



Research & Vehicle Technology
“Infotainment Systems Product Development”

Feature – Enhanced Ambient Lighting
Infotainment Subsystem Part Specific
Specification (SPSS)

Version 1.0

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Revision History

Date	Version	Notes	
June 17, 2022	0.1	Draft	
Dec 12, 2022	0.9	Please refer to the comments for modifications	For supplier define draft MRD
Dec 30, 2022	1.0	All	Removed strikethroughs and irrelevant sections from the previous version
		2.4	Added the configuration of music rhythm
		3.3.4	Modified the function definition of animation dynamic effects in custom themes
		3.4.2	Modified the function definition of Navigation remainder



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1 Architectural Design

1.1 Overview

The Enhanced Ambient Lighting (EAL) feature provides environment for customer to set the mood in the vehicle's cabin by selecting one of several different accent colors. When activated ambient lighting illuminates foot wells, cup holders, and door release handles, etc., depending on the vehicle model. A user can also adjust brightness settings to further personalize the interior. In multicolor variants equipped with door lights, Ambient Lighting is also capable of indicating a cabin door being ajar by activating the door's lights in a pre-configured color (Red). Ambient Lighting also works to support experience features such as Welcome/Farewell. Ambient lighting works with Selectable drive mode: ambient lighting system associates certain specific ambient light colors to Drive Modes. When a user changes their Drive mode, along with the traditional Drive Mode related attributes, the user will also see orchestrated changes to their Instrument Cluster, HMI screen, and Ambient Lights. Also, the enhanced ambient lighting system allow user to control ambient lightings by voice command, example: "turn on the ambient lighting" is called, the system Will turn on vehicle ambient lighting.

1.2 Abbreviations

Abbr.	Stands for
ADAS	Advanced Driver Assistance System
ALCM	Ambient Lighting Control Module
APIM	Auxiliary Protocol Interface Module
BCM	Body Control Module
CAN	Controller Area Network
CEA	Clear Exit Assist
EAL	Enhanced Ambient Lighting
ECG	Gateway Module
ECU	Electronic Control Module
HMI	Human Machine Interaction
IVI	In-Vehicle Infotainment
LDM	LED Driver Module
LIN	Local Interconnect Network
MR	Music Music Rhythm
SDM	System Driver Mode
W/F	Welcome/Farewell
MC	Message Center

1.3 ALCM Server

Ambient Lighting Control Module Server (ALCMServer) is responsible for the tasks listed below:

- Receive and process customer's requests from ALCMInterface Client and send back current ALCM settings status
- Receive and process informations from ALCMInterface Client and send back status
- Save settings parameters as a personalized profile

1.4 ALCMInterface Client



ALCMInterface **Server** is responsible for the tasks listed below:

- Provide HMI to the user for Enhanced Ambient Lighting application
- Send customer's settings requests to ALCM Server
- Receive feedback status from ALCM Server
- It can be called by some client (VR, Relax mode)
- ● Receive and process the request from ALCM Server, and recall some clients (MC Client)

1.5 Other Client

Voice Recognition Client is responsible for the tasks listed below:

- Recall ALCMInterface Client to finish user ambient lighting command.

Relax mode Client can recall ALCM Interface Client to settings ambient lighting colors and intensity or settings some theme.

- When relax mode feature is exiting, it will restore ALCM Interface Client previous settings.

MC Client: ALCMInterface Client used SDK to recall MC Client, for details interface will add.

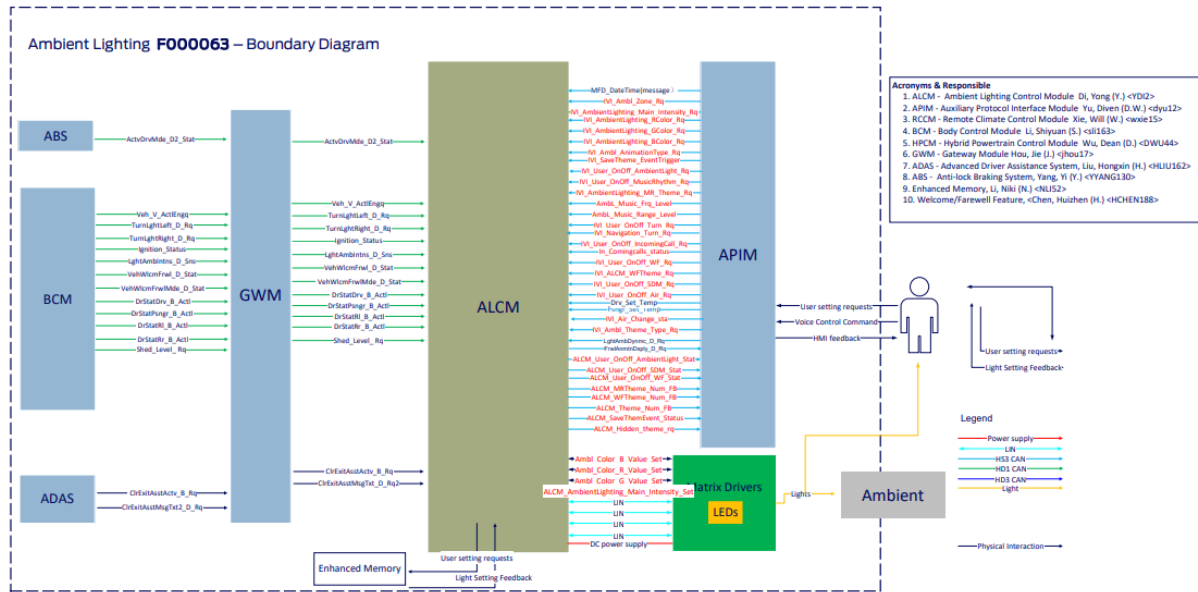
1.6 Physical Mapping of Classes

The table below shows how the logical classes that make up the Enhanced Ambient Lighting feature may be mapped into physical modules.

Logical Class	Physical Module (ECU)
ALCM Server	ALCM
ALCMInterface Client	APIM
VR Client	APIM
VACInterface Client	APIM
MC Client	APIM
Relax Mode Client	APIM



1.7 Boundary Diagram-Feature Level



1.8 CAN Signal

The CAN signals mentioned throughout this document.

Below signals is used between ALCM Server and ALCM Client, about some vehicle signals not be details describe, such as relevant of power mode, load shed, IGN, Delay ACC and so on.

