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Document Change History			
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1 Introduction and functional overview

This specification specifies the functionality, API and the configuration of the AUTOSAR Basic Software Module Crypto Interface (CRYIF).

The Crypto Interface module is located between the low level Crypto solutions (Crypto Driver [4] and SW-based CDD) and the upper service layer (Crypto Service Manager [5]). It represents the interface to the services of the Crypto Driver(s) for the upper service layer. An AUTOSAR Layered View can be found in Figure 7.1.

The Crypto Interface module provides a unique interface to manage different Crypto HW and SW solutions like HSM, SHE or SW-based CDD. Thus, multiple underlying internal and external Crypto HW as well as SW solutions can be utilized by the Crypto Service Manager module based on a mapping scheme maintained by Crypto Interface.

2 Acronyms and abbreviations

The glossary below includes acronyms and abbreviations relevant to the Crypto Interface module that are not included in the AUTOSAR glossary [7].

Abbreviation / Acronym:	***Description:***
CDD	Complex Device Driver
CSM	Crypto Service Manager
CRYIF	Crypto Interface
CRYPTO	Crypto Driver
DET	Default Error Tracer
HSM	Hardware Security Module
HW	Hardware
SHE	Security Hardware Extension
SW	Software

2.1 Glossary of Terms

Terms:	***Description:***	
Crypto Driver Object	A Crypto Driver Object is an instance of a crypto module (hardware or software), which is able to perform one or more different crypto operations.	
Key	A Key can be referenced by a job in the Csm. In the Crypto Driver, the key references a specific key type.	
Key Type	A key type consists of references to key elements. The key types are typically pre-configured by the vendor of the Crypto Driver.	
Key Element	Key elements are used to store data. This data can be e.g. key material or the IV needed for AES encryption. It can also be used to configure the behavior of the key management functions. Key elements from different keys have different memory area (both NV and RAM area).	
Channel	A channel is the path from a Crypto Service Manager queue via the Crypto Interface to a specific Crypto Driver Object.	
Job	A 'Job' is a configured 'CsmJob'. Among others, it refers to a key, a cryptographic primitive and a reference channel.	
Crypto Primitive	A crypto primitive is an instance of a configured cryptographic algorithm.	
Operation	An operation of a crypto primitive declares what part of the crypto primitive shall be performed. There are three different operations:	
	START	Operation indicates a new request of a crypto primitive, and it shall cancel all previous requests.
	UPDATE	Operation indicates, that the crypto primitive expect input data.
	FINISH	Operation indicates, that after this part all data are fed completely and the crypto primitive can finalize the calculations.

	It is also possible to perform more than one operation at once by concatenating the corresponding bits of the operation mode argument.	
Primitive	A 'Primitive' is an instance of a configured cryptographic algorithm realized in a Crypto Driver Object. Among others it refers to a functionality provided by the CSM to the application, the concrete underlining 'algorithm family' (e.g. AES, MD5, RSA, ...), and a 'algorithmmode' (e.g. ECB, CBC, ...).	
Priority	The priority of a job defines the importance of it. The higher the priority (as well in value), the more immediate the job will be executed. The priority of a cryptographic job is part of the configuration.	
Processing	Indicates the kind of job processing.	
	Asynchronous	The job is not processed immediately when calling a corresponding function. Usually, the caller is informed via a callback function when the job has been finished.
	Synchronous	The job is processed immediately when calling a corresponding function. When the function returns, a result will be available.
Service	A 'Service' shall be understood as defined in the TR_Glossary document: A service is a type of operation that has a published specification of interface and behavior, involving a contract between the provider of the capability and the potential clients.	

3 Related documentation

3.1 Input documents

[1] AUTOSAR Layered Software Architecture
AUTOSAR_EXP_LayeredSoftwareArchitecture.pdf

[2] AUTOSAR General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral.pdf

[3] AUTOSAR General Specification for Basic Software Modules
AUTOSAR_SWS_BSWGeneral.pdf

[4] AUTOSAR Specification of Crypto Driver
AUTOSAR_SWS_CryptoDriver.pdf

[5] AUTOSAR Specification of Crypto Service Manager
AUTOSAR_SWS_CryptoServiceManager.pdf

[6] AUTOSAR Requirements on Crypto Modules
AUTOSAR_SRS_CryptoStack.pdf

[7] Glossary
AUTOSAR_TR_Glossary

3.2 Related standards and norms

[8] IEC 7498-1 The Basic Model, IEC Norm, 1994

3.3 Related specification

AUTOSAR provides a General Specification on Basic Software (SWS BSW General) [3], which is also valid for Crypto Interface.

Thus, the specification SWS BSW General [3] shall be considered as additional and required specification for Crypto Interface.

4 Constraints and assumptions

4.1 Limitations

The Crypto Interface is specifically designed to operate with one or multiple underlying Crypto Drivers. Several Crypto Driver modules covering different HW processing units or cores are represented by just one generic interface as specified in the Crypto Driver specification [4].
Any software based Crypto Driver shall be implemented as a CDD represented by the same interface above.

4.2 Applicability to car domains

The Crypto Interface can be used for all domain applications when security features are to be used.

5 Dependencies to other modules

[SWS_CryIf_00001] [The Crypto Interface (CRYIF) shall be able to be called by the Crypto Service Manager (CSM), and forward its service requests to the underlying Crypto Drivers.
]()

[SWS_CryIf_00002] [The CRYIF shall be able to access the underlying Crypto Drivers to calculate results with their cryptographic services. These results shall be returned back to the CSM by the CRYIF.
]()

5.1 File structure

5.1.1 Code file structure

[SWS_CryIf_00003] [The code file structure shall not be defined within this specification completely.
]()

[SWS_CryIf_00004] [The code file structure shall contain one source file CryIf.c, that contains the entire CRYIF code.
]()

6 Requirements traceability

Requirement	Description	Satisfied by
SRS_BSW_00101	The Basic Software Module shall be able to initialize variables and hardware in a separate initialization function	SWS_CryIf_91000
SRS_BSW_00358	The return type of init() functions implemented by AUTOSAR Basic Software Modules shall be void	SWS_CryIf_91000
SRS_BSW_00359	All AUTOSAR Basic Software Modules callback functions shall avoid return types other than void if possible	SWS_CryIf_91013
SRS_BSW_00360	AUTOSAR Basic Software Modules callback functions are allowed to have parameters	SWS_CryIf_91013
SRS_BSW_00407	Each BSW module shall provide a function to read out the version information of a dedicated module implementation	SWS_CryIf_91001
SRS_BSW_00414	Init functions shall have a pointer to a configuration structure as single parameter	SWS_CryIf_91000
SRS_CryptoStack_00034	The Crypto Interface shall report detected development errors to the Default Error Tracer	SWS_CryIf_00014, SWS_CryIf_00017, SWS_CryIf_00027, SWS_CryIf_00028, SWS_CryIf_00029, SWS_CryIf_00049, SWS_CryIf_00050, SWS_CryIf_00052, SWS_CryIf_00053, SWS_CryIf_00056, SWS_CryIf_00057, SWS_CryIf_00059, SWS_CryIf_00060, SWS_CryIf_00062, SWS_CryIf_00063, SWS_CryIf_00064, SWS_CryIf_00068, SWS_CryIf_00069, SWS_CryIf_00070, SWS_CryIf_00071, SWS_CryIf_00073, SWS_CryIf_00074, SWS_CryIf_00076, SWS_CryIf_00077, SWS_CryIf_00082, SWS_CryIf_00083, SWS_CryIf_00084, SWS_CryIf_00085, SWS_CryIf_00086, SWS_CryIf_00090, SWS_CryIf_00091, SWS_CryIf_00092, SWS_CryIf_00094, SWS_CryIf_00107, SWS_CryIf_00108, SWS_CryIf_00110, SWS_CryIf_00111, SWS_CryIf_00112, SWS_CryIf_00113, SWS_CryIf_00115, SWS_CryIf_00116, SWS_CryIf_00117,

		SWS_CryIf_00118, SWS_CryIf_00119, SWS_CryIf_00121, SWS_CryIf_00122, SWS_CryIf_00129, SWS_CryIf_00130, SWS_CryIf_00131, SWS_CryIf_00139
SRS_CryptoStack_00086	The CSM module shall distinguish between error types	SWS_CryIf_00009
SRS_CryptoStack_00095	The Crypto Driver module shall strictly separate error and status information	SWS_CryIf_91020
SWS_BSW_00050	Check parameters passed to Initialization functions	SWS_CryIf_91019
SWS_BSW_00216	-	SWS_CryIf_91118

7 Functional specification

The Crypto Interface is located between the Crypto Service Manager and the underlying crypto drivers and is the unique interface to access cryptographic operations for all upper layers (BSW). The Crypto Interface is also the only user of the crypto drivers and provides a unique interface to manage different crypto hardware and software solutions. The Abstraction Layer encapsulates different mechanisms of hardware and software access, so the Crypto Interface implementation is independent from the underlying Crypto Drivers which can be realized in hardware or software.
Also it ensures the concurrent access to crypto services to enable the possibility to process multiple crypto tasks at the same time.

