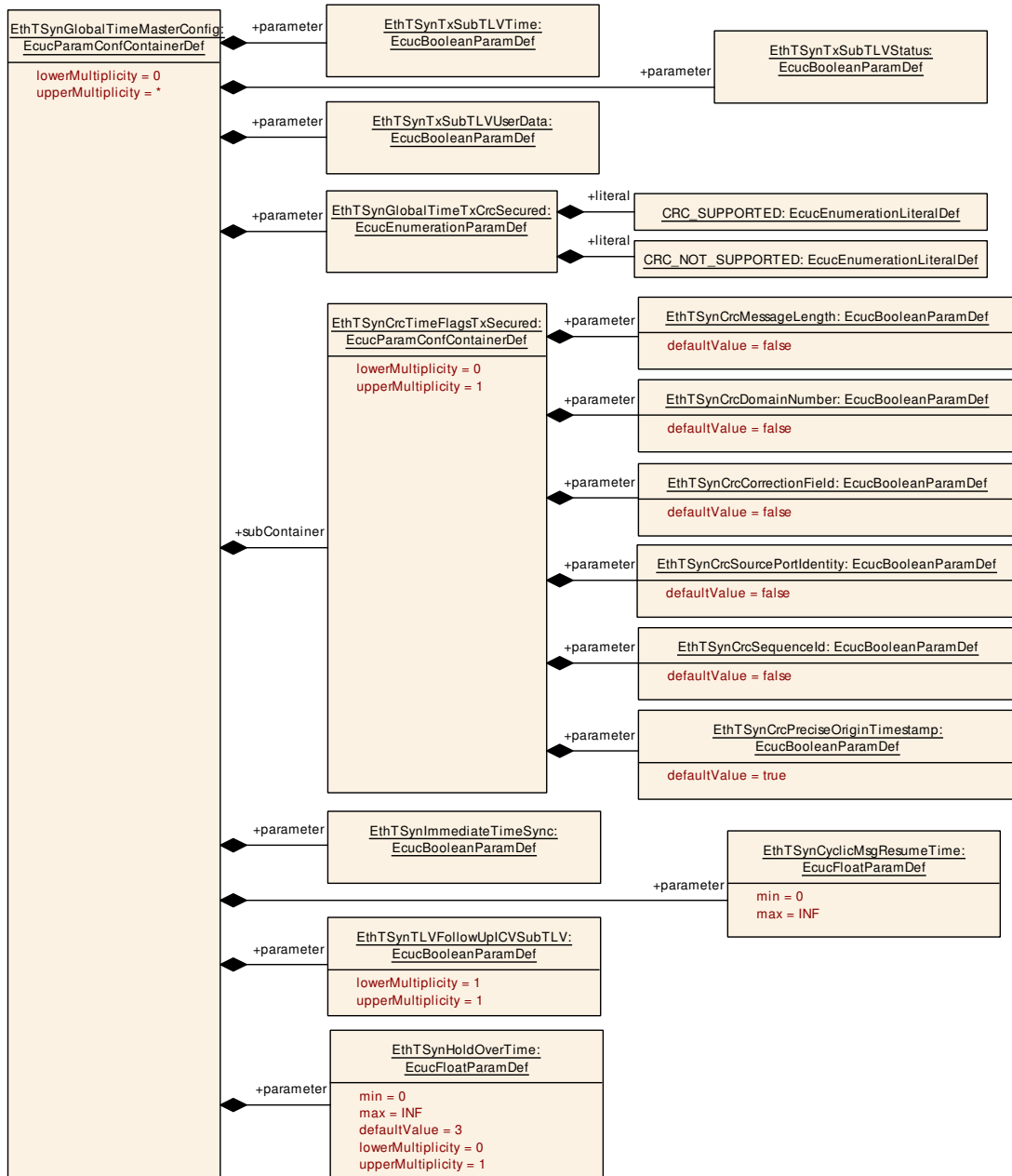


Figure 10.11: EthTSyn\_GlobalTimeMaster

## 10.2.18 EthTSynCrcTimeFlagsTxSecured

[ECUC\_EthTSyn\_00057] Definition of EcucParamConfContainerDef EthTSynCrcTimeFlagsTxSecured [

|                                         |                                                                                                                      |   |              |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Container Name</b>                   | EthTSynCrcTimeFlagsTxSecured                                                                                         |   |              |
| <b>Parent Container</b>                 | <a href="#">EthTSynGlobalTimeMasterConfig</a>                                                                        |   |              |
| <b>Description</b>                      | This container collects definitions which parts of the Follow_Up message elements shall be used for CRC calculation. |   |              |
| <b>Multiplicity</b>                     | 0..1                                                                                                                 |   |              |
| <b>Post-Build Variant Multiplicity</b>  | true                                                                                                                 |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b>                                                                                              | X | All Variants |
|                                         | <b>Link time</b>                                                                                                     | – |              |
|                                         | <b>Post-build time</b>                                                                                               | – |              |
| <b>Configuration Parameters</b>         |                                                                                                                      |   |              |

| Included Parameters                              |              |                      |
|--------------------------------------------------|--------------|----------------------|
| Parameter Name                                   | Multiplicity | ECUC ID              |
| <a href="#">EthTSynCrcCorrectionField</a>        | 1            | [ECUC_EthTSyn_00042] |
| <a href="#">EthTSynCrcDomainNumber</a>           | 1            | [ECUC_EthTSyn_00041] |
| <a href="#">EthTSynCrcMessageLength</a>          | 1            | [ECUC_EthTSyn_00040] |
| <a href="#">EthTSynCrcPreciseOriginTimestamp</a> | 1            | [ECUC_EthTSyn_00045] |
| <a href="#">EthTSynCrcSequenceld</a>             | 1            | [ECUC_EthTSyn_00044] |
| <a href="#">EthTSynCrcSourcePortIdentity</a>     | 1            | [ECUC_EthTSyn_00043] |

|                               |
|-------------------------------|
| <b>No Included Containers</b> |
|-------------------------------|

]

For parameter table [\[ECUC\\_EthTSyn\\_00042\] EthTSynCrcCorrectionField](#), see definition below container [EthTSynCrcFlagsRxValidated](#).

For parameter table [\[ECUC\\_EthTSyn\\_00041\] EthTSynCrcDomainNumber](#), see definition below container [EthTSynCrcFlagsRxValidated](#).

For parameter table [\[ECUC\\_EthTSyn\\_00040\] EthTSynCrcMessageLength](#), see definition below container [EthTSynCrcFlagsRxValidated](#).

For parameter table [\[ECUC\\_EthTSyn\\_00045\] EthTSynCrcPreciseOriginTimestamp](#), see definition below container [EthTSynCrcFlagsRxValidated](#).

For parameter table [\[ECUC\\_EthTSyn\\_00044\] EthTSynCrcSequenceld](#), see definition below container [EthTSynCrcFlagsRxValidated](#).

For parameter table [\[ECUC\\_EthTSyn\\_00043\] EthTSynCrcSourcePortIdentity](#), see definition below container [EthTSynCrcFlagsRxValidated](#).