Nm	CAN signal name	Describe
1	LghtAmbIntnsZn1_Pc_Act	Ambient Lighting Intensity Zone1 feedback from ALCM.
2	LghtAmbIntnsZn2_Pc_Act	Ambient Lighting Intensity Zone2 feedback from ALCM.
3	LghtAmbIntnsZn3_Pc_Act	Ambient Lighting Intensity Zone3 feedback from ALCM.
4	LghtAmbAnmtTypZn1_D_St	Ambient Lighting Animation Type Zone1 status from ALCM.
5	LghtAmbVehFn_D_St	Ambient Lighting Control Module Vehicle Function status
6	LghtAmbHideTheme1_D_Rq	A request signal from ALCM to be sent with Ambient Lighting - Hide Theme1 information.
7	LghtAmbHideTheme2_D_Rq	A request signal from ALCM to be sent with Ambient Lighting - Hide Theme2 information.
8	LghtAmbEnbl_D_Stat	Ambient Lighting Enable/Disable status signal from ALCM.
9	LghtAmbHvacEnbl_D_Stat	From ALCM to show Enable/Disable status of AirConditioner temperature change function.
10	LghtAmbCeaEnbl_D_Stat	From ALCM to show Enable/Disable status of Clear Exit Assist (CEA) function.
11	LghtColrBValZn1_No_Act	Ambient Lighting Blue color value setting of Zone1 feedback from ALCM.
12	LghtColrBValZn2_No_Act	Ambient Lighting Blue color value setting of Zone2 feedback from ALCM.
13	LghtColrBValZn3_No_Act	Ambient Lighting Blue color value setting of Zone3 feedback from ALCM.



14	LghtColrGValZn1_No_Act	Ambient Lighting Green color value setting of Zone1 feedback from ALCM.
15	LghtColrGValZn2_No_Act	Ambient Lighting Green color value setting of Zone2 feedback from ALCM.
16	LghtColrGValZn3_No_Act	Ambient Lighting Green color value setting of Zone3 feedback from ALCM.
17	LghtColrRValZn1_No_Act	Ambient Lighting Red color value setting of Zone1 feedback from ALCM.
18	LghtColrRValZn2_No_Act	Ambient Lighting Red color value setting of Zone2 feedback from ALCM.
19	LghtColrRValZn3_No_Act	Ambient Lighting Red color value setting of Zone3 feedback from ALCM.
20	LghtAmbDrAjarEnbl_D_St	From ALCM to show Enable/Disable status of DoorAjar function
21	LghtAmbCallFnEnbl_D_St	From ALCM to show Enable/Disable status of incoming call function.
22	LghtAmbVoiceFq_No_Actl	The voice frequency level from HMI.
23	LghtAmbVoiceRng_No_Act	The voice loudness range from HMI.
24	LghtAmbNavTurnEnb_D_St	From ALCM to show Enable/Disable status of navigation turn function
25	IncMngCall_D_Stat	The incoming call status from HMI.
26	LghtAmbAnmtTypZn1_D_Rq	Request from HMI to show Ambient Lighting Zone1 Animation Type.
27	LghtColrBValZn1_No_Rq	Request from HMI to set the Ambient Lighting Blue color value of Zone1.
28	LghtColrBValZn2_No_Rq	Request from HMI to set the Ambient Lighting Blue color value of Zone2.
29	LghtColrBValZn3_No_Rq	Request from HMI to set the Ambient Lighting Blue color value of Zone3.
30	LghtColrGValZn1_No_Rq	Request from HMI to set the Ambient Lighting Green color value of Zone1.
31	LghtColrGValZn2_No_Rq	Request from HMI to set the Ambient Lighting Green color value of Zone2.
32	LghtColrGValZn3_No_Rq	Request from HMI to set the Ambient Lighting Green color value of Zone3.
33	LghtAmbIntnsZn1_Pc_Rq	Request to set Zone1 Ambient Lighting Intensity from HMI.
34	LghtAmbIntnsZn2_Pc_Rq	Request to set Zone2 Ambient Lighting Intensity from HMI.
35	LghtAmbIntnsZn3_Pc_Rq	Request to set Zone3 Ambient Lighting Intensity from HMI.
36	LghtColrRValZn1_No_Rq	Request from HMI to set the Ambient Lighting Red color value of Zone1.
37	LghtColrRValZn2_No_Rq	Request from HMI to set the Ambient Lighting Red color value of Zone2.



38	LghtColrRValZn3_No_Rq	Request from HMI to set the Ambient Lighting Red color value of Zone3.
39	LghtAmbNavTurn_D_Rq	The actual navigation turn request from HMI.
40	LghtAmbHvacEnbl_D_Rq	Request from HMI to set enable/disable Air temperature change function
41	LghtAmbEnbl_D_Rq	Request from HMI to set enable/disable ambient lighting function
42	LghtAmbCeaEnbl_D_Rq	Request from HMI to set enable/disable Clear Exit Assist (Cea) function.
43	LghtAmbDrAjarEnbl_D_Rq	Request from HMI to set enable/disable Door Ajar function
44	LghtAmbCallFnEnbl_D_Rq	Request from HMI to set enable/disable Incoming Call function
45	LghtAmbNavTurnEnb_D_Rq	Request from HMI to set enable/disable navigation turn function
46	LghtAmbVehFn_D_Rq	A request for the Ambient Lighting Control Module Vehicle Function.
47	LghtAmbDrvMde_D_Actl	From ALCM to APIM for SDM status

1.9 ALCMInterface Client Rx

1.9.1 LghtAmbIntnsZn1_Pc_Act

Message Type: status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting brightness Zone1 Setting status from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbIntnsZn1_Pc_Act	-	-	From ALCM to feedback ambient lighting brightness Zone1 setting value.
	Null	0x0	
	0%	0x1	
	1%	0x2	
	2%	0x3	
	3%	0x4	
	...	...	Resolution is 1
	99%	0x64	
	100%	0x65	



1.9.2 LghtAmbIntnsZn2_Pc_Act

Message Type: status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting brightness Zone2 Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbIntnsZn2_Pc_Act	-	-	From ALCM to feedback ambient lighting brightness Zone2
	Null	0x0	
	0%	0x1	
	1%	0x2	
	2%	0x3	
	3%	0x4	
	...	...	Resolution is 1
	99%	0x64	
	100%	0x65	

