AUTOSAR LinSM User Manual

Document Change History				
Date (YYYY-MM-DD)	Ver.	Editor	Chap	Change Descriptions
2020-12-22	1.0.0.0	SJ Kim	All	- Initial version
2022-02-28	1.0.1.0	HJ Seong	4.2 4.3	- Update Scope of the Release - Add Change Log
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2023-08-24	1.0.9.0	KhaLN1	4.2 4.3	- Update Scope of the Release - Add Change Log

Table of Contents

1 Overview

This document provides caution or reference information for users when setting parameters or designing systems for LinSM module in the HYUNDAI AUTOEVER AUTOSAR platform. It is written based on SRS/SWS AUTOSAR standard. More detailed information can be found in the reference document below.

The interpretation of the category related to setting is as follows:

- Changeable (C) : Items that can be set by the user.
- Fixed (F) : Items that cannot be changed by user
- Not Supported (N) : Items that not supported

Acronyms and abbreviations:

Abbreviation / Acronym:	Description:
LIN	Local Interconnect Network
LinSM	LIN State Manager
LinIf	LIN Interface
ComM	Communication Manager
Sw	Software
ECU	Electric Control Unit
Bswmd	BswModule Description
AUTOSAR	Automotive Open System Architecture

2 Reference

Sl. No.	Title	Version
1	AUTOSAR_SWS_LINStateManager.pdf	4.4.0

3 AUTOSAR System

3.1 Overview of LinSM Module

The LinSM is dependent on upper module Communication Manager (ComM) and lower module LIN Interface (LinIf).
The main responsibilities for the LinSM are:

- Control the communication status (no communication or full communication) of all LIN networks
- Handle schedule change requests (Only applicable to LIN master node)

- Handle communication mode requests
- Notify of state changes to upper layers

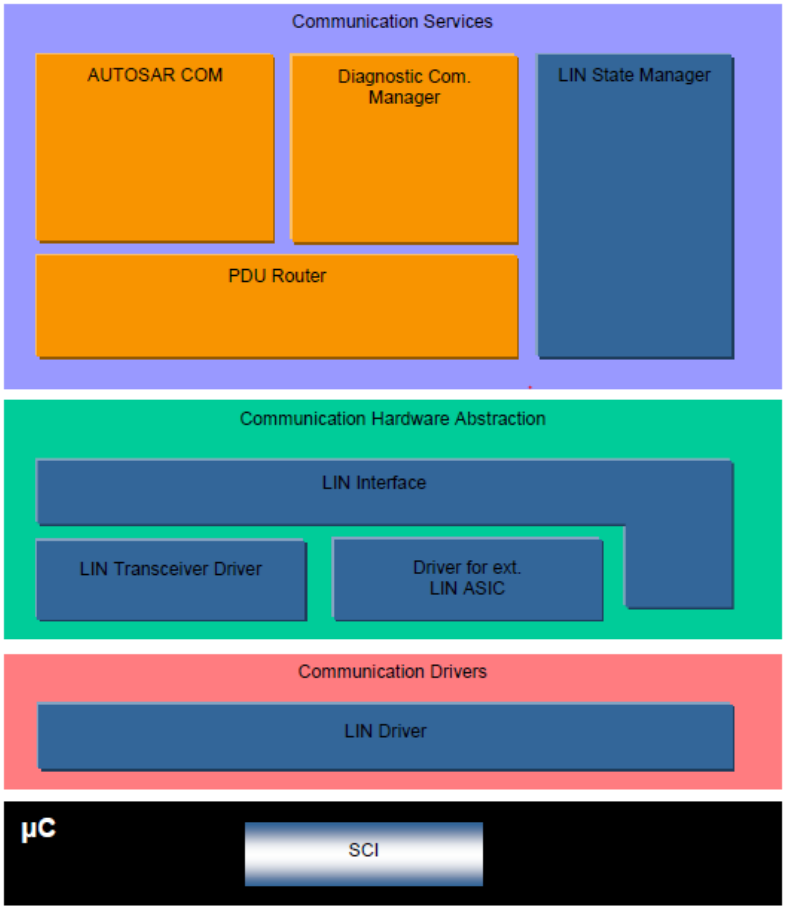

Figure 1 - AUTOSAR BSW software architecture - LIN stack scope

4 Product Release Notes

4.1 Overview

This chapter aims to provide release related content for the HYUNDAI AUTOEVER LinSM module, and describes restrictions and specifics for the release versions of LinSM Software product.