## 10.2.19 EthTSynGlobalTimeSlaveConfig

**[ECUC\_EthTSyn\_00009] Definition of EcucParamConfContainerDef EthTSynGlobalTimeSlaveConfig** [

|                                  |                                                                                                                                                                                                                                                                                                                                                             |   |              |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Container Name                   | EthTSynGlobalTimeSlaveConfig                                                                                                                                                                                                                                                                                                                                |   |              |
| Parent Container                 | EthTSyn                                                                                                                                                                                                                                                                                                                                                     |   |              |
| Description                      | Configuration of a global-time slave.<br>The exact role of the port is defined by EthTSynPortRole. A TIME_SLAVE port will exist on every configured ECU, except potentially on the SystemWideGlobalTimeMaster. Each global-time domain should have at least one port of one ECU in the TIME_MASTER role and one port of another ECU in the TIME_SLAVE role. |   |              |
| Multiplicity                     | 0..*                                                                                                                                                                                                                                                                                                                                                        |   |              |
| Post-Build Variant Multiplicity  | true                                                                                                                                                                                                                                                                                                                                                        |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                                                                                                                                                                                                            | X | All Variants |
|                                  | Link time                                                                                                                                                                                                                                                                                                                                                   | – |              |
|                                  | Post-build time                                                                                                                                                                                                                                                                                                                                             | – |              |
| Configuration Parameters         |                                                                                                                                                                                                                                                                                                                                                             |   |              |

| Included Parameters                        |              |                      |
|--------------------------------------------|--------------|----------------------|
| Parameter Name                             | Multiplicity | ECUC ID              |
| EthTSynGlobalTimeFollowUpTimeout           | 1            | [ECUC_EthTSyn_00007] |
| EthTSynGlobalTimeSequenceCounterHysteresis | 1            | [ECUC_EthTSyn_00084] |
| EthTSynGlobalTimeSequenceCounterJumpWidth  | 1            | [ECUC_EthTSyn_00083] |
| EthTSynRxCrcValidated                      | 1            | [ECUC_EthTSyn_00049] |
| EthTSynRxIcvVerificationType               | 1            | [ECUC_EthTSyn_00103] |
| EthTSynRxSubTLVStatus                      | 1            | [ECUC_EthTSyn_00086] |
| EthTSynRxSubTLVTime                        | 1            | [ECUC_EthTSyn_00085] |
| EthTSynRxSubTLVUserData                    | 1            | [ECUC_EthTSyn_00087] |

| Included Containers        |              |                                                                                                                        |
|----------------------------|--------------|------------------------------------------------------------------------------------------------------------------------|
| Container Name             | Multiplicity | Dependency                                                                                                             |
| EthTSynCrcFlagsRxValidated | 0..1         | This container collects definitions which parts of the Follow_Up message elements shall be included in CRC validation. |

]

## [ECUC\_EthTSyn\_00007] Definition of EcucFloatParamDef EthTSynGlobalTimeFollowUpTimeout [

|                           |                                                                                                                                                 |   |              |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimeFollowUpTimeout                                                                                                                |   |              |
| Parent Container          | EthTSynGlobalTimeSlaveConfig                                                                                                                    |   |              |
| Description               | Timeout value of the Follow_Up message (of the subsequent Sync message).<br>A value of 0 deactivates this timeout observation.<br>Unit: seconds |   |              |
| Multiplicity              | 1                                                                                                                                               |   |              |
| Type                      | EcucFloatParamDef                                                                                                                               |   |              |
| Range                     | [0 .. 4]                                                                                                                                        |   |              |
| Default value             | –                                                                                                                                               |   |              |
| Post-Build Variant Value  | true                                                                                                                                            |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                | X | All Variants |
|                           | Link time                                                                                                                                       | – |              |
|                           | Post-build time                                                                                                                                 | – |              |
| Dependency                |                                                                                                                                                 |   |              |

]

### [ECUC\_EthTSyn\_00084] Definition of EcucIntegerParamDef EthTSynGlobalTimeSequenceCounterHysteresis [

|                           |                                                                                                                                                                                                                  |   |              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimeSequenceCounterHysteresis                                                                                                                                                                       |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                                                                                                                                                     |   |              |
| Description               | EthTSynGlobalTimeSequenceCounterHysteresis specifies the number of consecutive valid message pairs that are required by the Time Slave while being in Timeout state until a Time Tuple is forwarded to the StbM. |   |              |
| Multiplicity              | 1                                                                                                                                                                                                                |   |              |
| Type                      | EcucIntegerParamDef                                                                                                                                                                                              |   |              |
| Range                     | 0 .. 15                                                                                                                                                                                                          |   |              |
| Default value             | 0                                                                                                                                                                                                                |   |              |
| Post-Build Variant Value  | true                                                                                                                                                                                                             |   |              |
| Value Configuration Class | Pre-compile time                                                                                                                                                                                                 | X | All Variants |
|                           | Link time                                                                                                                                                                                                        | – |              |
|                           | Post-build time                                                                                                                                                                                                  | – |              |
| Dependency                |                                                                                                                                                                                                                  |   |              |

]

### [ECUC\_EthTSyn\_00083] Definition of EcucIntegerParamDef EthTSynGlobalTimeSequenceCounterJumpWidth [

|                           |                                                                                                                                |   |              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynGlobalTimeSequenceCounterJumpWidth                                                                                      |   |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                                                                   |   |              |
| Description               | The SequenceCounterJumpWidth specifies the maximum allowed jump of the Sequence Counter between two consecutive Sync messages. |   |              |
| Multiplicity              | 1                                                                                                                              |   |              |
| Type                      | EcucIntegerParamDef                                                                                                            |   |              |
| Range                     | 0 .. 65535                                                                                                                     |   |              |
| Default value             | 0                                                                                                                              |   |              |
| Post-Build Variant Value  | true                                                                                                                           |   |              |
| Value Configuration Class | Pre-compile time                                                                                                               | X | All Variants |
|                           | Link time                                                                                                                      | – |              |
|                           | Post-build time                                                                                                                | – |              |
| Dependency                |                                                                                                                                |   |              |

]

### [ECUC\_EthTSyn\_00049] Definition of EcucEnumerationParamDef EthTSynRx\_crc Validated [

|                  |                                                                 |                                              |  |
|------------------|-----------------------------------------------------------------|----------------------------------------------|--|
| Parameter Name   | EthTSynRx_crcValidated                                          |                                              |  |
| Parent Container | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                    |                                              |  |
| Description      | Definition of whether or not validation of the CRC takes place. |                                              |  |
| Multiplicity     | 1                                                               |                                              |  |
| Type             | EcucEnumerationParamDef                                         |                                              |  |
| Range            | CRC_IGNORED                                                     | EthTSyn ignores any CRC inside the Sub-TLVs. |  |





|                           |                   |                                                                                                                                                                                                                                        |              |
|---------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|                           | CRC_NOT_VALIDATED | If EthTSynMessageCompliance is set to FALSE: EthTSyn discards Follow_Up messages with Sub-TLVs of Type 0x28, 0x50 or 0x60.                                                                                                             |              |
|                           | CRC_OPTIONAL      | If EthTSynMessageCompliance is set to FALSE: EthTSyn discards Follow_Up messages with Sub-TLVs of Type 0x28, 0x50 or 0x60, that contain an incorrect CRC value.                                                                        |              |
|                           | CRC_VALIDATED     | If EthTSynMessageCompliance is set to FALSE: EthTSyn discards Follow_Up messages with Sub-TLVs of Type 0x28, 0x50 or 0x60, that contain an incorrect CRC value. EthTSyn rejects Follow_Up messages with Sub-TLVs of Type 0x51 or 0x61. |              |
| Post-Build Variant Value  | true              |                                                                                                                                                                                                                                        |              |
| Value Configuration Class | Pre-compile time  | X                                                                                                                                                                                                                                      | All Variants |
|                           | Link time         | –                                                                                                                                                                                                                                      |              |
|                           | Post-build time   | –                                                                                                                                                                                                                                      |              |
| Dependency                |                   |                                                                                                                                                                                                                                        |              |