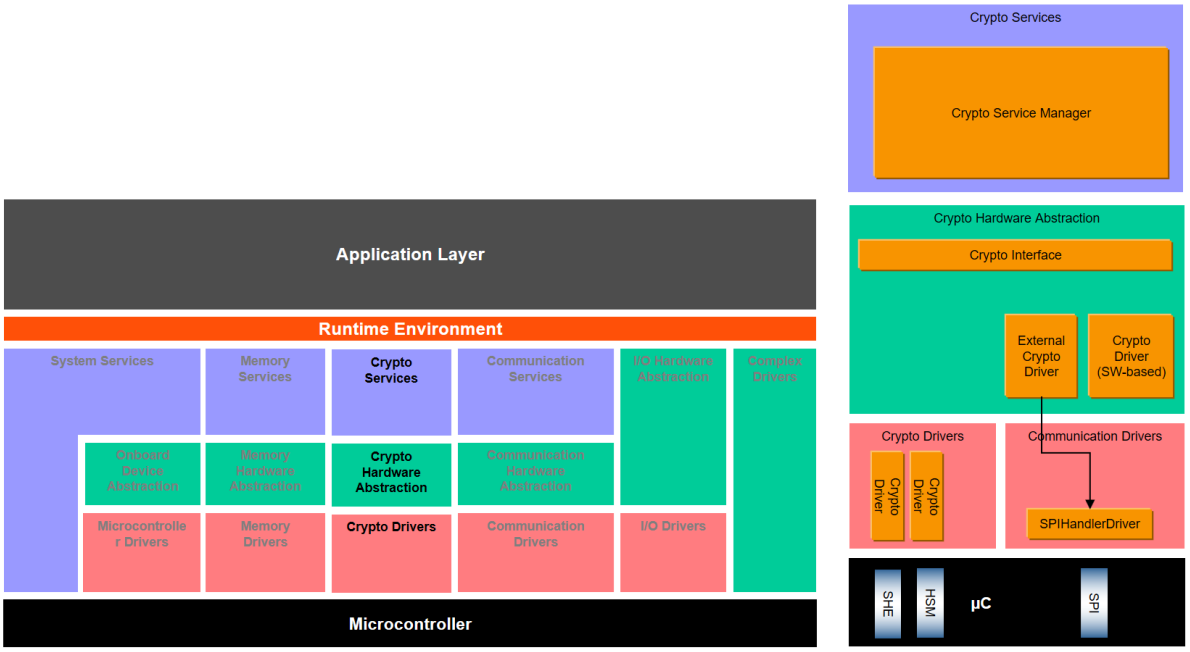


Figure 7.1: AUTOSAR Layered View with Crypto-Interface

7.1 Multicore

In a setup with a distributed CSM and Crypto drivers assigned to different partitions, the CryIf APIs will be used in different partitions. Nevertheless, CryIf shall stay a pure forwarding component and not care about execution contexts anyway, means it simply forwards a request in the context of the original caller.

[**SWS_CryIf_00144**] ⌈ *The CryIf module shall apply appropriate mechanisms to allow calls of its APIs from any partition.*
⌋()

[**SWS_CryIf_00145**] ⌈ *The CryIf module shall forward a call in the context of the original caller.*
⌋()

7.2 Error classification

Section 7.2 "Error Handling" of the document "General Specification of Basic Software Modules" 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.

7.2.1 Development Errors

[SWS_CryIf_00009]⌈

Type of error	*Related error code*	*Error value*
API request called before initialisation of CRYIF module.	CRYIF_E_UNINIT	0x00
Initialisation of CRYIF module failed.	CRYIF_E_INIT_FAILED	0x01
API request called with invalid parameter (null pointer).	CRYIF_E_PARAM_ POINTER	0x02
API request called with invalid parameter (out of range).	CRYIF_E_PARAM_HANDLE	0x03
API request called with invalid parameter (invalid value).	CRYIF_E_PARAM_VALUE	0x04
Source key element size does not match the target key elements size.	CRYIF_E_KEY_SIZE_ MISMATCH	0x05

⌋(SRS_CryptoStack_00086)

7.2.2 Runtime Errors

There are no runtime errors.

7.2.3 Transient Faults

There are no transient faults.

7.2.4 Production Errors

There are no production errors.

7.2.5 Extended Production Errors

There are no extended production errors.

7.3 Error detection

This chapter describes general error detection that applies to more than one specific functions.

[SWS_CryIf_00141] [If the parameter `job->jobPrimitiveInfo->primitiveInfo->service` is either set to `CRYPTO_KEYSETVALID, CRYPTO_KEYSETINVALID, CRYPTO_RANDOMSEED, CRYPTO_KEYGENERATE, CRYPTO_KEYDERIVE, CRYPTO_KEYEXCHANGECALCPUBVAL, CRYPTO_KEYEXCHANGECALCSECRET or CRYPTO_CUSTOM`, the parameters `job->jobPrimitiveInputOutput->cryIfKeyId` and, if applicable, `job->jobPrimitiveInputOutput->targetCryIfKeyId` shall be checked if it is in valid range.
If keys are out of range it shall report `CRYIF_E_PARAM_HANDLE` to DET in development mode, otherwise return `E_NOT_OK`.
](

[SWS_CryIf_00143] [If a job is called and the parameter `job->jobPrimitiveInfo->primitiveInfo->service` is either set to `CRYPTO_MACGENERATE, CRYPTO_MACVERIFY, CRYPTO_ENCRYPT, CRYPTO_DECRYPT, CRYPTO_AEADENCRYPT, CRYPTO_AEADDECRYPT, CRYPTO_RANDOMGENERATE, CRYPTO_SIGNATUREGENERATE, CRYPTO_SIGNATUREVERIFY or CRYPTO_CUSTOM`, the parameter `job->jobPrimitiveInfo->cryIfKeyId` shall be checked if it is in valid range.
If keys are out of range it shall report `CRYIF_E_PARAM_HANDLE` to DET in development mode, otherwise return `E_NOT_OK`.
](

8 API specification

8.1 Imported types

In this chapter, all types included from the following files are listed:

[SWS_CryIf_00011] Imported Types
[][

Module	*Header File*	*Imported Type*
Csm	Crypto_GeneralTypes.h	Crypto_AlgorithmFamilyType
	Crypto_GeneralTypes.h	Crypto_AlgorithmInfoType
	Crypto_GeneralTypes.h	Crypto_AlgorithmModeType
	Crypto_GeneralTypes.h	Crypto_JobPrimitiveInfoType
	Crypto_GeneralTypes.h	Crypto_JobPrimitiveInputOutputType
	Crypto_GeneralTypes.h	Crypto_JobRedirectionInfoType
	Crypto_GeneralTypes.h	Crypto_JobStateType
	Crypto_GeneralTypes.h	Crypto_JobType
	Crypto_GeneralTypes.h	Crypto_PrimitiveInfoType
	Crypto_GeneralTypes.h	Crypto_ProcessingType
	Crypto_GeneralTypes.h	Crypto_ServiceInfoType
	Rte_Csm_Type.h	Crypto_KeyStatusType
	Rte_Csm_Type.h	Crypto_OperationModeType
	Rte_Csm_Type.h	Crypto_ResultType
	Rte_Csm_Type.h	Crypto_VerifyResultType
Std	Std_Types.h	Std_ReturnType
	Std_Types.h	Std_VersionInfoType

]()

It should be noted, that the Crypto Stack API uses the key element index definition from the CSM module (see SWS_Csm_00122).