4.2 Scope of the Release

All contents of this document are limited following HYUNDAI AUTOEVER LinSM module in the table below.

Module	AUTOSAR version	Module version
LinSM	4.4.0	1.0.9

※ Module version means the Sw Version of each module's BswModule Description(Bswmd) file.

4.3 Change Log

4.3.1 Version 1.0.9.0

- Improvement
  - Remove Duplicate URI in Bswmd_LinSM.arxml.

Cause	LinSM generator added code to generate "EXCLUSIVE-AREAS" based on LIN channel but Bswmdt_LinSM.template did not remove the default "EXCLUSIVE-AREAS" elements.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.2 Version 1.0.8.0

- Improvement
  - Fix compiler warning in LinSM module.

Cause	A compiler warning occurred when LinSM has only one channel.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.3 Version 1.0.7.0

- Improvement
  - Improving the generator so that Exclusive Area is generated by the number of LIN channels.

Cause	The number of "Exclusive Area" is fixed by Bswmd template file, but it should be generated based on the LIN channel number.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.4 Version 1.0.6.0

- Improvement
  - Improve the code by referring to ASPICE inspection results.

Cause	Improve the code by referring to ASPICE inspection results.
Operation effect	None
Setting effect	None

ASW Action	None

4.3.5 Version 1.0.5.0

- Improvement
  - Improvement of UNECE security coding.

Cause	Improvement of UNECE security coding.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.6 Version 1.0.4.0

- Task
  - Editorial Changes of Work Products.

Cause	- Clarify the copyright of code. - Delete Module.bat file in the module. - Divide 'delivery' folder into 'delivery/src' and 'delivery/inc'.
Operation effect	None
Setting effect	None
ASW Action	None

- Improvement
  - Change 'CATEGORY' of 'IMPLEMENTATION-DATA-TYPE-ELEMENT' in Bswmd.

Cause	Fix TCG validation error.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.7 Version 1.0.3.0

- Bug
  - Generate Rte failed when Bswmd_LinSM is missing defines.

Cause	Fix Bswmd_LinSM is missing defines.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.8 Version 1.0.2.0

- Improvement

- Fix UNECE security coding rule violations.

Cause	Fix UNECE security coding rule violations.
Operation effect	None
Setting effect	None
ASW Action	None

➢ Bug

- Missing IMPLEMENTATION-DATA-TYPE-ELEMENT.

Cause	Missing IMPLEMENTATION-DATA-TYPE-ELEMENT.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.9 Version 1.0.1.0

➢ Improvement

- Fix compile warning.

Cause	Fix compile warning in LinSM_Cfg.h.
Operation effect	None
Setting effect	None
ASW Action	None

4.3.10 Version 1.0.0.0

➢ Feature

- R44 Initial version.

Cause	R44 Initial version.
Operation effect	None
Setting effect	None
ASW Action	None

4.4 Limitations

There is at most one instance of the LinSM in each ECU. If the underlying LIN Driver [10] supports multiple networks, the LinSM may be LIN master or LIN slave on more than one cluster.
All references to (switching of) schedule tables do only apply to LIN master node; there are no schedule tables for LIN slave node.

4.5 Deviations

None

5 Configuration Guide

LinSM configurations of AUTOSAR platform distributed by HYUNDAI AUTOEVER should be set by the users follow by the project requirements.

5.1 LinSMConfigSet Settings

Parameter Name	Value	Category
LinSMModeRequestRepetitionMax	Automated	C

1) LinSMModeRequestRepetitionMax: the maximal amount of mode request repetitions.

5.2 LinSMConfigSet - LinSMChannel Settings

Parameter Name	Value	Category
LinSMConfirmationTimeout	0	F
LinSMNodeType	Automated	C
LinSMSilenceAfterWakeupTimeout	Automated	C
LinSMTransceiverPassiveMode	From SRS	F
LinSMComMNetworkHandleRef	Automated	F

1) LinSMConfirmationTimeout
   - Timeout in seconds for the goto sleep, wakeup and schedule request calls to LinIf.
2) LinSMNodeType
   - Specifies the LIN node type of this channel.
3) LinSMSilenceAfterWakeupTimeout
   - Timeout in seconds after a failed wakeup sequence until a new wakeup process is started.
4) LinSMTransceiverPassiveMode
   - Selects STANDBY (true) or SLEEP (false) transceiver mode when entering LINSM_NO_COM.
5) LinSMComMNetworkHandleRef
   - Reference to one of the network handles configured in the ComM.