]

## [ECUC\_EthTSyn\_00103] Definition of EcucEnumerationParamDef EthTSynRxIcvVerificationType

|                           |                                                                             |                                                                                                                                                                                                                                 |              |
|---------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Parameter Name            | EthTSynRxIcvVerificationType                                                |                                                                                                                                                                                                                                 |              |
| Parent Container          | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                |                                                                                                                                                                                                                                 |              |
| Description               | This parameter controls whether or not ICV verification shall be supported. |                                                                                                                                                                                                                                 |              |
| Multiplicity              | 1                                                                           |                                                                                                                                                                                                                                 |              |
| Type                      | EcucEnumerationParamDef                                                     |                                                                                                                                                                                                                                 |              |
| Range                     | ICV_IGNORED                                                                 | The Timesync module shall not verify the ICV.                                                                                                                                                                                   |              |
|                           | ICV_NOT_VERIFIED                                                            | The Timesync module accepts only Time Synchronization messages, which are not ICV secured. All other Time Synchronization messages are ignored.                                                                                 |              |
|                           | ICV_OPTIONAL                                                                | The Timesync module accepts only Time Synchronization messages which are not ICV secured and Time Synchronization messages which are ICV secured and have the correct ICV. All other Time Synchronization messages are ignored. |              |
|                           | ICV_VERIFIED                                                                | The Timesync module accepts only Time Synchronization messages, which are ICV secured and have the correct ICV. All other Time Synchronization messages are ignored.                                                            |              |
| Post-Build Variant Value  | false                                                                       |                                                                                                                                                                                                                                 |              |
| Value Configuration Class | Pre-compile time                                                            | X                                                                                                                                                                                                                               | All Variants |
|                           | Link time                                                                   | –                                                                                                                                                                                                                               |              |
|                           | Post-build time                                                             | –                                                                                                                                                                                                                               |              |
| Dependency                |                                                                             |                                                                                                                                                                                                                                 |              |

]

## [ECUC\_EthTSyn\_00086] Definition of EcucBooleanParamDef EthTSynRxSubTLVStatus [

|                                  |                                                                                                                                                                           |   |              |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynRxSubTLVStatus                                                                                                                                                     |   |              |
| Parent Container                 | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                                                                                                              |   |              |
| Description                      | Definition of whether or not a Sub-TLV:Status Secured or Sub-TLV:Status Not Secured shall be present and shall be evaluated when processing a received Follow_Up message. |   |              |
| Multiplicity                     | 1                                                                                                                                                                         |   |              |
| Type                             | EcucBooleanParamDef                                                                                                                                                       |   |              |
| Default value                    | false                                                                                                                                                                     |   |              |
| Post-Build Variant Value         | false                                                                                                                                                                     |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                                                          | X | All Variants |
|                                  | Link time                                                                                                                                                                 | – |              |
|                                  | Post-build time                                                                                                                                                           | – |              |
| Value Configuration Class        | Pre-compile time                                                                                                                                                          | X | All Variants |
|                                  | Link time                                                                                                                                                                 | – |              |
|                                  | Post-build time                                                                                                                                                           | – |              |
| Dependency                       |                                                                                                                                                                           |   |              |

]

## [ECUC\_EthTSyn\_00085] Definition of EcucBooleanParamDef EthTSynRxSubTLVTime [

|                                  |                                                                                                                                          |   |              |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name                   | EthTSynRxSubTLVTime                                                                                                                      |   |              |
| Parent Container                 | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                                                                             |   |              |
| Description                      | Definition of whether or not a Sub-TLV:Time Secured shall be present and shall be evaluated when processing a received Follow_Up message |   |              |
| Multiplicity                     | 1                                                                                                                                        |   |              |
| Type                             | EcucBooleanParamDef                                                                                                                      |   |              |
| Default value                    | false                                                                                                                                    |   |              |
| Post-Build Variant Value         | false                                                                                                                                    |   |              |
| Multiplicity Configuration Class | Pre-compile time                                                                                                                         | X | All Variants |
|                                  | Link time                                                                                                                                | – |              |
|                                  | Post-build time                                                                                                                          | – |              |
| Value Configuration Class        | Pre-compile time                                                                                                                         | X | All Variants |
|                                  | Link time                                                                                                                                | – |              |
|                                  | Post-build time                                                                                                                          | – |              |
| Dependency                       |                                                                                                                                          |   |              |

]

**[ECUC\_EthTSyn\_00087] Definition of EcucBooleanParamDef EthTSynRxSubTLVUserData** [

|                                         |                                                                                                                                                                              |   |              |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Parameter Name</b>                   | EthTSynRxSubTLVUserData                                                                                                                                                      |   |              |
| <b>Parent Container</b>                 | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                                                                                                                 |   |              |
| <b>Description</b>                      | Definition of whether or not a Sub-TLV:UserData Secured or Sub-TLV:UserData Not Secured shall be present and shall be evaluated when processing a received Follow_Up message |   |              |
| <b>Multiplicity</b>                     | 1                                                                                                                                                                            |   |              |
| <b>Type</b>                             | EcucBooleanParamDef                                                                                                                                                          |   |              |
| <b>Default value</b>                    | false                                                                                                                                                                        |   |              |
| <b>Post-Build Variant Value</b>         | false                                                                                                                                                                        |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b>                                                                                                                                                      | X | All Variants |
|                                         | <b>Link time</b>                                                                                                                                                             | – |              |
|                                         | <b>Post-build time</b>                                                                                                                                                       | – |              |
| <b>Value Configuration Class</b>        | <b>Pre-compile time</b>                                                                                                                                                      | X | All Variants |
|                                         | <b>Link time</b>                                                                                                                                                             | – |              |
|                                         | <b>Post-build time</b>                                                                                                                                                       | – |              |
| <b>Dependency</b>                       |                                                                                                                                                                              |   |              |

]