8.2 Type Definitions

8.2.1 Extension to Std_ReturnType

[SWS_CryIf_91020][

Range	CRYPTO_E_BUSY	0x02	The service request failed because the service is still busy
	CRYPTO_E_ENTROPY_EXHAUSTED	0x04	The service request failed because the entropy of the random number generator is exhausted
	CRYPTO_E_KEY_READ_FAIL	0x06	The service request failed because read access was denied
	CRYPTO_E_KEY_WRITE_FAIL	0x07	The service request failed because the writing access failed
	CRYPTO_E_KEY_NOT_AVAILABLE	0x08	The service request failed because at least one required key element is not available.
	CRYPTO_E_KEY_NOT_VALID	0x09	The service request failed because the key is invalid.
	CRYPTO_E_KEY_SIZE_MISMATCH	0x0A	The service request failed because the key size does not match.
	CRYPTO_E_JOB_CANCELED	0x0C	The service request failed because the Job has been canceled.
	CRYPTO_E_KEY_EMPTY	0x0D	The service request failed because of uninitialized source key element.
	CRYPTO_E_CUSTOM_ERROR	0x0E	Custom processing failed.
Description	--		
Available via	Crypto_GeneralTypes.h		

](SRS_CryptoStack_00095)

Note:

`CRYPTO_E_KEY_NOT_AVAILABLE` is meant to indicate that the key has been programmed before but cannot be accessed at the moment (for instance it is temporarily not accessible, e.g. when the key is disabled due to debugger connection or parameters are wrong).

`CRYPTO_E_KEY_EMPTY` is meant to indicate that the referred key content has not been written so far and has no default value (For example, in SHE 1.1, the error code ERC_KEY_EMPTY would be returned then, "if the application attempts to use a key that has not been initialized".)

8.2.2 CryIf_ConfigType

[SWS_CryIf_91118]⌈

Name	CryIf_ConfigType	
Kind	Structure	
Elements	implementation specific	
	Type	--
	Comment	The content of the configuration data structure is implementation specific.
Description	Configuration data structure of CryIf module	
Available via	CryIf.h	

⌋(SWS_BSW_00216)

8.3 Function definitions

This is a list of functions provided for upper layer modules.

8.3.1 General API

8.3.1.1 CryIf_Init

[SWS_CryIf_91000]⌈

Service Name	CryIf_Init	

Syntax	`void CryIf_Init (`
	`  const CryIf_ConfigType* configPtr`
	`)`	

Service ID [hex]	0x00	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	configPtr	Pointer to a selected configuration structure
Parameters (inout)	None	
Parameters (out)	None	
Return value	None	

Description	Initializes the CRYIF module.
Available via	CryIf.h

](SRS_BSW_00101, SRS_BSW_00358, SRS_BSW_00414)

[SWS_CryIf_91019] [The Configuration pointer `configPtr` shall always have a null pointer value.
] (SWS_BSW_00050)

The Configuration pointer `configPtr` is currently not used and shall therefore be set to null pointer value.

[SWS_CryIf_00014] [If the initialization of the CRYIF module fails, the CRYIF shall report `CRYIF_E_INIT_FAILED` to the DET.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00015] [The service CryIf_Init() shall initialize the global variables and data structures of the CRYIF including flags and buffers.
] ( )

8.3.1.2 CryIf_GetVersionInfo

[SWS_CryIf_91001][

Service Name	CryIf_GetVersionInfo	
Syntax	`void CryIf_GetVersionInfo ( Std_VersionInfoType* versioninfo )`	
Service ID [hex]	0x01	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	versioninfo	Pointer to where to store the version information of this module.
Parameters (inout)	None	
Parameters (out)	None	
Return value	void	--
Description	Returns the version information of this module.	
Available via	CryIf.h	

](SRS_BSW_00407)

[SWS_CryIf_00017] [If development error detection for the CRYIF module is enabled: The function `CryIf_GetVersionInfo` shall report

`CRYIF_E_PARAM_POINTER` to the DET if the parameter `versioninfo` is a null pointer.
] (SRS_CryptoStack_00034)

8.3.2 Job Processing Interface

8.3.2.1 CryIf_ProcessJob

To unite a single call function and a streaming approach for the crypto services, there is one interface `CryIf_ProcessJob()`. Its `Crypto_JobType job` parameter contains a `Crypto_OperationModeType` flag field (`job->jobPrimitiveInputOutput.mode`), which can be set as "`START`", "`UPDATE`", "`FINISH`" or combination of them. It declares explicitly what operation shall be performed. These operation modes can be mixed, and execute multiple operations at once.

To process a crypto service with a single call with `Crypto_ProcessJob()` the operation mode is a disjunction of the 3 modes "`START|UPDATE|FINISH`".

[SWS_CryIf_91003][

Service Name	CryIf_ProcessJob	
Syntax	`Std_ReturnType CryIf_ProcessJob ( uint32 channelId, Crypto_JobType* job )`	
Service ID [hex]	0x03	
Sync/Async	Depends on configuration	
Reentrancy	Reentrant	
Parameters (in)	channelId	Holds the identifier of the crypto channel.
Parameters (inout)	job	Pointer to the configuration of the job. Contains structures with user and primitive relevant information.
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypro Driver Object is busy CRYPTO_E_KEY_NOT_VALID: Request failed, the key is not valid CRYPTO_E_KEY_SIZE_MISMATCH: Request failed, a key element has the wrong size CRYPTO_E_QUEUE_FULL: Request failed, the queue is full CRYPTO_E_KEY_READ_FAIL: The service request failed, because key element extraction is not allowed CRYPTO_E_KEY_WRITE_FAIL: The service request failed because the writing access failed CRYPTO_E_KEY_NOT_AVAILABLE: The service request failed because the key is not available

		CRYPTO_E_JOB_CANCELED: The service request failed because the synchronous Job has been canceled CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element CRYPTO_E_ENTROPY_EXHAUSTED CRYPTO_E_CUSTOM_ERROR: Remote processing failed
Description	This interface dispatches the received jobs to the configured crypto driver object.	
Available via	CryIf.h	

](

[SWS_CryIf_00027] [If development error detection for the CRYIF is enabled: The function `CryIf_ProcessJob` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00028] [If development error detection for the CRYIF is enabled: The function `CryIf_ProcessJob` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `channelId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00029] [If development error detection for the CRYIF is enabled: The function `CryIf_ProcessJob` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `job` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00044] [If no errors are detected by CRYIF, the service `CryIf_ProcessJob()` shall call `Crypto_<vi>_<ai>_ProcessJob()` for the driver configuration mapped to the service and pass on the return value.
](

[SWS_CryIf_00136] [If job processing redirection is used for a job, the crypto interface need to adapt the incoming crypto interface key references and key element references to the corresponding key references and key element references of the respective values of the crypto driver.
](

8.3.2.2 Dispatch Key IDs

[SWS_CryIf_00133] [If the parameter `job->jobPrimitiveInfo->primitiveInfo->service` is either set to `CRYPTO_KEYSETVALID, CRYPTO_KEYSETINVALID, CRYPTO_RANDOMSEED, CRYPTO_KEYGENERATE, CRYPTO_KEYDERIVE, CRYPTO_KEYEXCHANGECALCPUBVAL, CRYPTO_KEYEXCHANGECALCSECRET or CRYPTO_CUSTOM`, the parameters job->jobPrimitiveInputOutput->cryIfKeyId and, if applicable, job->jobPrimitiveInputOutput->targetCryIfKeyId have to be checked if it is in a valid range.