1.9.3 LghtAmbIntnsZn3_Pc_Act

Message Type: status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting brightness Zone3 Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbIntnsZn3_Pc_Act	-	-	From ALCM to feedback ambient lighting brightness Zone3
	Null	0x0	
	0%	0x1	
	1%	0x2	
	2%	0x3	
	3%	0x4	
	...	...	Resolution is 1
	99%	0x64	
	100%	0x65	

1.9.4 LghtAmbAnmtTypZn1_D_St

Message Type: status

Signal send type: EventPeriodic(tbd)



Cycle time(ms): 1000(tbd)

Ambient lighting animation type Zone1 setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbAnmtTypZn1_D_St	-	-	From ALCM to feedback ambient lighting animation type Zone1 setting
	Null	0x0	
	Static	0x1	
	Breathing	0x2	
	Running water	0x3	
	Discoloration	0x4	
	Not Used1	0x5	
	Not Used2	0x6	
	Not Used3	0x7	

1.9.5 LghtAmbHideTheme1_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to APIM to show there is a hidden theme can be selected.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbHideTheme1_D_Rq	-	-	From ALCM to request which hidden theme is trigger.
	Inactive	0x0	
	Theme1	0x1	
	Theme2	0x2	
	Theme3	0x3	
	Theme4	0x4	
	Theme5	0x5	
	Theme6	0x6	
	
	Theme63	0x3E	

1.9.6 LghtAmbHideTheme2_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)



From ALCM to APIM to show there is a hidden theme can be selected.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbHideTheme2_D_Rq	-	-	From ALCM to request which hidden theme is trigger.
	Inactive	0x0	
	Theme1	0x1	
	Theme2	0x2	
	Theme3	0x3	
	Theme4	0x4	
	Theme5	0x5	
	Theme6	0x6	
	
	Theme63	0x3E	

1.9.7 LghtAmbVehFn_D_St

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to APIM show selected number of theme.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbVehFn_D_St	-	-	Ambient Lighting Control Module Vehicle Function status
	NoRequest	0x0	
	MusicRhythm1	0x1	
	MusicRhythm2	0x2	
	Custom1	0x3	
	Custom2	0x4	
	HideTheme1	0x5	
	HideTheme2	0x6	
	PrestoreTheme1	0x7	
	PrestoreTheme2	0x8	
	PrestoreTheme3	0x9	
	PrestoreTheme4	0xA	
	PrestoreTheme5	0xB	
	PrestoreTheme6	0xC	
	PrestoreTheme7	0xD	
	PrestoreTheme8	0xE	



PrestoreTheme9 0xF

1.9.8 LghtColrBValZn1_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color blue Zone1 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrBValZn1_No_Act	-	-	From ALCM to show ambient lighting color blue Zone1 value.
	Null	0x0	
	Color blue 1	0x1	
	Color blue 2	0x2	
	Color blue 3	0x3	
	...	...	Resolution is 1
	Color blue 123	0x7B	
	Color blue 125	0x7C	
	
	Color blue 254	0xFE	
	Color blue 255	0xFF	

1.9.9 LghtColrBValZn2_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color blue Zone2 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrBValZn2_No_Act	-	-	From ALCM to show ambient lighting color blue Zone2 value.
	Null	0x0	
	Color blue 1	0x1	
	Color blue 2	0x2	
	Color blue 3	0x3	
	...	...	Resolution is 1
	Color blue 123	0x7B	
	Color blue 125	0x7C	



	
	Color blue 254	0xFE	
	Color blue 255	0xFF	

1.9.10 LghtColrBValZn3_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color blue Zone3 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrBValZn3_No_Act	-	-	From ALCM to show ambient lighting color blue Zone3 value.
	Null	0x0	
	Color blue 1	0x1	
	Color blue 2	0x2	
	Color blue 3	0x3	
	...	...	Resolution is 1
	Color blue 123	0x7B	
	Color blue 125	0x7C	
	
	Color blue 254	0xFE	
	Color blue 255	0xFF	

1.9.11 LghtColrGValZn1_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color green Zone1 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrGValZn1_No_Act	-	-	From ALCM to show ambient lighting color green Zone1 value.
	Null	0x0	
	Color Green 1	0x1	
	Color Green 2	0x2	
	Color Green 3	0x3	
	
	Color Green 123	0x7B	
	Color Green 125	0x7C	



	...	...	Resolution is 1
	Color Green 254	0xFE	
	Color Green 255	0xFF	

1.9.12 LghtColrGValZn2_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color green Zone2 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrGValZn2_No_Act	-	-	From ALCM to show ambient lighting color green Zone2 value.
	Null	0x0	
	Color Green 1	0x1	
	Color Green 2	0x2	
	Color Green 3	0x3	
	
	Color Green 123	0x7B	
	Color Green 125	0x7C	
	...	...	Resolution is 1
	Color Green 254	0xFE	
	Color Green 255	0xFF	

1.9.13 LghtColrGValZn3_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color green Zone3 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrGValZn3_No_Act	-	-	From ALCM to show ambient lighting color green Zone3 value.
	Null	0x0	
	Color Green 1	0x1	
	Color Green 2	0x2	
	Color Green 3	0x3	
	



	Color Green 123	0x7B	
	Color Green 125	0x7C	
	...	...	Resolution is 1
	Color Green 254	0xFE	
	Color Green 255	0xFF	

1.9.14 LghtColrRValZn1_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color red Zone1 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrRValZn1_No_Act	-	-	From ALCM to show ambient lighting color red Zone1 value.
	Null	0x0	
	Color Red 1	0x1	
	Color Red 2	0x2	
	Color Red 3	0x3	
	...	...	Resolution is 1
	Color Red 123	0x7B	
	Color Red 125	0x7C	
	
	Color Red 254	0xFE	
	Color Red 255	0xFF	

1.9.15 LghtColrRValZn2_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color red Zone2 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrRValZn2_No_Act	-	-	From ALCM to show ambient lighting color red Zone2 value.
	Null	0x0	
	Color Red 1	0x1	
	Color Red 2	0x2	



	Color Red 3	0x3	
	...	...	Resolution is 1
	Color Red 123	0x7B	
	Color Red 125	0x7C	
	
	Color Red 254	0xFE	
	Color Red 255	0xFF	

1.9.16 LghtColrRValZn3_No_Act

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Ambient lighting color red Zone3 value Setting from ALCM feedback to APIM