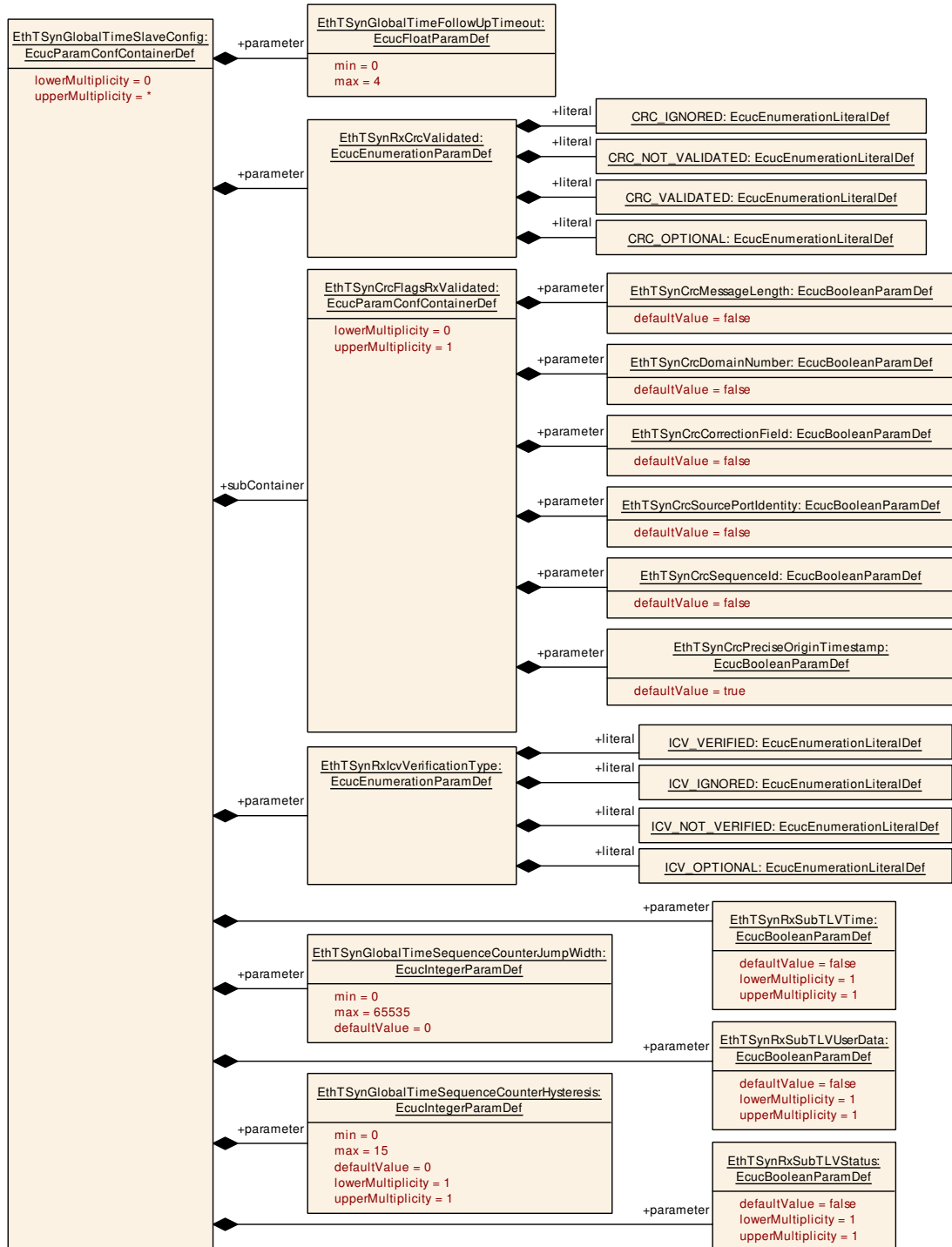


Figure 10.12: EthTSyn\_GlobalTimeSlave

## 10.2.20 EthTSynCrcFlagsRxValidated

[ECUC\_EthTSyn\_00050] Definition of EcucParamConfContainerDef EthTSynCrcFlagsRxValidated

|                                         |                                                                                                                        |   |              |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------|---|--------------|
| <b>Container Name</b>                   | EthTSynCrcFlagsRxValidated                                                                                             |   |              |
| <b>Parent Container</b>                 | <a href="#">EthTSynGlobalTimeSlaveConfig</a>                                                                           |   |              |
| <b>Description</b>                      | This container collects definitions which parts of the Follow_Up message elements shall be included in CRC validation. |   |              |
| <b>Multiplicity</b>                     | 0..1                                                                                                                   |   |              |
| <b>Post-Build Variant Multiplicity</b>  | true                                                                                                                   |   |              |
| <b>Multiplicity Configuration Class</b> | <b>Pre-compile time</b>                                                                                                | X | All Variants |
|                                         | <b>Link time</b>                                                                                                       | – |              |
|                                         | <b>Post-build time</b>                                                                                                 | – |              |
| <b>Configuration Parameters</b>         |                                                                                                                        |   |              |

| Included Parameters                              |              |                      |
|--------------------------------------------------|--------------|----------------------|
| Parameter Name                                   | Multiplicity | ECUC ID              |
| <a href="#">EthTSynCrcCorrectionField</a>        | 1            | [ECUC_EthTSyn_00042] |
| <a href="#">EthTSynCrcDomainNumber</a>           | 1            | [ECUC_EthTSyn_00041] |
| <a href="#">EthTSynCrcMessageLength</a>          | 1            | [ECUC_EthTSyn_00040] |
| <a href="#">EthTSynCrcPreciseOriginTimestamp</a> | 1            | [ECUC_EthTSyn_00045] |
| <a href="#">EthTSynCrcSequenceld</a>             | 1            | [ECUC_EthTSyn_00044] |
| <a href="#">EthTSynCrcSourcePortIdentity</a>     | 1            | [ECUC_EthTSyn_00043] |

|                               |
|-------------------------------|
| <b>No Included Containers</b> |
|-------------------------------|

## [ECUC\_EthTSyn\_00042] Definition of EcucBooleanParamDef EthTSynCrcCorrectionField

|                                  |                                                                                           |   |              |
|----------------------------------|-------------------------------------------------------------------------------------------|---|--------------|
| <b>Parameter Name</b>            | EthTSynCrcCorrectionField                                                                 |   |              |
| <b>Parent Container</b>          | <a href="#">EthTSynCrcFlagsRxValidated</a> , <a href="#">EthTSynCrcTimeFlagsTxSecured</a> |   |              |
| <b>Description</b>               | correctionField from the Follow_Up Message Header shall be included in CRC calculation.   |   |              |
| <b>Multiplicity</b>              | 1                                                                                         |   |              |
| <b>Type</b>                      | EcucBooleanParamDef                                                                       |   |              |
| <b>Default value</b>             | false                                                                                     |   |              |
| <b>Post-Build Variant Value</b>  | true                                                                                      |   |              |
| <b>Value Configuration Class</b> | <b>Pre-compile time</b>                                                                   | X | All Variants |
|                                  | <b>Link time</b>                                                                          | – |              |
|                                  | <b>Post-build time</b>                                                                    | – |              |
| <b>Dependency</b>                |                                                                                           |   |              |

#### [ECUC\_EthTSyn\_00041] Definition of EcucBooleanParamDef EthTSynCrcDomainNumber [

|                           |                                                                                           |   |              |
|---------------------------|-------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynCrcDomainNumber                                                                    |   |              |
| Parent Container          | <a href="#">EthTSynCrcFlagsRxValidated</a> , <a href="#">EthTSynCrcTimeFlagsTxSecured</a> |   |              |
| Description               | domainNumber from the Follow_Up Message Header shall be included in CRC calculation.      |   |              |
| Multiplicity              | 1                                                                                         |   |              |
| Type                      | EcucBooleanParamDef                                                                       |   |              |
| Default value             | false                                                                                     |   |              |
| Post-Build Variant Value  | true                                                                                      |   |              |
| Value Configuration Class | Pre-compile time                                                                          | X | All Variants |
|                           | Link time                                                                                 | – |              |
|                           | Post-build time                                                                           | – |              |
| Dependency                |                                                                                           |   |              |

]