If so, CryIf shall set job->cryptoKeyId with the key ID of the crypto driver that corresponds to job->jobPrimitiveInputOutput->cryIfKeyId, and, if applicable, job->targetCryptoKeyId with the key ID of the crypto driver that corresponds to job->jobPrimitiveInputOutput->targetCryIfKeyId..
](

[SWS_CryIf_00134] [If the parameter `job->jobPrimitiveInfo->primitiveInfo->service` is either set to `CRYPTO_KEYSETVALID`, `CRYPTO_KEYSETINVALID`, `CRYPTO_RANDOMSEED`, `CRYPTO_KEYGENERATE`, `CRYPTO_KEYDERIVE`, `CRYPTO_KEYEXCHANGECALCPUBVAL`, `CRYPTO_KEYEXCHANGECALCSECRET` or `CRYPTO_CUSTOM`, the parameter job->cryIfKeyId must be in range; else the function CryIf_ProcessJob shall report `CRYIF_E_PARAM_HANDLE` to DET.
](

[SWS_CryIf_00135] [If the parameter `job->jobPrimitiveInfo->primitiveInfo->service` is set to `CRYPTO_KEYDERIVE`, the parameter job->cryIfTargetKeyId must be in range; else the function CryIf_ProcessJob shall report `CRYIF_E_PARAM_HANDLE` to DET.
](

[SWS_CryIf_00142] [
If a job is called and the parameter `job->jobPrimitiveInfo->primitiveInfo->service` is either set to `CRYPTO_MACGENERATE`, `CRYPTO_MACVERIFY`, `CRYPTO_ENCRYPT`, `CRYPTO_DECRYPT`, `CRYPTO_AEADENCRYPT`, `CRYPTO_AEADDECRYPT`, `CRYPTO_RANDOMGENERATE`, `CRYPTO_SIGNATUREGENERATE` or `CRYPTO_SIGNATUREVERIFY`, the parameter `job->jobPrimitiveInfo->cryIfKeyId` have to be checked if it is in a valid range.
If so, CryIf shall set `job->cryptoKeyId` with the key ID of the crypto driver that corresponds to `job->jobPrimitiveInfo->cryIfKeyId`.
](

8.3.3 Job Cancellation Interface

8.3.3.1 CryIf_CancelJob

[SWS_CryIf_91014][

Service Name	CryIf_CancelJob

Syntax	`Std_ReturnType CryIf_CancelJob (`
	`  uint32 channelId,`
	`  Crypto_JobType* job`
	`)`

Service ID [hex]	0x0e
Sync/Async	Synchronous
Reentrancy	Reentrant

Parameters (in)	channelId	Holds the identifier of the crypto channel.
Parameters (inout)	job	Pointer to the configuration of the job. Contains structures with user and primitive relevant information.
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful, job has been removed E_NOT_OK: Request failed, job couldn't be removed CRYPTO_E_JOB_CANCELED
Description	This interface dispatches the job cancellation function to the configured crypto driver object.	
Available via	CryIf.h	

](

[SWS_CryIf_00129] [If development error detection for the CRYIF is enabled: The function `CryIf_CancelJob` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00130] [If development error detection for the CRYIF is enabled: The function `CryIf_CancelJob` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `channelId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00131] [If development error detection for the CRYIF is enabled: The function `CryIf_CancelJob` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `job` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00132] [If no errors are detected by CRYIF, the service `CryIf_CancelJob()` shall call `Crypto_<vi>_<ai>_CancelJob()` for the driver configuration mapped to the service and pass on the return value.
](

8.3.4 Key Management Interface

8.3.4.1 Key Setting Interface

8.3.4.1.1 CryIf_KeyElementSet

[SWS_CryIf_91004][

Service Name	CryIf_KeyElementSet

Syntax	`Std_ReturnType CryIf_KeyElementSet (`
	`  uint32 cryIfKeyId,`
	`  uint32 keyElementId,`
	`  const uint8* keyPtr,`
	`  uint32 keyLength`
	`)`

Service ID [hex]	0x04	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key whose key element shall be set.
	keyElement Id	Holds the identifier of the key element which shall be set.
	keyPtr	Holds the pointer to the key data which shall be set as key element.
	keyLength	Contains the length of the key element in bytes.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_WRITE_FAIL:Request failed because write access was denied CRYPTO_E_KEY_NOT_AVAILABLE: Request failed because the key is not available CRYPTO_E_KEY_SIZE_MISMATCH: Request failed, key element size does not match size of provided data
Description	This function shall dispatch the set key element function to the configured crypto driver object.	
Available via	CryIf.h	

](

[SWS_CryIf_00049] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementSet` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00050] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementSet` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out of range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00052] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementSet` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `keyPtr` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00053] [If development error detection for the CRYIF is enabled: The function `CryIf_KeyElementSet` shall report `CRYIF_E_PARAM_VALUE` to the DET if `keyLength` is zero.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00055] [If no errors are detected by CRYIF, the service `CryIf_KeyElementSet()` shall call `Crypto_<vi>_<ai>_KeyElementSet()` for the driver configuration mapped to the service and pass on the return value.
] ()

8.3.4.1.2 CryIf_KeySetValid

[SWS_CryIf_91005][

Service Name	CryIf_KeySetValid	
Syntax	`Std_ReturnType CryIf_KeySetValid ( uint32 cryIfKeyId )`	
Service ID [hex]	0x05	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key whose key elements shall be set to valid.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypro Driver Object is busy
Description	This function shall dispatch the set key valid function to the configured crypto driver object.	
Available via	CryIf.h	

]()

[SWS_CryIf_00056] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeySetValid` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00057] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeySetValid` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out of range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00058] ⌈ If no errors are detected by CRYIF, the service `CryIf_KeySetValid()` shall call `Crypto_<vi>_<ai>_KeySetValid()` for the driver configuration mapped to the service and pass on the return value.
⌋ ()

8.3.4.1.3 CryIf_KeySetInvalid

[SWS_CryIf_91021]⌈

Service Name	CryIf_KeySetInvalid	
Syntax	`Std_ReturnType CryIf_KeySetInvalid ( uint32 cryIfKeyId )`	
Service ID [hex]	0x14	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key for which the status shall be set to invalid.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypro Driver Object is busy
Description	Sets invalid for the status of the key identified by cryIfKeyId.	
Available via	CryIf.h	

⌋()

[**SWS_CryIf_00150**] ⌈ If development error detection for the CryIf module is enabled, the function `CryIf_KeySetInvalid()` shall report the error `CRYIF_E_UNINIT` if the module is not yet initialized.
⌋()

[**SWS_CryIf_00151**] ⌈ If development error detection for the CryIf module is enabled, the function `CryIf_KeySetInvalid()` shall report the error `CRYIF_E_PARAM_HANDLE` if the parameter *cryIfKeyId* is out of range.
⌋()

[**SWS_CryIf_00152**] ⌈ If no errors are detected by CryIf, the service `CryIf_KeySetInvalid()` shall call `Crypto_<vi>_<ai>_KeySetInvalid()` for the driver configuration mapped to the service and pass on the return value.
⌋()

8.3.4.2 Key Status Interface

8.3.4.2.1 CryIf_KeyGetStatus

[SWS_CryIf_91012]⌈

Service Name	CryIf_KeyGetStatus	
Syntax	`Std_ReturnType CryIf_KeyGetStatus ( uint32 cryIfKeyId, Crypto_KeyStatusType* keyStatusPtr )`	
Service ID [hex]	0x13	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key for which the key state shall be returned.
Parameters (inout)	None	
Parameters (out)	keyStatusPtr	Contains the pointer to the data where the status of the key shall be stored.
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed
Description	Returns the key state of the key identified by cryIfKeyId.	
Available via	CryIf.h	

⌋()

[**SWS_CryIf_00146**] ⌈ If development error detection for the CryIf module is enabled, the function `CryIf_KeyGetStatus()` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
⌋()

[**SWS_CryIf_00147**] ⌈ If development error detection for the CryIf module is enabled, the function `CryIf_KeyGetStatus()` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter *cryIfKeyId* is out of range.
⌋()

[**SWS_CryIf_00148**] ⌈ If development error detection for the CryIf module is enabled, the function `CryIf_KeyGetStatus()` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter *keyStatusPtr* is a null pointer.
⌋()

[**SWS_CryIf_00149**] ⌈ If no errors are detected by CryIf, the service `CryIf_KeyGetStatus()` shall call `Crypto_<vi>_<ai>_KeyGetStatus()` for the driver configuration mapped to the service and pass on the return value ⌋()