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrRValZn3_No_Act	-	-	From ALCM to show ambient lighting color red Zone3 value.
	Null	0x0	
	Color Red 1	0x1	
	Color Red 2	0x2	
	Color Red 3	0x3	
	...	...	Resolution is 1
	Color Red 123	0x7B	
	Color Red 125	0x7C	
	
	Color Red 254	0xFE	
	Color Red 255	0xFF	

1.9.17 LghtAmbEnbl_D_Stat

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to APIM show Ambient Lighting Enable/Disable status.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbEnbl_D_Stat	-	-	From ALCM to APIM show Ambient Lighting Enable/Disable
	No_Request	0x0	



	Enable	0x1	
	Disable	0x2	

1.9.18 LghtAmbCeaEnbl_D_Stat

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to show Enable/Disable status of Clear Exit Assist (Cea) function.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbCeaEnbl_D_Stat	-	-	From ALCM to show Enable/Disable status of Clear Exit Assist (Cea)
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.9.19 LghtAmbDrAjarEnbl_D_St

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to show Enable/Disable status of DoorAjar function.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbDrAjarEnbl_D_St	-	-	From ALCM to show Enable/Disable status of DoorAjar function.
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.9.20 LghtAmbHvacEnbl_D_Stat

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to show Enable/Disable status of AirConditioner temperature change function.

Signal Name	Detailed Meaning	Value encodes	Description
-------------	------------------	---------------	-------------



LghtAmbHvacEn bl_D_Stat	-	-	From ALCM to show Enable/Disable status of AirConditioner
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.9.21 LghtAmbCallFnEnbl_D_St

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to show Enable/Disable status of incoming call function.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbCallFnE nbl_D_St	-	-	From ALCM to show Enable/Disable status of incoming call function.
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.9.22 LghtAmbNavTurnEnb_D_St

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From ALCM to show Enable/Disable status of navigation turn function.

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbNavTur nEnb_D_St	-	-	From ALCM to show Enable/Disable status of navigation turn
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.9.23 LghtAmbDrvMde_D_Actl

Message Type: status

Signal send type: EventPeriodic

Cycle time(ms): 1000



From ALCM to APIM to feedback status of SDM

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbDrvMde _D_Actl	-	-	From ALCM to APIM to feedback status of SDM
	Null	0x0	
	Manual	0x1	
	Automatic	0x2	
	NotUsed	0x3	

1.10 ALCMInterface Client Tx

Send to ALCM, signals related to the ambient light control function.

1.10.1 LghtAmbEnbl_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From IVI to set enable/disable ambient lighting function

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbEnbl_D _Rq	-	-	From IVI to set enable/disable ambient lighting function. Default valve is no request.
	No_Request	0x0	send this valve when there is no request.
	Enable	0x1	
	Disable	0x2	

1.10.2 LghtAmbCeaEnbl_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Request from HMI to set enable/disable Clear Exit Assist (Cea) function.

Signal Name	Detailed	Value encodes	Description
-------------	----------	---------------	-------------



	Meaning		
LghtAmbCeaEnb l_D_Rq	-	-	Request from HMI to set enable/disable Clear Exit Assist (Cea) function.
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.10.3 LghtAmbDrAjarEnbl_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From IVI to set enable/disable DoorAjar function

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbDrAjar Enbl_D_Rq	-	-	From IVI to set enable/disable DoorAjar function
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.10.4 LghtAmbNavTurnEnb_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From IVI to set enable/disable navigation turn function

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbNavTur nEnb_D_Rq	-	-	From IVI to set enable/disable navigation turn function
	No_Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.10.5 LghtAmbHvacEnbl_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)



Cycle time(ms): 1000(tbd)

From APIM to show the disable/enable air temperature change function

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbHvacEn bl_D_Rq	-	-	From APIM to show the disable/enable air temperature change function
	No Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.10.6 LghtAmbCallFnEnbl_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From IVI to set enable/disable Incoming Call function

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbCallFnE nbl_D_Rq	-	-	From IVI to set enable/disable Incoming Call function
	No Request	0x0	
	Enable	0x1	
	Disable	0x2	

1.10.7 LghtAmbVehFn_D_Rq

Message Type: request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

A request for the Ambient Lighting Control Module Vehicle Function.

Signal Name	Detailed Meaning	Value encodes	Description
IVI_Ambl_Theme_Type_Rq	-	-	A request for the Ambient Lighting Control Module Vehicle Function.
	NoRequest	0x0	
	MusicRhythm1	0x1	
	MusicRhythm2	0x2	
	Custom1	0x3	
	Custom2	0x4	
	HideTheme1	0x5	



	HideTheme2	0x6	
	PrestoreTheme1	0x7	
	PrestoreTheme2	0x8	
	PrestoreTheme3	0x9	
	PrestoreTheme4	0xA	
	PrestoreTheme5	0xB	
	PrestoreTheme6	0xC	
	PrestoreTheme7	0xD	
	PrestoreTheme8	0xE	
	PrestoreTheme9	0xF	

1.10.8 LghtAmbIntnsZn1_Pc_Rq

Message Type: request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the brightness value of Zone1

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbIntnsZn1_Pc_Rq	-	-	From APIM to ALCM setting the brightness value of Zone1
	Null	0x0	
	0%	0x1	
	1%	0x2	
	2%	0x3	
	3%	0x4	
	...	...	Resolution is 1
	99%	0x64	
	100%	0x65	

1.10.9 LghtColrRValZn1_No_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the red color value of Zone1

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrRValZn1_No_Rq	-	-	From APIM to ALCM setting the red color value of Zone1
	Null	0x0	



	Color Red 1	0x1	
	Color Red 2	0x2	
	Color Red 3	0x3	
	...	...	Resolution is 1
	Color Red 123	0x7B	
	Color Red 125	0x7C	
	
	Color Red 254	0xFE	
	Color Red 255	0xFF	

1.10.10 LghtColrGValZn1_No_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the green color value of Zone1

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrGValZn1_No_Rq	-	-	From APIM to ALCM setting the green color value of Zone1
	Null	0x0	
	Color Green 1	0x1	
	Color Green 2	0x2	
	Color Green 3	0x3	
	...	...	Resolution is 1
	Color Green 123	0x7B	
	Color Green 125	0x7C	
	
	Color Green 254	0xFE	
	Color Green 255	0xFF	

1.10.11 LghtColrBValZn1_No_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the blue color value of Zone1

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrBValZn1_No_Rq	-	-	From APIM to ALCM setting the blue color value of Zone1
	Null	0x0	