#### [ECUC\_EthTSyn\_00040] Definition of EcucBooleanParamDef EthTSynCrcMessageLength [

|                           |                                                                                           |   |              |
|---------------------------|-------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynCrcMessageLength                                                                   |   |              |
| Parent Container          | <a href="#">EthTSynCrcFlagsRxValidated</a> , <a href="#">EthTSynCrcTimeFlagsTxSecured</a> |   |              |
| Description               | messageLength from the Follow_Up Message Header shall be included in CRC calculation.     |   |              |
| Multiplicity              | 1                                                                                         |   |              |
| Type                      | EcucBooleanParamDef                                                                       |   |              |
| Default value             | false                                                                                     |   |              |
| Post-Build Variant Value  | true                                                                                      |   |              |
| Value Configuration Class | Pre-compile time                                                                          | X | All Variants |
|                           | Link time                                                                                 | – |              |
|                           | Post-build time                                                                           | – |              |
| Dependency                |                                                                                           |   |              |

]

#### [ECUC\_EthTSyn\_00045] Definition of EcucBooleanParamDef EthTSynCrcPreciseOriginTimestamp [

|                           |                                                                                               |   |              |
|---------------------------|-----------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynCrcPreciseOriginTimestamp                                                              |   |              |
| Parent Container          | <a href="#">EthTSynCrcFlagsRxValidated</a> , <a href="#">EthTSynCrcTimeFlagsTxSecured</a>     |   |              |
| Description               | preciseOriginTimestamp from the Follow_Up Message Field shall be included in CRC calculation. |   |              |
| Multiplicity              | 1                                                                                             |   |              |
| Type                      | EcucBooleanParamDef                                                                           |   |              |
| Default value             | true                                                                                          |   |              |
| Post-Build Variant Value  | true                                                                                          |   |              |
| Value Configuration Class | Pre-compile time                                                                              | X | All Variants |
|                           | Link time                                                                                     | – |              |
|                           | Post-build time                                                                               | – |              |





|            |  |
|------------|--|
| Dependency |  |
|------------|--|

]

#### [ECUC\_EthTSyn\_00044] Definition of EcucBooleanParamDef EthTSynCrcSequenceld [

|                           |                                                                                           |   |              |
|---------------------------|-------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynCrcSequenceld                                                                      |   |              |
| Parent Container          | <a href="#">EthTSynCrcFlagsRxValidated</a> , <a href="#">EthTSynCrcTimeFlagsTxSecured</a> |   |              |
| Description               | sequenceld from the Follow_Up Message Header shall be included in CRC calculation.        |   |              |
| Multiplicity              | 1                                                                                         |   |              |
| Type                      | EcucBooleanParamDef                                                                       |   |              |
| Default value             | false                                                                                     |   |              |
| Post-Build Variant Value  | true                                                                                      |   |              |
| Value Configuration Class | Pre-compile time                                                                          | X | All Variants |
|                           | Link time                                                                                 | – |              |
|                           | Post-build time                                                                           | – |              |
| Dependency                |                                                                                           |   |              |

]

#### [ECUC\_EthTSyn\_00043] Definition of EcucBooleanParamDef EthTSynCrcSourcePortIdentity [

|                           |                                                                                            |   |              |
|---------------------------|--------------------------------------------------------------------------------------------|---|--------------|
| Parameter Name            | EthTSynCrcSourcePortIdentity                                                               |   |              |
| Parent Container          | <a href="#">EthTSynCrcFlagsRxValidated</a> , <a href="#">EthTSynCrcTimeFlagsTxSecured</a>  |   |              |
| Description               | sourcePortIdentity from the Follow_Up Message Header shall be included in CRC calculation. |   |              |
| Multiplicity              | 1                                                                                          |   |              |
| Type                      | EcucBooleanParamDef                                                                        |   |              |
| Default value             | false                                                                                      |   |              |
| Post-Build Variant Value  | true                                                                                       |   |              |
| Value Configuration Class | Pre-compile time                                                                           | X | All Variants |
|                           | Link time                                                                                  | – |              |
|                           | Post-build time                                                                            | – |              |
| Dependency                |                                                                                            |   |              |

]

## 10.3 Constraints

**Note:** If a Time Master transmits Timesync messages for a Time Domain via multiple Ethernet controllers, the EthTSyn allows for different configuration options:

1. a Time Domain container ([EthTSynGlobalTimeDomain](#)) references multiple Ethernet controllers (([EthTSynGlobalTimeEthIfRef](#))).
2. a Time Domain container references only one Ethernet controller. In this case one Time Domain container needs to be configured per Ethernet controller and

each Time Domain is configured using the same Time Domain Id (`EthTSynGlobalTimeDomainId`).

**[SWS\_EthTSyn\_CONSTR\_00003] `EthTSynGlobalTimeMasterConfig` Container Validity for Time Domains** [The `EthTSynGlobalTimeMasterConfig` container exists for Synchronized Time Domains (`EthTSynGlobalTimeDomain` 0 .. 127) only.]

**[SWS\_EthTSyn\_CONSTR\_00004] ICV Generation Timeout for Synchronous CSM Jobs** [If the CSM job used to generate ICV is configured in synchronous behaviour, the `EthTSynIcvGenerationTimeout` shall be set to 0.]

**[SWS\_EthTSyn\_CONSTR\_00005] ICV Verification Timeout for Synchronous CSM Jobs** [If the CSM job used to verify ICV is configured in synchronous behavior, the `EthTSynIcvVerificationTimeout` shall be set to 0.]

**[SWS\_EthTSyn\_CONSTR\_00006] Tx Period Availability Based on Port Role** [The parameter `EthTSynGlobalTimeTxPeriod` shall determine the transmission interval of Sync messages. It shall be available if and only if the parameter `EthTSynPortRole` is set to `TIME_MASTER` or `DYNAMIC`.]

Note: Configuring different `EthTSynGlobalTimeTxPeriod` for different port requires the involvement of StbM.

**[SWS\_EthTSyn\_CONSTR\_00007] Port Role Conflict Within Time Domain** [

The parameter `EthTSynPortRole` shall not be configured as `TIME_SLAVE` for two ports under same `EthTSynGlobalTimeDomain`.]

**[SWS\_EthTSyn\_CONSTR\_00008] Configuration for VLAN Support** [

If parameter `EthTSynFramePrio` exists for a Time Domain, at least one Virtual Ethernet Controller (`EthTSynGlobalTimeEthIfRef`) referenced by the Time Domain shall refer to a tagged VLAN.]

**[SWS\_EthTSyn\_CONSTR\_00009] Support of PDUs with `KeepLocalPduBuffer` set to `FALSE`** [

The configuration of `EthTSynTxPdu` and `EthTSynRxPdu` shall refer to PDUs where `KeepLocalPduBuffer` is set to `FALSE`. Otherwise the configuration shall be rejected as invalid.]

## 10.4 Configuration Constraints

An `EthTSynGlobalTimeDomain` represents the concept of a PTP Instance from [4, IEEE Std 802.1AS-2011] and operates on multiple `EthTSynPTPPorts`. Since every `EthTSynGlobalTimeDomain` requires an `EthTSynSynchronizedTimeBaseRef`

only Time Gateways (Chapter 7.9) are possible, i.e. a Time Aware Bridge (or PTP Relay Instance per [4, IEEE Std 802.1AS-2011]) can not be configured here.

In the context of the [13, AUTOSAR System Template] Chapter 9.2 “The big Picture” the `EthTSynGlobalTimeDomain` constitutes a `globalTimeSubDomain`, since the overarching `GlobalTimeDomain` there is defined through a hierarchy of `TimeBases`.

**[constr\_0002] ICV Generation Timeout for Synchronous CSM Jobs** [If the CSM job used to generate ICV is configured in synchronous behavior, the `EthTSynIcvGenerationTimeout` shall be set to 0.]