8.3.4.3 Key Extraction Interface

8.3.4.3.1 CryIf_KeyElementGet

[SWS_CryIf_91006]⌈

Service Name	CryIf_KeyElementGet	
Syntax	`Std_ReturnType CryIf_KeyElementGet ( uint32 cryIfKeyId, uint32 keyElementId, uint8* resultPtr, uint32* resultLengthPtr )`	
Service ID [hex]	0x06	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key whose key element shall be returned.
	keyElementId	Holds the identifier of the key element which shall be returned.
Parameters (inout)	resultLengthPtr	Holds a pointer to a memory location in which the length information is stored. On calling this function this parameter shall contain the size of the buffer provided by resultPtr. If the key element is configured to allow partial access, this parameter contains the amount of data which should be read from the key element. The size may not be equal to the size of the provided buffer anymore. When the request has finished, the amount of data that has been stored shall be stored.
Parameters (out)	resultPtr	Holds the pointer of the buffer for the returned key element
Return value	Std_-Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_NOT_AVAILABLE: Request failed, the requested key element is not available CRYPTO_E_KEY_READ_FAIL: Request failed because read access was denied CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element
Description	This function shall dispatch the get key element function to the configured crypto driver object.	
Available via	CryIf.h	

](

[SWS_CryIf_00059] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementGet` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00060] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementGet` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out of range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00062] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementGet` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `resultPtr` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00063] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementGet` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `resultLengthPtr` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00064] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyElementGet` shall report `CRYIF_E_PARAM_VALUE` to the DET if the value, which is pointed by `resultLengthPtr`, is zero.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00065] [If no errors are detected by CRYIF, the service `CryIf_KeyElementGet()` shall call `Crypto_<vi>_<ai>_KeyElementGet()` for the driver configuration mapped to the service and pass on the return value.
] ( )

8.3.4.4 Key Copying Interface

8.3.4.4.1 CryIf_KeyElementCopy

[SWS_CryIf_91015][

Service Name	CryIf_KeyElementCopy

Syntax	`Std_ReturnType CryIf_KeyElementCopy (`
	`  uint32 cryIfKeyId,`
	`  uint32 keyElementId,`
	`  uint32 targetCryIfKeyId,`
	`  uint32 targetKeyElementId`
	`)`

Service ID [hex]	0x0f

Sync/Async	Synchronous	
Reentrancy	Reentrant, but not for the same cryIfKeyId	
Parameters (in)	cryIfKeyId	Holds the identifier of the key whose key element shall be the source element.
	keyElementId	Holds the identifier of the key element which shall be the source for the copy operation.
	targetCryIfKeyId	Holds the identifier of the key whose key element shall be the destination element.
	targetKeyElementId	Holds the identifier of the key element which shall be the destination for the copy operation.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_NOT_AVAILABLE: Request failed, the requested key element is not available CRYPTO_E_KEY_READ_FAIL: Request failed, not allowed to extract key element CRYPTO_E_KEY_WRITE_FAIL: Request failed, not allowed to write key element CRYPTO_E_KEY_SIZE_MISMATCH: Request failed, key element sizes are not compatible CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element
Description	This function shall copy a key elements from one key to a target key.	
Available via	CryIf.h	

]()

[SWS_CryIf_00110] [If development error detection for the CRYIF is enabled: The function `CryIf_KeyElementCopy` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00111] [If development error detection for the CRYIF is enabled: The function `CryIf_KeyElementCopy` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00112] [If development error detection for the CRYIF is enabled: The function `CryIf_KeyElementCopy` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `targetCryIfKeyId` is out or range.

] (SRS_CryptoStack_00034)

[SWS_CryIf_00113] [If no errors are detected by CRYIF and the `cryIfKeyId` and `targetCryIfKeyId` are located in the same Crypto Driver, the service `CryIf_KeyElementCopy()` shall call `Crypto_<vi>_<ai>_KeyElementCopy()` for the driver configuration mapped to the service and pass on the return value.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00114] [If no errors are detected by CRYIF and the `cryIfKeyId` and `targetCryIfKeyId` are located in different Crypto Drivers, the service `CryIf_KeyElementCopy()` shall copy the provided key element by getting the element with `Crypto_<vi>_<ai>_KeyElementGet()` and setting the target key element via `Crypto_<vi>_<ai>_KeyElementSet()`.
] ( )

[SWS_CryIf_00115] [
If development error detection for the CRYIF is enabled: If requested key element of `cryIfKeyId` is available in `targetCryIfKeyId`, and if the source element size does not match the target key elements size, CryIf_KeyElementCopy() shall report `CRYIF_E_KEY_SIZE_MISMATCH` to the DET.
] (SRS_CryptoStack_00034)

8.3.4.4.2 CryIf_KeyElementCopyPartial

[SWS_CryIf_91018][

Service Name	CryIf_KeyElementCopyPartial	
Syntax	`Std_ReturnType CryIf_KeyElementCopyPartial ( uint32 cryIfKeyId, uint32 keyElementId, uint32 keyElementSourceOffset, uint32 keyElementTargetOffset, uint32 keyElementCopyLength, uint32 targetCryIfKeyId, uint32 targetKeyElementId )`	
Service ID [hex]	0x12	
Sync/Async	Synchronous	
Reentrancy	Reentrant but not for the same cryIfKeyId	
Parameters (in)	cryIfKeyId	Holds the identifier of the key whose key element shall be the source element.
	keyElementId	Holds the identifier of the key element which shall be the source for the copy operation.
	keyElementSource Offset	This is the offset of the source key element indicating the start index of the copy operation.
	keyElementTarget	This is the offset of the target key element indicating the start

	Offset	index of the copy operation.
	keyElementCopyLength	Specifies the number of bytes that shall be copied.
	targetCryIfKeyId	Holds the identifier of the key whose key element shall be the destination element.
	targetKeyElementId	Holds the identifier of the key element which shall be the destination for the copy operation.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_ReturnType	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_NOT_AVAILABLE: Request failed, the requested key element is not available CRYPTO_E_KEY_READ_FAIL: Request failed, not allowed to extract key element CRYPTO_E_KEY_WRITE_FAIL: Request failed, not allowed to write key element CRYPTO_E_KEY_SIZE_MISMATCH: Request failed, key element sizes are not compatible CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element
Description	Copies a key element to another key element. The keyElementOffsets and key ElementCopyLength allows to copy just parts of the source key element into the destination key element.	
Available via	CryIf.h	

]()

[SWS_CryIf_00137] [If the Crypto Interface is not yet initialized and if development error detection for the Crypto Interface is enabled, the function `CryIf_KeyElementCopyPartial` shall report `CRYIF_E_UNINIT` to the DET.
]()

[SWS_CryIf_00138] [If `cryIfKeyId` or `targetCryIfKeyId` is out of range and if development error detection for the Crypto Interface is enabled, the function `CryIf_KeyElementCopyPartial` shall report `CRYIF_E_PARAM_HANDLE` to the DET.
]()

[SWS_CryIf_00139] [If no errors are detected by CRYIF and the `cryIfKeyId` and `targetCryIfKeyId` are located in the same Crypto Driver, the service `CryIf_KeyElementCopyPartial()` shall call

`Crypto_<vi>_<ai>_KeyElementCopyPartial()` for the driver configuration mapped to the service and pass on the return value.
](SRS_CryptoStack_00034)

[SWS_CryIf_00140] [If no errors are detected by CRYIF and the `cryIfKeyId` and `targetCryIfKeyId` are located in different Crypto Drivers, the service `CryIf_KeyElementCopyPartial()` shall copy the provided key element by getting the element with `Crypto_<vi>_<ai>_KeyElementGet()`, copy the partial data to its destination and setting the target key element via `Crypto_<vi>_<ai>_KeyElementSet()`.
]()