	Color blue 1	0x1	
	Color blue 2	0x2	
	Color blue 3	0x3	
	...	...	Resolution is 1
	Color blue 123	0x7B	
	Color blue 125	0x7C	
	
	Color blue 254	0xFE	
	Color blue 255	0xFF	

1.10.12 LghtAmbAnmtTypZn1_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

Form APIM to ALCM to show the request of Zone1 animation type

Signal Name	Detailed Meaning	Value encodes	Description
ILghtAmbAnmtTypZn1_D_Rq	-	-	Form APIM to show the request of zone1 animation type
	Null	0x0	
	Static	0x1	
	Breathing	0x2	
	Running water	0x3	
	Discoloration	0x4	
	Not Used1	0x5	
	Not Used2	0x6	
	Not Used3	0x7	

1.10.13 LghtAmbIntnsZn2_Pc_Rq

Message Type: request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the brightness value of Zone2

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbIntnsZn2_Pc_Rq	-	-	From APIM to ALCM setting the brightness value of Zone2
	Null	0x0	
	0%	0x1	
	1%	0x2	
	2%	0x3	



	3%	0x4	
	...	...	Resolution is 1
	99%	0x64	
	100%	0x65	

1.10.14 LghtColrRValZn2_No_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the red color value of Zone2

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrRValZn2_No_Rq	-	-	From APIM to ALCM setting the red color value of Zone2
	Null	0x0	
	Color Red 1	0x1	
	Color Red 2	0x2	
	Color Red 3	0x3	
	...	...	Resolution is 1
	Color Red 123	0x7B	
	Color Red 125	0x7C	
	
	Color Red 254	0xFE	
	Color Red 255	0xFF	

1.10.15 LghtColrGValZn2_No_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the green color value of Zone2

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrGValZn2_No_Rq	-	-	From APIM to ALCM setting the green color value of Zone2
	Null	0x0	
	Color Green 1	0x1	
	Color Green 2	0x2	
	Color Green 3	0x3	
	...	...	Resolution is 1
	Color Green 123	0x7B	
	Color Green 125	0x7C	



	
	Color Green 254	0xFE	
	Color Green 255	0xFF	

1.10.16 LghtColrBValZn2_No_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the blue color value of Zone2

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrBValZn2_No_Rq	-	-	From APIM to ALCM setting the blue color value of Zone2
	Null	0x0	
	Color blue 1	0x1	
	Color blue 2	0x2	
	Color blue 3	0x3	
	...	...	Resolution is 1
	Color blue 123	0x7B	
	Color blue 125	0x7C	
	
	Color blue 254	0xFE	
	Color blue 255	0xFF	

1.10.17 LghtAmbIntnsZn3_Pc_Rq

Message Type: request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the brightness value of Zone3

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbIntnsZn3_Pc_Rq	-	-	From APIM to ALCM setting the brightness value of Zone3
	Null	0x0	
	0%	0x1	
	1%	0x2	
	2%	0x3	
	3%	0x4	
	...	...	Resolution is 1
	99%	0x64	
	100%	0x65	

**1.10.18 LghtColrRValZn3_No_Rq**

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the red color value of Zone3

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrRValZn3_No_Rq	-	-	From APIM to ALCM setting the red color value of Zone3
	Null	0x0	
	Color Red 1	0x1	
	Color Red 2	0x2	
	Color Red 3	0x3	
	...	...	Resolution is 1
	Color Red 123	0x7B	
	Color Red 125	0x7C	
	
	Color Red 254	0xFE	
	Color Red 255	0xFF	

1.10.19 LghtColrGValZn3_No_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the green color value of Zone3

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrGValZn3_No_Rq	-	-	From APIM to ALCM setting the green color value of Zone3
	Null	0x0	
	Color Green 1	0x1	
	Color Green 2	0x2	
	Color Green 3	0x3	
	...	...	Resolution is 1
	Color Green 123	0x7B	
	Color Green 125	0x7C	
	
	Color Green 254	0xFE	
	Color Green 255	0xFF	

1.10.20 LghtColrBValZn3_No_Rq

Message Type: Request



Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM setting the blue color value of Zone3

Signal Name	Detailed Meaning	Value encodes	Description
LghtColrBV alZn 3_No_Rq	-	-	From APIM to ALCM setting the blue color value of Zone3
	Null	0x0	
	Color blue 1	0x1	
	Color blue 2	0x2	
	Color blue 3	0x3	
	...	...	Resolution is 1
	Color blue 123	0x7B	
	Color blue 125	0x7C	
	
	Color blue 254	0xFE	
	Color blue 255	0xFF	

1.10.21 IncmngCall_D_Stat

Message Type: Status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM to show the incoming call status

Signal Name	Detailed Meaning	Value encodes	Description
IncmngCall_D_Stat	-	-	From APIM to show the incoming call status
	Null	0x0	
	Incoming	0x1	
	Connect	0x2	
	Hang Up	0x3	
	Secorndry_Incom	0x4	
	NotUsed_1	0x5	
	NotUsed_2	0x6	
	NotUsed_3	0x7	

1.10.22 LghtAmbNavTurn_D_Rq

Message Type: Request

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)



From APIM to show the actual navigation turn request

Signal Name	Detailed Meaning	Value encodes	Description
LghtAmbNavTurn_D_Rq	-	-	From APIM to show the actual navigation turn request
	NoRequest	0x0	
	Turn Left	0x1	
	Turn Right	0x2	
	NotUsed1	0x3	

1.10.23 LghtAmbVoiceFq_No_Actl

Message Type: status

Signal send type: EventPeriodic(tbd)

Cycle time(ms): 1000(tbd)

From APIM to ALCM to show the music frequency level

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbVoiceFq_No_Actl	-	-	From APIM to show the music frequency level
	No Request	0x0	
	0~30HZ	0x1	
	31~62HZ	0x2	
	63~123HZ	0x3	
	124~247HZ	0x4	
	248~494HZ	0x5	
	495~989HZ	0x6	
	990~1400HZ	0x7	
	1401~1975Hz	0x8	
	1976~16383Hz	0x9	
	Reserved	0xA	
	Reserved	0xB	
	Reserved	0xC	
	Reserved	0xD	
	Reserved	0xE	
	Reserved	0xF	