5.3 LinSMConfigSet – LinSMChannel - LinSMSchedule Settings

Parameter Name	Value	Category
LinSMScheduleIndex	Automated	C
LinSMScheduleIndexRef	Automated	C

1) LinSMScheduleIndex
   - This index parameter can be used by the BswM as a SymbolicNameReference target. The LinSM just forwards the request from the BswM to LinIf.

2) LinSMScheduleIndexRef
   - Reference to a schedule table in the LinIf configuration.

5.4 LinSMGeneral Settings

Parameter Name	Value	Category
LinSMDevErrorDetect	True	F
LinSMMainProcessingPeriod	-	F
LinSMVersionInfoApi	False	F

1) LinSMDevErrorDetect
   - Switches the development error detection and notification on or off.
2) LinSMMainProcessingPeriod
   - Fixed period that the MainFunction shall be called.
3) LinSMVersionInfoApi
   - Switches the LinSM_GetVersionInfo function ON or OFF.

6 Application Programming Interface (API)

6.1 Type Definitions

6.1.1 LinSM_NodeType

Type:	Enumeration		
Range:	LINSM_MASTER_NODE	0x00	Master Node
	LINSM_SLAVE_NODE	0x01	Slave Node
Description:	Specifies the LIN node type of channel		
Available via:	LinSM.h		

6.1.2 LinSM_ConfigType

Type:	Structure	
Range:	implementation specific	--
Description:	Data structure type for the post-build configuration parameters.	
Available via:	LinSM.h	

6.2 Macro Constants

None

6.3 Functions

Describes all functionalities of LIN State Manager modules.

6.3.1 LinSM_Init

Function Name	LinSM_Init	
Syntax	void LinSM_Init (const LinSM_ConfigType* ConfigPtr)	
Service ID [Hex]	0x01	
Sync/Async	Synchronous	
Reentrancy	Non-Reentrant	
Parameters (In)	ConfigPtr	Pointer to the LinSM post-build configuration data.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	
Description	This function initializes the LinSM.	
Available via	LinSM.h	

6.3.2 LinSM_ScheduleRequest

Function Name	LinSM_ScheduleRequest
Syntax	Std_ReturnType LinSM_ScheduleRequest (NetworkHandleType network, LinIf_SchHandleType schedule)
Service ID [Hex]	0x10
Sync/Async	Asynchronous
Reentrancy	Reentrant

Parameters (In)	network	Identification of the LIN channel.
	schedule	Pointer to the new Schedule table.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	Std_ReturnType	E_OK - Schedule table request has been accepted. E_NOT_OK - Schedule table switch request has not been accepted due to one of the following reasons: + LinSM has not been initialized referenced channel does not exist (identification is out of range). + Referenced schedule table does not exist (identification is out of range). + Sub-state is not LINSM_FULL_COM
Description	The upper layer requests a schedule table to be changed on one LIN network.	
Available via	LinSM.h	

6.3.3 LinSM_GetVersionInfo

Function Name	LinSM_GetVersionInfo	
Syntax	void LinSM_GetVersionInfo (Std_VersionInfoType* versioninfo)	
Service ID [Hex]	0x02	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (In)	None	
Parameters (Inout)	None	
Parameters (Out)	VersionInfo	Pointer to where to store the version information of this module.
Return Value	None	
Description	This service returns the version information of the called LinSM module.	

Available via	LinSM.h

6.3.4 LinSM_GetCurrentComMode

Function Name	LinSM_GetCurrentComMode	
Syntax	Std_ReturnType LinSM_GetCurrentComMode (NetworkHandleType network, ComM_ModeType* mode)	
Service ID [Hex]	0x11	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (In)	network	Identification of the LIN channel.
Parameters (Inout)	None	
Parameters (Out)	mode	Returns the active mode, see ComM_ModeType for descriptions of the modes.
Return Value	Std_ReturnType	E_OK - Ok E_NOT_OK - Not possible to perform the request, e.g. not initialized.
Description	Function to query the current communication mode.	
Available via	LinSM.h	

6.3.5 LinSM_RequestComMode

Function Name	LinSM_RequestComMode	
Syntax	Std_ReturnType LinSM_RequestComMode (NetworkHandleType network, ComM_ModeType mode)	
Service ID [Hex]	0x12	
Sync/Async	ASynchronous	
Reentrancy	Reentrant	
Parameters (In)	network	Identification of the LIN channel.