8.3.4.4.3 CryIf_KeyCopy

[SWS_CryIf_91016][

Service Name	CryIf_KeyCopy	
Syntax	`Std_ReturnType CryIf_KeyCopy ( uint32 cryIfKeyId, uint32 targetCryIfKeyId )`	
Service ID [hex]	0x10	
Sync/Async	Synchronous	
Reentrancy	Reentrant but not for the same cryIfKeyId	
Parameters (in)	cryIfKeyId	Holds the identifier of the key whose key element shall be the source element.
	targetCryIf KeyId	Holds the identifier of the key whose key element shall be the destination element.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_NOT_AVAILABLE: Request failed, the requested key element is not available CRYPTO_E_KEY_READ_FAIL: Request failed, not allowed to extract key element CRYPTO_E_KEY_WRITE_FAIL: Request failed, not allowed to write key element CRYPTO_E_KEY_SIZE_MISMATCH: Request failed, key element sizes are not compatible CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element
Description	This function shall copy all key elements from the source key to a target key.	
Available via	CryIf.h	

](

[SWS_CryIf_00116] [If development error detection for the CRYIF is enabled: The function `CryIf_KeyCopy` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00117] [If development error detection for the CRYIF is enabled: The function `CryIf_KeyCopy` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00118] [If development error detection for the CRYIF is enabled: The function `CryIf_KeyCopy` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `targetCryIfKeyId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00119] [If no errors are detected by CRYIF and the `cryIfKeyId` and `targetCryIfKeyId` are located in the same Crypto Driver, the service `CryIf_KeyCopy()` shall call `Crypto_<vi>_<ai>_KeyCopy()` for the driver configuration mapped to the service and pass on the return value.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00120] [If no errors are detected by CRYIF and the cryIfKeyId and targetCryIfKeyId are located in different Crypto Drivers, the service CryIf_KeyCopy() shall transfer the key elements of the source key to the target key. First, a list of key elements from cryIfKeyId and targetCryIfKeyId shall be read using the function Crypto_<vi>_<ai__KeyElementdsIdGet(). All key elements from this list that are identical to each other shall be copied by reading each key element of cryIfKeyId with Crypto_<vi>_<ai>_KeyElementGet() and setting the target key element of targetCryIfKeyId via Crypto_<vi>_<ai>_KeyElementSet().
] ( )

[SWS_CryIf_00121] [
If development error detection for the CRYIF is enabled: For all key elements of `cryIfKeyId` that are available in `targetCryIfKeyId`, if the source element size does not match the target key elements size, CryIf_KeyCopy() shall report `CRYIF_E_KEY_SIZE_MISMATCH` to the DET.
] (SRS_CryptoStack_00034)

8.3.4.5 Key Generation Interface

8.3.4.5.1 CryIf_RandomSeed

[SWS_CryIf_91007][

Service Name	CryIf_RandomSeed

Syntax	`Std_ReturnType CryIf_RandomSeed (`
	`  uint32 cryIfKeyId,`
	`  const uint8* seedPtr,`
	`  uint32 seedLength`

	)	
Service ID [hex]	0x07	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key for which a new seed shall be generated.
	seedPtr	Holds a pointer to the memory location which contains the data to feed the seed.
	seedLength	Contains the length of the seed in bytes.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_KEY_NOT_VALID: Request failed, the key state of the key identified by cryptoKeyId is "invalid".
Description	This function shall dispatch the random seed function to the configured crypto driver object.	
Available via	CryIf.h	

](

[SWS_CryIf_00068] [If development error detection for the CRYIF is enabled: The function `CryIf_RandomSeed` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00069] [If development error detection for the CRYIF is enabled: The function `CryIf_RandomSeed` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00070] [If development error detection for the CRYIF is enabled: The function `CryIf_RandomSeed` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `seedPtr` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00071] [If development error detection for the CRYIF is enabled: The function `CryIf_RandomSeed` shall report `CRYIF_E_PARAM_VALUE` to the DET if `seedLength` is zero.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00072] [If no errors are detected by CRYIF, the service `CryIf_RandomSeed()` shall call `Crypto_<vi>_<ai>_RandomSeed()` for the driver configuration mapped to the service and pass on the return value.
] ( )

8.3.4.5.2 CryIf_KeyGenerate

[SWS_CryIf_91008][

Service Name	CryIf_KeyGenerate	
Syntax	`Std_ReturnType CryIf_KeyGenerate ( uint32 cryIfKeyId )`	
Service ID [hex]	0x08	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key which is to be updated with the generated value.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element CRYPTO_E_KEY_NOT_VALID: Request failed, the key state of the key identified by cryptoKeyId is "invalid".
Description	This function shall dispatch the key generate function to the configured crypto driver object.	
Available via	CryIf.h	

]()

[SWS_CryIf_00073] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyGenerate` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00074] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyGenerate` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00075] [If no errors are detected by CRYIF, the service `CryIf_KeyGenerate()` shall call `Crypto_<vi>_<ai>_KeyGenerate()` for the driver configuration mapped to the service and pass on the return value.
] ( )

8.3.4.6 Key Derivation Interface

8.3.4.6.1 CryIf_KeyDerive

[SWS_CryIf_91009][

Service Name	CryIf_KeyDerive	
Syntax	`Std_ReturnType CryIf_KeyDerive ( uint32 cryIfKeyId, uint32 targetCryIfKeyId )`	
Service ID [hex]	0x09	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key which is used for key derivation.
	targetCryIf KeyId	Holds the identifier of the key which is used to store the derived key.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element CRYPTO_E_BUSY: Crypto Driver Object has returned CRYPTO_E_BUSY. CRYPTO_E_KEY_NOT_VALID: Request failed, the key state of the key identified by cryptoKeyId is "invalid".
Description	This function shall dispatch the key derive function to the configured crypto driver object.	
Available via	CryIf.h	

]()

[SWS_CryIf_00076] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyDerive` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00077] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyDerive` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00122] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyDerive` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `targetCryIfKeyId` is out or range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00081] [If no errors are detected by CRYIF, the service `CryIf_KeyDerive()` shall call `Crypto_<vi>_<ai>_KeyDerive()` for the driver configuration mapped to the service and pass on the return value.
] ( )

The key derivation service needs a salt and password to derivate a new key. The salt and the password therefore are stored as key elements in the key referred by `cryIfKeyId`.

8.3.4.7 Key Exchange Interface

8.3.4.7.1 CryIf_KeyExchangeCalcPubVal

[SWS_CryIf_91010][

Service Name	CryIf_KeyExchangeCalcPubVal	
Syntax	`Std_ReturnType CryIf_KeyExchangeCalcPubVal ( uint32 cryIfKeyId, uint8* publicValuePtr, uint32* publicValueLengthPtr )`	
Service ID [hex]	0x0a	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key which shall be used for the key exchange protocol.
Parameters (inout)	public Value LengthPtr	Holds a pointer to the memory location in which the public value length information is stored. On calling this function, this parameter shall contain the size of the buffer provided by publicValuePtr. When the request has finished, the actual length of the returned value shall be stored.
Parameters (out)	public ValuePtr	Contains the pointer to the data where the public value shall be stored.
Return value	Std_-Return-Type	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element

		CRYPTO_E_KEY_NOT_VALID: Request failed, the key state of the key identified by cryptoKeyId is "invalid".
Description	This function shall dispatch the key exchange public value calculation function to the configured crypto driver object.	
Available via	CryIf.h	

]()
[SWS_CryIf_00082] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcPubVal` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00083] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcPubVal` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out of range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00084] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcPubVal` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `publicValuePtr` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00085] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcPubVal` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `pubValueLengthPtr` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00086] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcPubVal` shall report `CRYIF_E_PARAM_VALUE` to the DET if the value, which is pointed by `pubValueLengthPtr,` is zero.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00087] [If no errors are detected by CRYIF, the service `CryIf_KeyExchangeCalcPubVal()` shall call `Crypto_<vi>_<ai>_KeyExchangeCalcPubVal()` for the driver configuration mapped to the service and pass on the return value.
] ( )

8.3.4.7.2 CryIf_KeyExchangeCalcSecret
[SWS_CryIf_91011][

Service Name	CryIf_KeyExchangeCalcSecret	
Syntax	`Std_ReturnType CryIf_KeyExchangeCalcSecret ( uint32 cryIfKeyId, const uint8* partnerPublicValuePtr, uint32 partnerPublicValueLength )`	
Service ID [hex]	0x0b	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (in)	cryIfKeyId	Holds the identifier of the key which shall be used for the key exchange protocol.
	partnerPublic ValuePtr	Holds the pointer to the memory location which contains the partner's public value.
	partnerPublic ValueLength	Contains the length of the partner's public value in bytes.
Parameters (inout)	None	
Parameters (out)	None	
Return value	Std_ReturnType	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: Request failed, Crypto Driver Object is busy CRYPTO_E_KEY_EMPTY: Request failed because of uninitialized source key element CRYPTO_E_KEY_NOT_VALID: Request failed, the key state of the key identified by cryIfKeyId is "invalid".
Description	This function shall dispatch the key exchange common shared secret calculation function to the configured crypto driver object.	
Available via	CryIf.h	