1.10.24LghtAmbVoiceRng_No_Act

Message Type: status

Signal send type: EventPeriodic(tbd)



Cycle time(ms): 1000(tbd)

From APIM to show the music loudness to ALCM be used for music rhythm

Signal Name	Detailed Meaning	Value encoding	Description
LghtAmbVoiceRng_No_Act	-	-	From APIM to show the music loudness to ALCM be used for music rhythm
	No Request	0x0	
	$-\infty \sim -23$	0x1	
	$-22 \sim -18$	0x2	
	$-17 \sim -14$	0x3	
	$-13 \sim -10$	0x4	
	$-9 \sim -7$	0x5	
	$-6 \sim -4$	0x6	
	$-3 \sim -2$	0x7	
	$-1 \sim 0$	0x8	
	Reserved	0x9	
	Reserved	0xA	
	Reserved	0xB	
	Reserved	0xC	
	Reserved	0xD	
	Reserved	0xE	
	Reserved	0xF	



2 General Requirements

2.1 Power mode

The working state of ALCM Interface client and ALCM Server needs to be the same. If the ALCM Server is not working, the ALCM Interface client HMI interface should not be set.

ALCM Interface Client working state is in Delay ACC ON.

ALCM Interface Client should Power Off once DelayACC power is Off.

Note.

When IVI go into Extended Play Mode, the ALCM Server is not working, so ALCM Client should not work. When IVI go into transport mode, ALCM Interface Client is not working, and ALCM Server will do special treatment.

When IVI go into Loadshed mode, ALCM Interface Client should Power Off once IVI and ALCM go into Loadshed mode

2.2 General requirements for CAN signals

When a request occurs, the request CAN signal needs to be sent 5 frames in quick. times with an interval of about 20msec $\pm 10\%$, after which the request signal value should return to null or no request. Please attention, This need be handled by MCU, but if MCU can not do this, the zeroing setting need by application to do.

To the status signal from ALCM Server will send state values all the time based on last request.

To the color, intensity, when a request occurs, only need send once.

The whole process time interval from user request to HMI change needs to be controlled within 200ms.

2.3 Memory

To the ALCM Interface Client, There is no Enhanced Memory for the ambient light setting. and it is also need not to memory setting parameters status when power transfer.

When IVI re-powering, the client should display HMI status based on the server's status values.

When EAL setting button from disable to enable, the Client should display other settings based on caching.

2.4 Configuration and Diagnostic

Enhanced Ambient Lighting is a configurable feature on infotainment system, all functions can be configured as below, if one function configured to disable, Corresponding HMI and functions will be not visible for the user.

Config	Byte	Start	Length	Definition	Default	Operation	备注
--------	------	-------	--------	------------	---------	-----------	----



Block		Bit					
XXX	X	X	1	Enhanced Ambient Lighting	0	0x1: active 0x0: inactive	是否有氛围灯这项功能。如果该项配置为 0 时, 剩余其他项也不应再显示。
XXX	X	X	1	Enable/Disable EAL settings	0	0x1: active 0x0: inactive	是否有氛围灯使能设置开关。
XXX	X	X	1	Enable/Disable Temperature Setting	0	0x1: active 0x0: inactive	是否有氛围灯温度提醒开关
XXX	X	X	1	Enable/Disable Call Reminder	0	0x1: active 0x0: inactive	是否有氛围灯来电提醒使能开关
XXX	X	X	1	Enable/Disable Navigation Turn Reminder	0	0x1: active 0x0: inactive	是否有氛围灯转向提醒使能开关
XXX	X	X	1	Enable/Disable CEA Reminder	0	0x1: active 0x0: inactive	是否有氛围灯 CEA 使能开关
XXX	X	X	1	Enable/Disable Door Left Open Reminder	0	0x1: active 0x0: inactive	是否有氛围灯开门提醒使能开关
XXX	X	X	5	Manually Select Preset Theme	6	0x0: 0 theme 0x1: 1theme 0x2: 2theme 0x3: 3theme 0x4: 4theme 0x5: 5theme 0x6: 6themes 0x7: 7themes 0x8:	氛围灯主题个数数量, 初始值为 6 个。



						8themes ... 0x63:63 themes	
XXX	X	X	1	Zone1	1	0x1: active 0x0: inactive	是否有氛围灯区 间 1 的设置
XXX	X	X	1	Zone 2	1	0x1: active 0x0: inactive	是否有氛围灯区 间 2 的设置
XXX	X	X	1	Zone 3	1	0x1: active 0x0: inactive	是否有氛围灯区 间 3 的设置
XXX	X	X	1	Zone 4	1	0x1: active 0x0: inactive	是否有氛围灯区 间 4 的设置
XXX	X	X	1	Zone 5	1	0x1: active 0x0: inactive	是否有氛围灯区 间 5 的设置
XXX	X	X	1	Music rhythm	1	0x1: active 0x0: inactive	是否有氛围灯音 乐律动的配置

DTC:

When messages communication is lost, a DTC should be reported.

2.5 Error Handling

1, When the communication is lost (signal lost beyond 5 seconds), the client needs to get the detailed signal loss situation and display it according to the HMI requirements, currently it is required to gray out the relevant functions.

If the EAL setting status signal is lost, the entire ambient light setting interface should be grayed out.

2, When the status signal value is beyond the valid value, the client shall process it according to the last valid value.

2.6 Performance

For all enable settings and custom parameter settings, the whole response time from user commands to HMI changes should be controlled within 200ms, for each link, for general time requirements as below, and hopefully within the requirements when developing.

- 1, APP → FDBUS/DBUS : 10ms
- 2, FDBUS/BUS → MCU : 10ms
- 3, MCU → CANBUS : 10ms
- 4, CANBUS Transfer ignore



- 5, ALCM hand and feedback signal: 100ms
- 6, MCU →FDBUS/DBUS: 10ms
- 7, FDBUS/DBUS →APP: 10ms
- 8, HMI update: 5ms

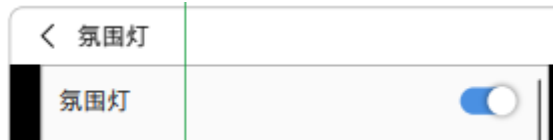


3 Functional Definition

3.1 EAL Function-Enable/Disable Settings

3.1.1 Enable/Disable EAL settings

3.1.1.1 HMI icon



3.1.1.2 Use cases-Enable EAL settings

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL setting is Disable.
Scenario Description	Users turn ON Ambient lighting feature by click on Touchscreen [enable/disable button]
Post-conditions	Ambient lighting feature changed from OFF to ON. EAL setting changed to enable.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.1.3 Use cases-Disable EAL settings

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL setting is Enable.
Scenario Description	Users turn OFF Ambient lighting feature by click on Touchscreen [enable/disable button]
Post-conditions	Ambient lighting feature changed from ON to OFF. EAL setting changed to Disable. other settings HMI view based on HMI spec.
List of	



Exception Use Cases	
Interfaces	HMI, CAN

3.1.1.4 Requirements

User can choose ambient lighting feature on or off by click on ALCM Interface Client.