	mode	Request mode.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	Std_ReturnType	E_OK - Ok E_NOT_OK - Not possible to perform the request, e.g. not initialized.
Description	Requesting of a communication mode. The mode switch will not be made instant. The LinSM will notify the caller when mode transition is made.	
Available via	LinSM.h	

6.3.6 LinSM_MainFunction

Function Name	LinSM_MainFunction
Syntax	void LinSM_MainFunction (void)
Service ID [Hex]	0x30
Description	Periodic function that runs the timers of different request timeouts
Available via	SchM_LinSm.h

6.3.7 LinSM_ScheduleRequestConfirmation

Function Name	LinSM_ScheduleRequestConfirmation	
Syntax	void LinSM_ScheduleRequestConfirmation (NetworkHandleType network, LinIf_SchHandleType schedule)	
Service ID [Hex]	0x20	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (In)	network	Identification of the LIN channel.

	schedule	Pointer to the new active Schedule table.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	
Description	The LinIf module will call this callback when the new requested schedule table is active.	
Available via	LinSM.h	

6.3.8 LinSM_GotoSleepIndication

Function Name	LinSM_GotoSleepIndication	
Syntax	void LinSM_GotoSleepIndication (NetworkHandleType Channel)	
Service ID [Hex]	0x03	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (In)	Channel	Identification of the LIN channel.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	
Description	The LinIf will call this callback when the go to sleep command is received on the network or a bus idle timeout occurs. Only applicable for LIN slave nodes.	
Available via	LinSM.h	

6.3.9 LinSM_GotoSleepConfirmation

Function Name	LinSM_GotoSleepConfirmation
Syntax	void LinSM_GotoSleepConfirmation (

	NetworkHandleType network, boolean success)	
Service ID [Hex]	0x22	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (In)	network	Identification of the LIN channel.
	success	True if goto sleep was successfully sent, false otherwise.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	
Description	The LinIf will call this callback when the go to sleep command is sent successfully or not sent successfully on the network.	
Available via	LinSM.h	

6.3.10 LinSM_WakeupConfirmation

Function Name	LinSM_WakeupConfirmation	
Syntax	void LinSM_WakeupConfirmation (NetworkHandleType network, boolean success)	
Service ID [Hex]	0x21	
Sync/Async	Synchronous	
Reentrancy	Reentrant	
Parameters (In)	network	Identification of the LIN channel.
	success	True if goto sleep was successfully sent, false otherwise.
Parameters (Inout)	None	
Parameters (Out)	None	
Return Value	None	

Description	The LinIf will call this callback when the wake up signal command is sent not successfully/successfully on the network.
Available via	LinSM.h

7 Generator

7.1 Generator Option

Options	Description
-G,--Generation	Symbolic parameters to be used for fore generation (skip validation).
-H,--Help	Display this help message.
-I,--Input <I>	ECU description file path of the module for which generation tool need to run.
-L,--Log	Symbolic parameters to be used for generation error log.
-M,--Module <M>	Specify module name and version to be generated code for.
-O,--Output <O>	Project-relative path to location where the generated code is to be placed.
-T,--Top_path <T>	Symbolic parameters to be used for set path of module.
-V,--Validate	Symbolic parameters to be used for invoking validation checks.

7.2 Generator Message

This section helps to analyze the errors or warnings displayed during the execution of the tool. It ensures conformance of input file(s) with syntax and semantics.

7.2.1 Error Messages

7.2.1.1 ERR141001: Unexpected Error Found. Please contact Hyundai-AutoEver AUTOSAR Support.

Description: This is an Unexpected Error. On the occurrence of this error contact Hyundai-AutoEver Basic Platform Development Team.

7.2.1.2 ERR141003: 'Component Name' Component is not present in the input file(s).

Description: This error occurs, if any one of LinSM or LINIF or ComM component is not present in any of the input ECU Configuration Description File(s).

7.2.1.3 ERR141004: The reference path is empty for the parameter 'Parameter Name' in the container 'Container Name', having short name 'short name'.

Description: This error occurs, if reference path is not provided for the reference parameter.

Container Name	Parameter Name
LinSMComMNetworkHandleRef	LinSMChannel
LinSMScheduleIndexRef	LinSMSchedule

7.2.1.4 ERR141005: The parameter 'Parameter Name' in the container 'Container Name' should be configured.

Description: This error message is displayed when EN, TX pin wasn't configured for parameters LinSMHardwareInterfaceName in the container LinSMDioChannelAccess.