]()

[SWS_CryIf_00090] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcSecret` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00091] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcSecret` shall report `CRYIF_E_PARAM_HANDLE` to the DET if the parameter `cryIfKeyId` is out of range.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00092] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcSecret` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `partnerPublicValuePtr` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00094] [If development error detection for the CRYIF module is enabled: The function `CryIf_KeyExchangeCalcSecret` shall report `CRYIF_E_PARAM_VALUE` to the DET if `partnerPubValueLength` is zero.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00095] [If no errors are detected by CRYIF, the service `CryIf_KeyExchangeCalcSecret()` shall call `Crypto_<vi>_<ai>_KeyExchangeCalcSecret()` for the driver configuration mapped to the service and pass on the return value.
] ( )

8.3.5 Custom Service Interface

[SWS_CryIf_91022][

Service Name	CryIf_CustomSync	
Syntax	`Std_ReturnType CryIf_CustomSync ( uint32 dispatchId, uint32 keyId, uint32 keyElementId, uint32 targetKeyId, uint32 targetKeyElementId, const uint8* inputPtr, uint32 inputLength, uint8* outputPtr, uint32* outputLengthPtr, uint8* secondaryOutputPtr, uint32* secondaryOutputLengthPtr )`	
Service ID [hex]	0x15	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	dispatchId	unique id to identify the request
	keyId	key Id of the key the certificate is stored
	keyElementId	key element id
	targetKeyId	Holds the target key id
	targetKeyElementId	--
	inputPtr	Pointer to the input data.
	inputLength	Contains the input length in bytes.

Parameters (inout)	None	
Parameters (out)	outputPtr	Pointer to the output data.
	outputLengthPtr	Contains the output length in bytes.
	secondaryOutputPtr	Pointer to the secondary output data.
	secondaryOutput LengthPtr	Contains the secondary output length in bytes.
Return value	Std_ReturnType	E_OK: Request successful E_NOT_OK: Request failed CRYPTO_E_BUSY: The service request failed because the service is still busy CRYPTO_E_CUSTOM_ERROR: Custom processing failed
Description	Requests the execution of a function that is specified by the given dispatch id.	
Available via	CryIf.h	

]()

[SWS_CryIf_91002] [`If no errors are detected by CRYIF, the service CryIf_ CustomSync) shall call Crypto_ CustomSync() for the driver configuration mapped to the service and pass on the return value.`] ( )

8.4 Call-back notifications

This is a list of functions provided for other modules.

8.4.1 CryIf_CallbackNotification

[SWS_CryIf_91013][

Service Name	CryIf_CallbackNotification	
Syntax	`void CryIf_CallbackNotification ( Crypto_JobType* job, Crypto_ResultType result )`	
Service ID [hex]	0x0d	
Sync/Async	Synchronous	
Reentrancy	Non Reentrant	
Parameters (in)	job	Points to the completed job's information structure. It contains a callback ID to identify which job is finished.
	result	Contains the result of the cryptographic operation.

Parameters (inout)	None	
Parameters (out)	None	
Return value	void	--
Description	Notifies the CRYIF about the completion of the request with the result of the cryptographic operation.	
Available via	CryIf.h	

](SRS_BSW_00359, SRS_BSW_00360)

[SWS_CryIf_00107] [If development error detection for the CRYIF module is enabled: The function `CryIf_CallbackNotification` shall report `CRYIF_E_UNINIT` to the DET if the module is not yet initialized.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00108] [If development error detection for the CRYIF module is enabled: The function `CryIf_CallbackNotification` shall report `CRYIF_E_PARAM_POINTER` to the DET if the parameter `job` is a null pointer.
] (SRS_CryptoStack_00034)

[SWS_CryIf_00109] [If no errors are detected by CRYIF, the service `CryIf_CallbackNotification()` shall call `Csm_CallbackNotification()` and pass on the result.
] ( )

8.5 Expected Interfaces

8.5.1 Mandatory Interfaces

This chapter defines all interfaces, which are required to fulfill the core functionality of the CryIf module.
[SWS_CryIf_91100][

API Function	***Header File***	***Description***
Csm_Callback-Notification	Csm.h	Notifies the CSM that a job has finished. This function is used by the underlying layer (CRYIF).
Det_Report-RuntimeError	Det.h	Service to report runtime errors. If a callout has been configured then this callout shall be called.

]()

8.5.2 Optional Interfaces

This chapter defines all interfaces, which are required to fulfill an optional functionality of the CryIf module.
[SWS_CryIf_91101]⌈

API Function	*Header File*	*Description*
Det_ReportError	Det.h	Service to report development errors.

⌋()

9 Sequence diagrams

N/A.

10 Configuration specification

Chapter 10.1 specifies the structure (containers) and the parameters of the module CRYIF.

Chapter 10.2 specifies additionally published information of the module CRYIF.

10.1 Containers and configuration parameters

The following chapters summarize all configuration parameters. The detailed meanings of the parameters describe Chapters 7 and Chapter 8.
Note: The Ids in the configuration containers shall be consecutive, gapless and shall start from zero.

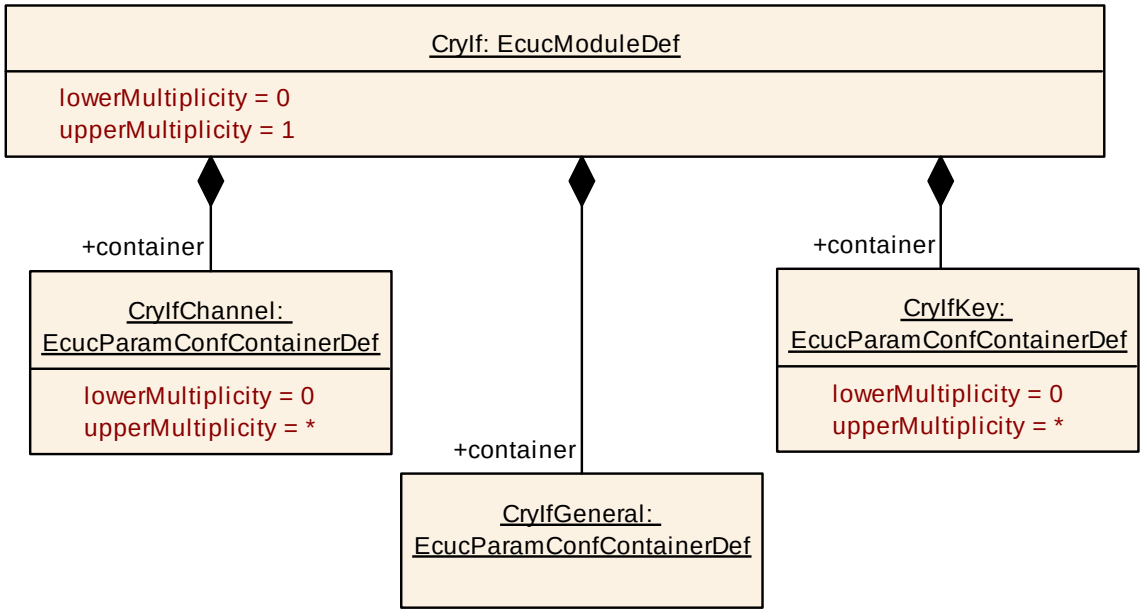
10.1.1 Variants

For details refer to the chapter 10.1.2 “Variants” in *SWS_BSWGeneral.*

10.1.2 CryIf

SWS Item	[ECUC_CryIf_00001]
Module Name	CryIf
Description	Configuration of the Crypto Interface.
Post-Build Variant Support	false

Included Containers		
Container Name	**Multiplicity**	**Scope / Dependency**
CryIfChannel	0..*	Container for incorporation of CryIfChannel.
CryIfGeneral	1	Container for incorporation of CryIfGeneral.
CryIfKey	0..*	Container for incorporation of CryIfKey.