For the **LghtAmbEnbl_D_Rq** signal, when a request occurs, 5 frames are sent immediately, and the interval between each frame is 20 ms. After the 5 frames are sent, the periodic transmission is resumed, and the signal value is No_Request. After the ALCM server receives the request, it immediately processes and sends the status feedback signal **LghtAmbEnbl_D_Stat** and keeps sending the status value periodically.

When EAL Setting is from OFF to ON, ALCM Client should display according to the cache from ALCM server, and then verify and update HMI based on status signals values of ALCM Server.

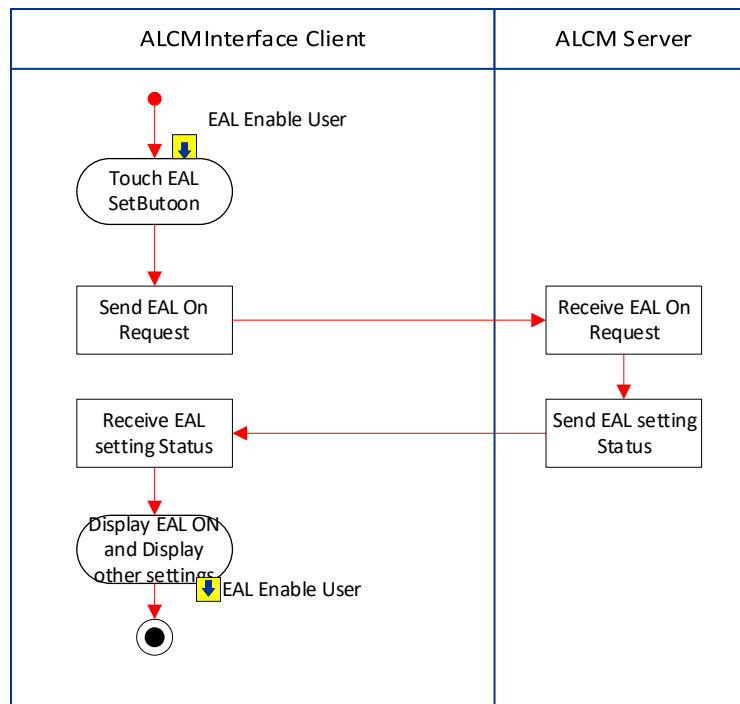
When SDM Setting button is ON, if put EAL Setting to OFF, SDM Setting Button also should put to OFF (SDM feature is responsible for this requirement). When re-enable EAL Setting, HMI should display based on signals from ALCM Server, normally, it should show a theme.

For Client initial status, when the CAN bus network is woken up, Client will receive the status values from Server. If no valid status signals is received, HMI should display based on Error Handling requirement.

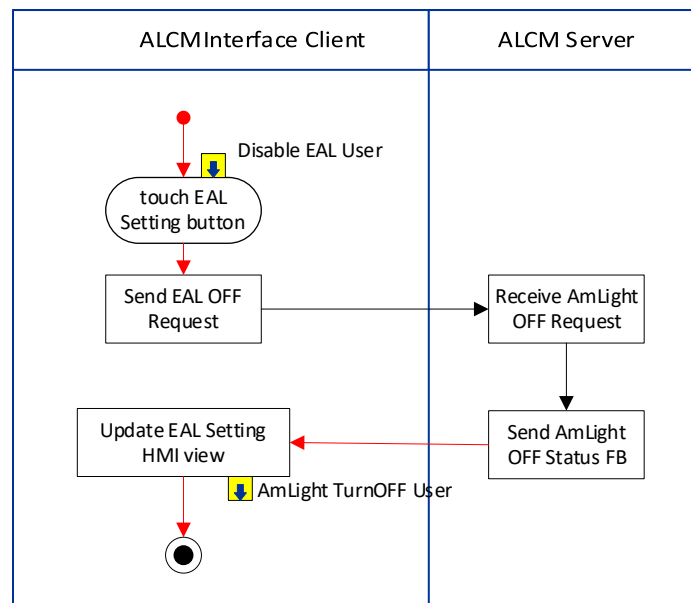
When active personality is changed, Client should update HMI based on the feedback status values from Server. When the personality is changed, if it returns to the ambient light setting interface, the user cannot see the jump of display status at this time. Returning from the SDM feature should do same.