7.2.1.5 ERR064054: Value of the parameter LinSMChannelId should be unique in in the container LinSMChannel.

Description: This error occurs, if any of the mandatory configuration parameters mentioned below is not configured in ECU Configuration Description File.

Container Name	Parameter Name
LinSMGeneral	LinSMDevErrorDetect
	LinSMMainProcessingPeriod
	LinSMVersionInfoApi
LinSMChannel	LinSMConfirmationTimeout
LinSMSchedule	LinSMScheduleIndex
BSW-IMPLEMENTATION	AR-RELEASE-VERSION
	VENDOR-ID
	SW-VERSION
BSW-MODULE-DESCRIPTION	MODULE-ID

7.2.1.6 ERR141006: The value configured for the parameter 'Parameter Name' in the container 'Container Name' should follow the pattern: <Pattern>.

Description: This error occurs, if the parameter 'Parameter Name' is not configured as per the pattern.

Parameter Name	Container Name	Pattern	Example

AR-RELEASE-VERSION	BSW-IMPLEMENTATION	4.[0-9]+.[0-9]+	4.4.0
SW-VERSION		1.[0-9]+.[0-9]+	1.0.0

7.2.1.7 ERR141013: The reference path <path> provided for the parameter 'Parameter Name' in the container 'Container Name', having short name 'Container ShortName' is incorrect.

Description: This error occurs, if incorrect reference is provided for the reference parameter.

Container Name	Parameter Name
LinSMComMNetworkHandleRef	LinSMChannel
LinSMScheduleIndexRef	LinSMSchedule

7.2.1.8 ERR141022: Value of the parameter 'LinSMMainProcessingPeriod' in the container LinSMGeneral should not be configured as <0>.

Description: This error occurs, if incorrect reference is provided for the reference parameter.

Container Name	Parameter Name
LinSMComMNetworkHandleRef	LinSMChannel
LinSMScheduleIndexRef	LinSMSchedule

7.2.1.9 ERR141022: Value of the parameter 'LinSMMainProcessingPeriod' in the container LinSMGeneral should not be configured as <0>.

Description: This error occurs, if the value of the parameter 'LinSMMainProcessingPeriod' in the container LinSMGeneral is configured as 0.

7.2.1.10 ERR141051: The value configured for the parameter 'LinSMComMNetworkHandleRef' should be unique in the container 'LinSMChannel'.

Description: This error occurs, if the value configured for the parameter 'LinSMComMNetworkHandleRef' is not unique in the container 'LinSMChannel'.

7.2.1.11 ERR141052: Value of the parameter 'LinSMScheduleIndex' should be equal to the value of the parameter 'LinSMScheduleIndexRef' in the container 'LinSMSchedule'.

Description: This error occurs, if the value of the parameter 'LinSMScheduleIndex' is not equal to the value of the parameter 'LinSMScheduleIndexRef' in the container 'LinSMSchedule'.

7.2.1.12 ERR141053: Value of the parameter <Name Of Parameter> is out of range, please update.

Description: This error occurs, if the value of the follow parameters is smaller than 0 and bigger than 255.
Name Of Parameter: LinSMModeRequestRepetitionMax, LinSMScheduleIndex.

7.2.1.13 ERR141054: Value of the parameter <Name Of Parameter> is out of range, please update.

Description: This error occurs, if the value of the follow parameters is smaller than 0. Name Of Parameter: LinSMMainProcessingPeriod, LinSMConfirmationTimeout, LinSMSilenceAfterWakeupTimeout.

7.2.1.14 ERR141055: Value of the parameter LinSMNodeType is not correct, please update.

Description: This error occurs, if the value of LinSMNodeType parameter is not equal both MASTER and SLAVE.

7.2.1.15 ERR141056: Value of the parameter <Name Of Parameter> is not configured, please provide.

Description: This error occurs, if the value of the follow parameters is not configured.
Name Of Parameter: LinSMScheduleIndexRef, LinSMNodeType, LinSMComMNetworkHandleRef, LinSMModeRequestRepetitionMax.

7.2.1.16 ERR141056: Value of the parameter 'LinSMTransceiverPassiveMode' of Channel LinSMChannel0 can not be configured TRUE when the parameter 'LinIfTrcvDriverSupported' is not enabled in LinIf.

Description: Value of the parameter 'LinSMTransceiverPassiveMode' of Channel LinSMChannel0 can not be configured TRUE when the parameter 'LinIfTrcvDriverSupported' is not enabled in LinIf

7.2.2 Warning Messages

None

8 SWP Error Code

There are no production errors.

9 Appendix

None

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