**[constr\_0003] ICV Verification Timeout for Synchronous CSM Jobs** [If the CSM job used to verify ICV is configured in synchronous behavior, the `EthTSynIcvVerificationTimeout` shall be set to 0.]

**[constr\_0004] Tx Period Availability Based on Port Role** [The parameter `EthTSynGlobalTimeTxPeriod` shall determine the transmission interval of Sync messages. It shall be available if and only if the parameter `EthTSynPortRole` is set to `TIME_MASTER` or `DYNAMIC`.]

**[constr\_0005] Port Role Conflict Within Time Domain** [The parameter `EthTSynPortRole` shall not be configured as `TIME_SLAVE` for two ports under same `EthTSynGlobalTimeDomain`.]

**[constr\_0006] Configuration for VLAN Support** [If parameter `EthTSynFramePrio` exists for a Time Domain, at least one Virtual Ethernet Controller (`EthTSynGlobalTimeEthIfRef`) referenced by the Time Domain shall refer to a tagged VLAN.]

**[constr\_0007] Support of PDUs with `KeepLocalPduBuffer` set to `FALSE`**

*Status:* DRAFT

[The configuration of `EthTSynTxPdu` and `EthTSynRxPdu` shall refer to PDUs where `KeepLocalPduBuffer` is set to `FALSE`. Otherwise the configuration shall be rejected as invalid.]

**[constr\_0008] Multiple Domains reference a single StbM Time Base**

*Status:* DRAFT

[If multiple `EthTSynGlobalTimeDomains` use the same `EthTSynSynchronizedTimeBaseRef`, only one of them can have a `EthTSynPTPPort` in `EthTSynPortRole` set to `TIME_SLAVE`. All other `EthTSynPTPPorts` must have `EthTSynPortRole` set to `TIME_MASTER`.]

**[constr\_0009] Multiple StbM Time Bases referenced by single Domain**

*Status:* DRAFT

[While technically multiple `EthTSynSynchronizedTimeBaseRef` could be updated by a single `EthTSynGlobalTimeDomain`, if no `EthTSynPTPPort` has `EthTSyn-`

`PortRole` set to `TIME_MASTER`, the multiplicity of `EthTSynSynchronizedTimeBaseRef` prohibits this.]

**Note:** To transfer the time information of a `EthTSynGlobalTimeDomain` to multiple `TimeBases`, [2, AUTOSAR Synchronized Time-Base Manager] Chapter 7.12 “*Time Base Cloning*” should be used.

#### [constr\_0010] Single Pdelay mechanism per Domain

*Status:* DRAFT

[Both `EthTSynNeighbourRateRatioConfig` and `EthTSynLinkDelayConfig` technically allow to be configured for `CMLDS` or `TransportSpecific`. This could lead to two instances of the Pdelay mechanism to be operating for the same `EthTSynGlobalTimeDomain`.

- If `EthTSynNeighbourRateRatioConfig` is configured for `CMLDS`, `EthTSynLinkDelayConfig` must not be configured for `TransportSpecific`
- If `EthTSynLinkDelayConfig` is configured for `CMLDS`, `EthTSynNeighbourRateRatioConfig` must not be configured for `TransportSpecific`,

]

#### [constr\_0011] Consistent Pdelay configuration with CMLDS

*Status:* DRAFT

[

- If either `EthTSynNeighbourRateRatioConfig` is configured for `CMLDS`, or `EthTSynLinkDelayConfig` is configured for `CMLDS`, then no `EthTSynPdelayConfigRef` must be configured for the `EthTSynPTPPort`.
- If either `EthTSynNeighbourRateRatioConfig` is configured for `TransportSpecific`, or `EthTSynLinkDelayConfig` is configured for `TransportSpecific`, then no `EthTSynCMLDSVirtualPortRef` must be configured for the same `EthTSynVirtualPortRef`.

]

## 10.5 Published Information

For details refer to [3] Chapter 10.3 “*Published Information*”.

## A Not applicable requirements

### [SWS\_EthTSyn\_NA\_00996]

*Upstream requirements:* RS\_TS\_00003, RS\_TS\_00004, RS\_TS\_00005, RS\_TS\_00006, RS\_TS\_00007, RS\_TS\_00008, RS\_TS\_00009, RS\_TS\_00010, RS\_TS\_00011, RS\_TS\_00014, RS\_TS\_00015, RS\_TS\_00016, RS\_TS\_00017, RS\_TS\_00018, RS\_TS\_00019, RS\_TS\_00021, RS\_TS\_00024, RS\_TS\_00025, RS\_TS\_00026, RS\_TS\_00027, RS\_TS\_00029, RS\_TS\_00030, RS\_TS\_00031, RS\_TS\_00032, RS\_TS\_00033, RS\_TS\_00035, RS\_TS\_00036, RS\_TS\_00037, RS\_TS\_00038, RS\_TS\_00039, RS\_TS\_20040, RS\_TS\_20041, RS\_TS\_20042, RS\_TS\_20043, RS\_TS\_20045, RS\_TS\_20046, RS\_TS\_20060, RS\_TS\_20068, RS\_TS\_20070, RS\_TS\_20071, RS\_TS\_20073, RS\_TS\_20074

[This specification item references requirements from RS Time Synchronization [1] that are not applicable to EthTSyn, because they are allocated either to other network specific Time Sync modules (CAN, FlexRay) or to the Synchronized Time-Base Manager (StbM) module.]

### [SWS\_EthTSyn\_NA\_00997]

*Upstream requirements:* SRS\_BSW\_00388, SRS\_BSW\_00389, SRS\_BSW\_00390, SRS\_BSW\_00392, SRS\_BSW\_00393, SRS\_BSW\_00395, SRS\_BSW\_00396, SRS\_BSW\_00403, SRS\_BSW\_00478

[This specification item references requirements, that cannot be traced because they apply only to EcuC elements.]

Note: EcuC elements do not support trace links

### [SWS\_EthTSyn\_NA\_00998]

*Upstream requirements:* SRS\_BSW\_00345, SRS\_BSW\_00369, SRS\_BSW\_00383, SRS\_BSW\_00384, SRS\_BSW\_00399, SRS\_BSW\_00419

[This specification item references requirements, that cannot be traced to a specific spec item in the EthTSyn.]

Note: These requirements are generic in nature and would affect all or very many requirements or cannot be traced to any requirement at all (but just explanatory chapters of the SWS).

### [SWS\_EthTSyn\_NA\_00999]

*Upstream requirements:* SRS\_BSW\_00168, SRS\_BSW\_00170, SRS\_BSW\_00336, SRS\_BSW\_00375, SRS\_BSW\_00416, SRS\_BSW\_00422, SRS\_BSW\_00425, SRS\_BSW\_00432, SRS\_BSW\_00458, SRS\_BSW\_00461, SRS\_BSW\_00466, SRS\_BSW\_00469, SRS\_BSW\_00470, SRS\_BSW\_00471, SRS\_BSW\_00472

[These requirements are not applicable to EthTSyn.]

## B Change history of AUTOSAR traceable items

Please note that the lists in this chapter also include constraints and specification items that have been removed from the specification in a later version. These constraints and specification items do not appear as hyperlinks in the document.