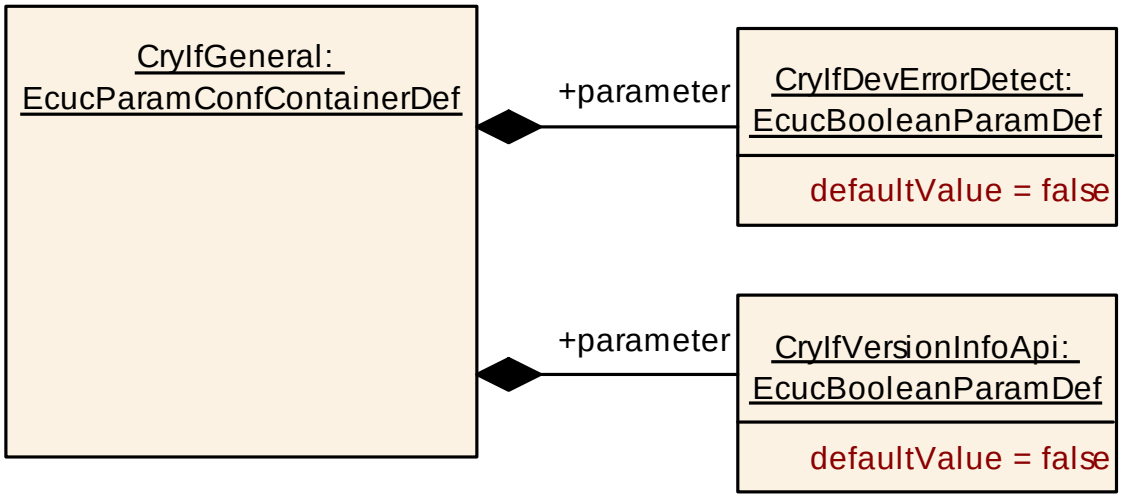
10.1.3 CryIfGeneral

SWS Item	[ECUC_CryIf_00009]
Container Name	CryIfGeneral
Parent Container	CryIf
Description	Container for incorporation of CryIfGeneral.
Configuration Parameters	

SWS Item	[ECUC_CryIf_00010]
Parameter Name	CryIfDevErrorDetect
Parent Container	CryIfGeneral
Description	Switches the development error detection and notification on or off. true: detection and notification is enabled. false: detection and notification is disabled.
Multiplicity	1
Type	EcucBooleanParamDef
Default value	false
Scope / Dependency	scope: local

SWS Item	[ECUC_CryIf_00011]
Parameter Name	CryIfVersionInfoApi
Parent Container	CryIfGeneral
Description	Pre-processor switch to enable and disable availability of the API CryIf_Get VersionInfo(). True: API CryIf_GetVersionInfo() is available False: API CryIf_Get VersionInfo() is not available.
Multiplicity	1
Type	EcucBooleanParamDef
Default value	false
Scope / Dependency	scope: local

No Included Containers



10.1.4 CryIfChannel

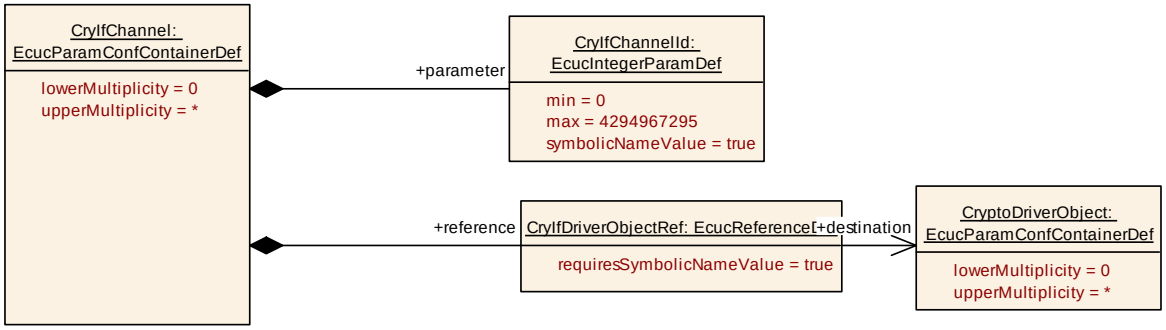
SWS Item	[ECUC_CryIf_00002]
Container Name	CryIfChannel
Parent Container	CryIf
Description	Container for incorporation of CryIfChannel.

Configuration Parameters

SWS Item	[ECUC_CryIf_00004]	
Parameter Name	CryIfChannelId	
Parent Container	CryIfChannel	
Description	Identifier of the crypto channel. Specifies to which crypto channel the CSM queue is connected to.	
Multiplicity	1	
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)	
Range	0 .. 4294967295	
Default value	--	
Post-Build Variant Multiplicity	false	
Post-Build Variant Value	false	
Scope / Dependency	scope: local	

SWS Item	[ECUC_CryIf_00005]
Parameter Name	CryIfDriverObjectRef
Parent Container	CryIfChannel
Description	This parameter refers to a Crypto Driver Object. Specifies to which Crypto Driver Object the crypto channel is connected to
Multiplicity	1
Type	Symbolic name reference to CryptoDriverObject
Post-Build Variant Multiplicity	false
Post-Build Variant Value	false
Scope / Dependency	scope: local

No Included Containers



10.1.5 CryIfKey

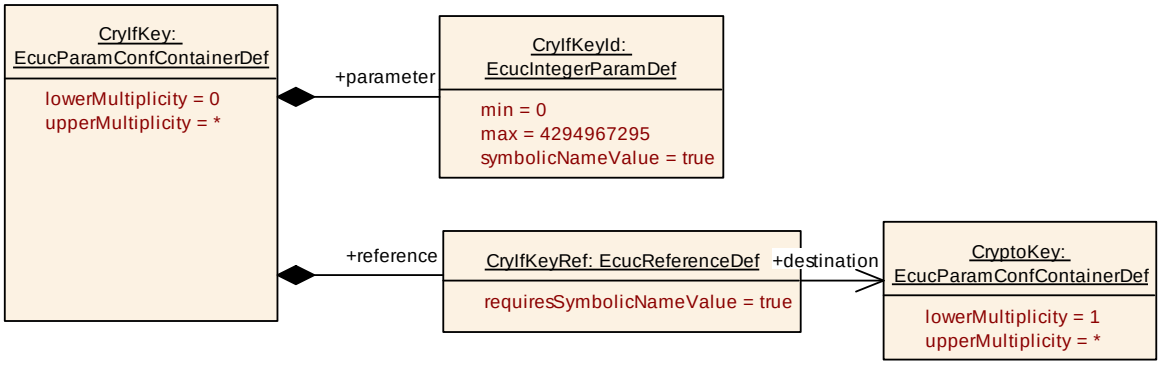
SWS Item	[ECUC_CryIf_00003]
Container Name	CryIfKey
Parent Container	CryIf
Description	Container for incorporation of CryIfKey.
Configuration Parameters	

SWS Item	[ECUC_CryIf_00007]
Parameter Name	CryIfKeyId
Parent Container	CryIfKey
Description	Identifier of the CryIf key. Specifies to which CryIf key the CSM key is mapped to.
Multiplicity	1
Type	EcucIntegerParamDef (Symbolic Name generated for this parameter)
Range	0 .. 4294967295
Default value	--
Post-Build Variant Value	false
Scope / Dependency	scope: local

SWS Item	[ECUC_CryIf_00008]
Parameter Name	CryIfKeyRef
Parent Container	CryIfKey
Description	This parameter refers to the crypto driver key. Specifies to which crypto driver key the CryIf key is mapped to.

Multiplicity	1
Type	Symbolic name reference to CryptoKey
Post-Build Variant Value	false
Scope / Dependency	scope: local

No Included Containers



10.2 Published Information

Published information contains data defined by the implementer of the SW module that does not change when the module is adapted (i.e. configured) to the actual HW/SW environment. It thus contains version and manufacturer information.

Additional module-specific published parameters are listed below if applicable.