### B.1 Traceable item history of this document according to AUTOSAR Release R25-11

#### B.1.1 Added Specification Items in R25-11

[ECUC\_EthTSyn\_00128] [ECUC\_EthTSyn\_00129] [ECUC\_EthTSyn\_00130]  
[ECUC\_EthTSyn\_00131] [ECUC\_EthTSyn\_00132] [ECUC\_EthTSyn\_00133]  
[ECUC\_EthTSyn\_00134] [ECUC\_EthTSyn\_00135] [ECUC\_EthTSyn\_00136]  
[ECUC\_EthTSyn\_00137] [ECUC\_EthTSyn\_00138] [ECUC\_EthTSyn\_00139]  
[ECUC\_EthTSyn\_00140] [ECUC\_EthTSyn\_00141] [ECUC\_EthTSyn\_00142]  
[ECUC\_EthTSyn\_00143] [ECUC\_EthTSyn\_00144] [ECUC\_EthTSyn\_00145] [SWS\_EthTSyn\_00421] [SWS\_EthTSyn\_00422] [SWS\_EthTSyn\_00423] [SWS\_EthTSyn\_00424]

#### B.1.2 Changed Specification Items in R25-11

[ECUC\_EthTSyn\_00001] [ECUC\_EthTSyn\_00002] [ECUC\_EthTSyn\_00003]  
[ECUC\_EthTSyn\_00004] [ECUC\_EthTSyn\_00005] [ECUC\_EthTSyn\_00007]  
[ECUC\_EthTSyn\_00008] [ECUC\_EthTSyn\_00009] [ECUC\_EthTSyn\_00010]  
[ECUC\_EthTSyn\_00012] [ECUC\_EthTSyn\_00013] [ECUC\_EthTSyn\_00015]  
[ECUC\_EthTSyn\_00018] [ECUC\_EthTSyn\_00029] [ECUC\_EthTSyn\_00030]  
[ECUC\_EthTSyn\_00031] [ECUC\_EthTSyn\_00032] [ECUC\_EthTSyn\_00033]  
[ECUC\_EthTSyn\_00034] [ECUC\_EthTSyn\_00035] [ECUC\_EthTSyn\_00036]  
[ECUC\_EthTSyn\_00037] [ECUC\_EthTSyn\_00039] [ECUC\_EthTSyn\_00040]  
[ECUC\_EthTSyn\_00041] [ECUC\_EthTSyn\_00042] [ECUC\_EthTSyn\_00043]  
[ECUC\_EthTSyn\_00044] [ECUC\_EthTSyn\_00045] [ECUC\_EthTSyn\_00046]  
[ECUC\_EthTSyn\_00047] [ECUC\_EthTSyn\_00048] [ECUC\_EthTSyn\_00049]  
[ECUC\_EthTSyn\_00050] [ECUC\_EthTSyn\_00057] [ECUC\_EthTSyn\_00058]  
[ECUC\_EthTSyn\_00059] [ECUC\_EthTSyn\_00060] [ECUC\_EthTSyn\_00061]  
[ECUC\_EthTSyn\_00063] [ECUC\_EthTSyn\_00065] [ECUC\_EthTSyn\_00066]  
[ECUC\_EthTSyn\_00068] [ECUC\_EthTSyn\_00070] [ECUC\_EthTSyn\_00071]  
[ECUC\_EthTSyn\_00074] [ECUC\_EthTSyn\_00075] [ECUC\_EthTSyn\_00076]  
[ECUC\_EthTSyn\_00081] [ECUC\_EthTSyn\_00082] [ECUC\_EthTSyn\_00083]  
[ECUC\_EthTSyn\_00084] [ECUC\_EthTSyn\_00085] [ECUC\_EthTSyn\_00086]  
[ECUC\_EthTSyn\_00087] [ECUC\_EthTSyn\_00089] [ECUC\_EthTSyn\_00090]  
[ECUC\_EthTSyn\_00091] [ECUC\_EthTSyn\_00092] [ECUC\_EthTSyn\_00093]  
[ECUC\_EthTSyn\_00094] [ECUC\_EthTSyn\_00095] [ECUC\_EthTSyn\_00096]

[ECUC\_EthTSyn\_00097] [ECUC\_EthTSyn\_00098] [ECUC\_EthTSyn\_00099]  
 [ECUC\_EthTSyn\_00100] [ECUC\_EthTSyn\_00101] [ECUC\_EthTSyn\_00103]  
 [ECUC\_EthTSyn\_00104] [ECUC\_EthTSyn\_00105] [ECUC\_EthTSyn\_00106]  
 [ECUC\_EthTSyn\_00107] [ECUC\_EthTSyn\_00108] [ECUC\_EthTSyn\_00109]  
 [ECUC\_EthTSyn\_00110] [ECUC\_EthTSyn\_00112] [ECUC\_EthTSyn\_00113]  
 [ECUC\_EthTSyn\_00114] [ECUC\_EthTSyn\_00115] [ECUC\_EthTSyn\_00116]  
 [ECUC\_EthTSyn\_00117] [ECUC\_EthTSyn\_00119] [ECUC\_EthTSyn\_00120]  
 [ECUC\_EthTSyn\_00121] [ECUC\_EthTSyn\_00122] [ECUC\_EthTSyn\_00123]  
 [ECUC\_EthTSyn\_00124] [ECUC\_EthTSyn\_00125] [ECUC\_EthTSyn\_00126]  
 [ECUC\_EthTSyn\_00127] [SWS\_EthTSyn\_00014] [SWS\_EthTSyn\_00029] [SWS\_EthTSyn\_00031]  
 [SWS\_EthTSyn\_00032] [SWS\_EthTSyn\_00047] [SWS\_EthTSyn\_00104] [SWS\_EthTSyn\_00127]  
 [SWS\_EthTSyn\_00162] [SWS\_EthTSyn\_00172] [SWS\_EthTSyn\_00187] [SWS\_EthTSyn\_00200]  
 [SWS\_EthTSyn\_00201] [SWS\_EthTSyn\_00202] [SWS\_EthTSyn\_00203] [SWS\_EthTSyn\_00210]  
 [SWS\_EthTSyn\_00213] [SWS\_EthTSyn\_00214] [SWS\_EthTSyn\_00215] [SWS\_EthTSyn\_00216]  
 [SWS\_EthTSyn\_00217] [SWS\_EthTSyn\_00227] [SWS\_EthTSyn\_00228] [SWS\_EthTSyn\_00229]  
 [SWS\_EthTSyn\_00231] [SWS\_EthTSyn\_00232] [SWS\_EthTSyn\_00236] [SWS\_EthTSyn\_00243]  
 [SWS\_EthTSyn\_00250] [SWS\_EthTSyn\_00256] [SWS\_EthTSyn\_00261] [SWS\_EthTSyn\_00263]  
 [SWS\_EthTSyn\_00264] [SWS\_EthTSyn\_00265] [SWS\_EthTSyn\_00266] [SWS\_EthTSyn\_00330]  
 [SWS\_EthTSyn\_00331] [SWS\_EthTSyn\_00412] [SWS\_EthTSyn\_00413] [SWS\_EthTSyn\_00414]  
 [SWS\_EthTSyn\_00417] [SWS\_EthTSyn\_91001] [SWS\_EthTSyn\_91002] [SWS\_EthTSyn\_92000]  
 [SWS\_EthTSyn\_92001] [SWS\_EthTSyn\_92002] [SWS\_EthTSyn\_92003]

### B.1.3 Deleted Specification Items in R25-11

[ECUC\_EthTSyn\_00067] [ECUC\_EthTSyn\_00069] [ECUC\_EthTSyn\_00118]

### B.1.4 Added Constraints in R25-11

[SWS\_EthTSyn\_CONSTR\_00003] [SWS\_EthTSyn\_CONSTR\_00004] [SWS\_EthTSyn\_CONSTR\_00005]  
 [SWS\_EthTSyn\_CONSTR\_00006] [SWS\_EthTSyn\_CONSTR\_00007] [SWS\_EthTSyn\_CONSTR\_00008]  
 [SWS\_EthTSyn\_CONSTR\_00009] [constr\_0008] [constr\_0009] [constr\_0010] [constr\_0011]

### B.1.5 Changed Constraints in R25-11

[constr\_0002] [constr\_0004] [constr\_0005]

### B.1.6 Deleted Constraints in R25-11

[constr\_0001]

## B.2 Traceable item history of this document according to AUTOSAR Release R24-11

### B.2.1 Added Specification Items in R24-11

[[ECUC\\_EthTSyn\\_00120](#)] [[ECUC\\_EthTSyn\\_00121](#)] [[ECUC\\_EthTSyn\\_00122](#)]  
[[ECUC\\_EthTSyn\\_00123](#)] [[ECUC\\_EthTSyn\\_00124](#)] [[ECUC\\_EthTSyn\\_00125](#)]  
[[ECUC\\_EthTSyn\\_00126](#)] [[ECUC\\_EthTSyn\\_00127](#)] [[SWS\\_EthTSyn\\_00417](#)] [[SWS\\_EthTSyn\\_00418](#)] [[SWS\\_EthTSyn\\_00419](#)] [[SWS\\_EthTSyn\\_00420](#)] [[SWS\\_EthTSyn\\_92000](#)] [[SWS\\_EthTSyn\\_92001](#)] [[SWS\\_EthTSyn\\_92002](#)] [[SWS\\_EthTSyn\\_92003](#)]

### B.2.2 Changed Specification Items in R24-11

[[ECUC\\_EthTSyn\\_00003](#)] [[ECUC\\_EthTSyn\\_00008](#)] [[ECUC\\_EthTSyn\\_00009](#)]  
[[ECUC\\_EthTSyn\\_00034](#)] [[ECUC\\_EthTSyn\\_00049](#)] [[ECUC\\_EthTSyn\\_00063](#)] [[SWS\\_EthTSyn\\_00014](#)] [[SWS\\_EthTSyn\\_00031](#)] [[SWS\\_EthTSyn\\_00040](#)] [[SWS\\_EthTSyn\\_00041](#)] [[SWS\\_EthTSyn\\_00042](#)] [[SWS\\_EthTSyn\\_00047](#)] [[SWS\\_EthTSyn\\_00049](#)]  
[[SWS\\_EthTSyn\\_00124](#)] [[SWS\\_EthTSyn\\_00128](#)] [[SWS\\_EthTSyn\\_00160](#)] [[SWS\\_EthTSyn\\_00161](#)] [[SWS\\_EthTSyn\\_00162](#)] [[SWS\\_EthTSyn\\_00174](#)] [[SWS\\_EthTSyn\\_00175](#)] [[SWS\\_EthTSyn\\_00200](#)] [[SWS\\_EthTSyn\\_00201](#)] [[SWS\\_EthTSyn\\_00202](#)] [[SWS\\_EthTSyn\\_00203](#)] [[SWS\\_EthTSyn\\_00210](#)] [[SWS\\_EthTSyn\\_00261](#)]

### B.2.3 Deleted Specification Items in R24-11

[[ECUC\\_EthTSyn\\_00038](#)] [[ECUC\\_EthTSyn\\_00062](#)] [[ECUC\\_EthTSyn\\_00088](#)] [[SWS\\_EthTSyn\\_00086](#)] [[SWS\\_EthTSyn\\_00087](#)] [[SWS\\_EthTSyn\\_00136](#)] [[SWS\\_EthTSyn\\_00148](#)] [[SWS\\_EthTSyn\\_00198](#)] [[SWS\\_EthTSyn\\_00199](#)] [[SWS\\_EthTSyn\\_00262](#)]

### B.2.4 Added Constraints in R24-11

[[constr\\_0006](#)] [[constr\\_0007](#)]

### B.2.5 Changed Constraints in R24-11

none

### **B.2.6 Deleted Constraints in R24-11**

none

## **B.3 Change History of this document according to AUTOSAR Release R23-11**

### **B.3.1 Added Specification Items in R23-11**

[SWS\_EthTSyn\_00263] [SWS\_EthTSyn\_00264] [SWS\_EthTSyn\_00265] [SWS\_EthTSyn\_00266] [SWS\_EthTSyn\_00267] [SWS\_EthTSyn\_00268] [SWS\_EthTSyn\_00400] [SWS\_EthTSyn\_00401] [SWS\_EthTSyn\_00402] [SWS\_EthTSyn\_00403] [SWS\_EthTSyn\_00404] [SWS\_EthTSyn\_00405] [SWS\_EthTSyn\_00406] [SWS\_EthTSyn\_00407] [SWS\_EthTSyn\_00408] [SWS\_EthTSyn\_00409] [SWS\_EthTSyn\_00410] [SWS\_EthTSyn\_00411] [SWS\_EthTSyn\_00412] [SWS\_EthTSyn\_00413] [SWS\_EthTSyn\_00414] [SWS\_EthTSyn\_00415] [SWS\_EthTSyn\_00416] [SWS\_EthTSyn\_NA\_00996] [SWS\_EthTSyn\_NA\_00997] [SWS\_EthTSyn\_NA\_00998] [SWS\_EthTSyn\_NA\_00999]

### **B.3.2 Changed Specification Items in R23-11**

[SWS\_EthTSyn\_00017] [SWS\_EthTSyn\_00030] [SWS\_EthTSyn\_00031] [SWS\_EthTSyn\_00043] [SWS\_EthTSyn\_00047] [SWS\_EthTSyn\_00052] [SWS\_EthTSyn\_00086] [SWS\_EthTSyn\_00127] [SWS\_EthTSyn\_00128] [SWS\_EthTSyn\_00136] [SWS\_EthTSyn\_00137] [SWS\_EthTSyn\_00139] [SWS\_EthTSyn\_00150] [SWS\_EthTSyn\_00172] [SWS\_EthTSyn\_00190] [SWS\_EthTSyn\_00210] [SWS\_EthTSyn\_00211] [SWS\_EthTSyn\_00224] [SWS\_EthTSyn\_00225] [SWS\_EthTSyn\_00228] [SWS\_EthTSyn\_00229] [SWS\_EthTSyn\_00236] [SWS\_EthTSyn\_00241] [SWS\_EthTSyn\_00243] [SWS\_EthTSyn\_00248] [SWS\_EthTSyn\_00249] [SWS\_EthTSyn\_00250] [SWS\_EthTSyn\_00256] [SWS\_EthTSyn\_00257] [SWS\_EthTSyn\_00258] [SWS\_EthTSyn\_00261] [SWS\_EthTSyn\_00262]

### **B.3.3 Deleted Specification Items in R23-11**

[SWS\_EthTSyn\_00235]

### **B.3.4 Added Constraints in R23-11**

[constr\_0001] [constr\_0002] [constr\_0003] [constr\_0004] [constr\_0005]

### **B.3.5 Changed Constraints in R23-11**

none

### **B.3.6 Deleted Constraints in R23-11**

[SWS\_EthTSyn\_CONSTR\_00001] [SWS\_EthTSyn\_CONSTR\_00002]