3.1.1.5 Activity Diagrams

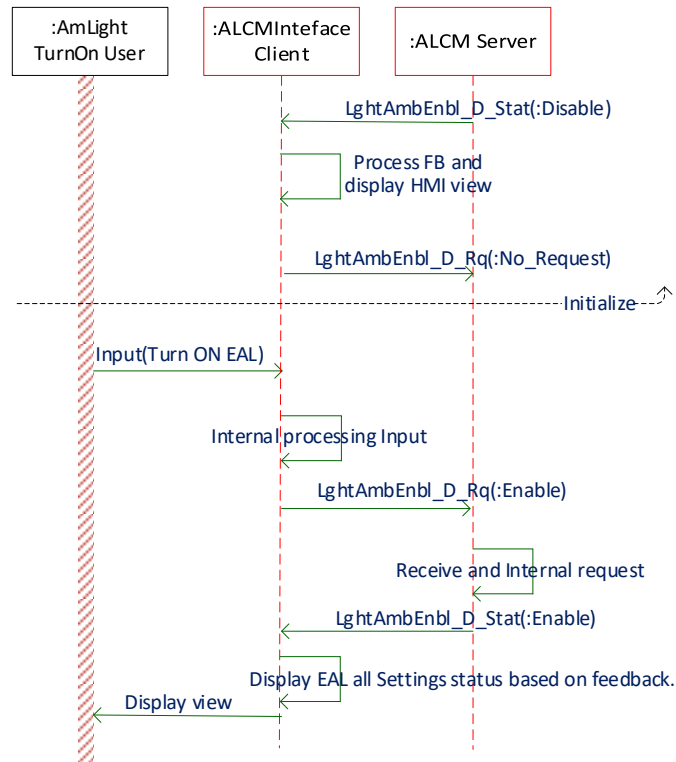


Enable EAL Settings

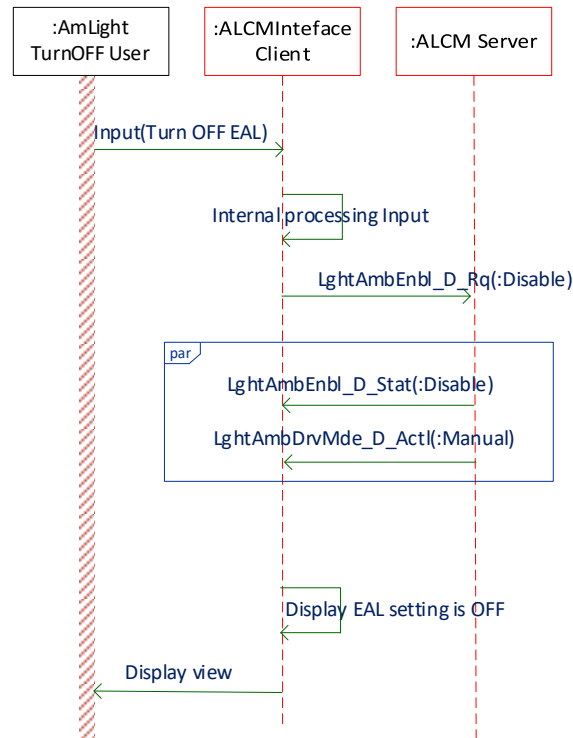


Disable EAL setting

3.1.1.6 Sequence Diagrams



Enable EAL Settings



Disable EAL Settings



3.1.2 Enable/Disable SDM settings

3.1.2.1 HMI icon

This icon in SDM setting page.

3.1.2.2 Use cases-Enable SDM when EAL is OFF

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is OFF.
Scenario Description	User operation SDMInterface Client and click on <Drive mode switch> for Enable SDM
Post-conditions	EAL setting status transit to Enable. No themes were selected, and the text reminds the user that it is in SDM mode. HMI update view refer to HMI spec
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.2.3 Use Cases- Enable SDM when EAL is ON

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON.
Scenario Description	User operation SDMInterface Client and click on <Drive mode switch> for select Enable SDM
Post-conditions	User selected theme is canceled, use text in the image display area to remind the user is in SDM mode. HMI update view refer to HMI spec.
List of	



Exception Use Cases	
Interfaces	HMI, CAN

3.1.2.4 Use cases- Disable SDM by SDM setting button

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON.
Scenario Description	Users operation SDM Interface Client and click on <Drive mode switch> for Disable SDM
Post-conditions	The ambient light mode transit to a theme mode that is determined by the ALCM module. HMI update view to current mode of ambient light.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.2.5 Use cases- Disable SDM by select another theme

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON. SDM in Auto.
Scenario Description	Users operation ALCMInterface Client and select another theme
Post-conditions	The ambient light mode transit to the user selected theme. HMI update view to the user selected theme.
List of Exception Use	



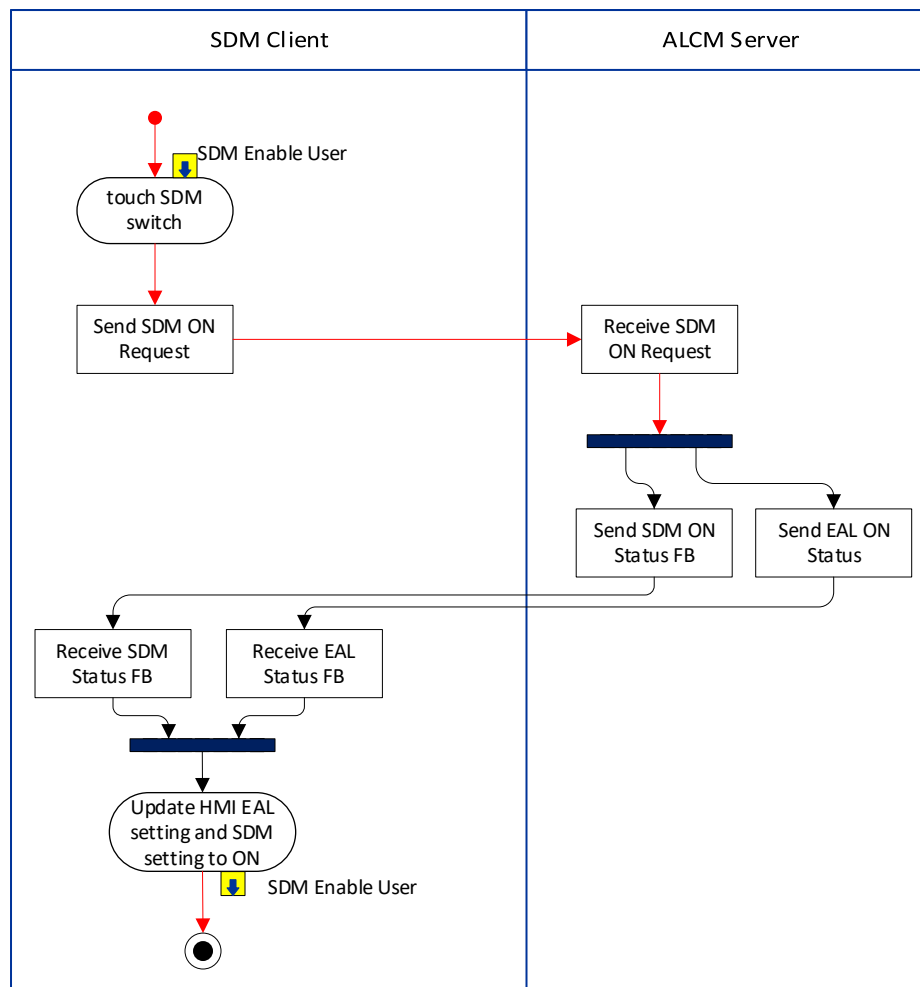
Cases	
Interfaces	HMI, CAN

3.1.2.6 Requirements

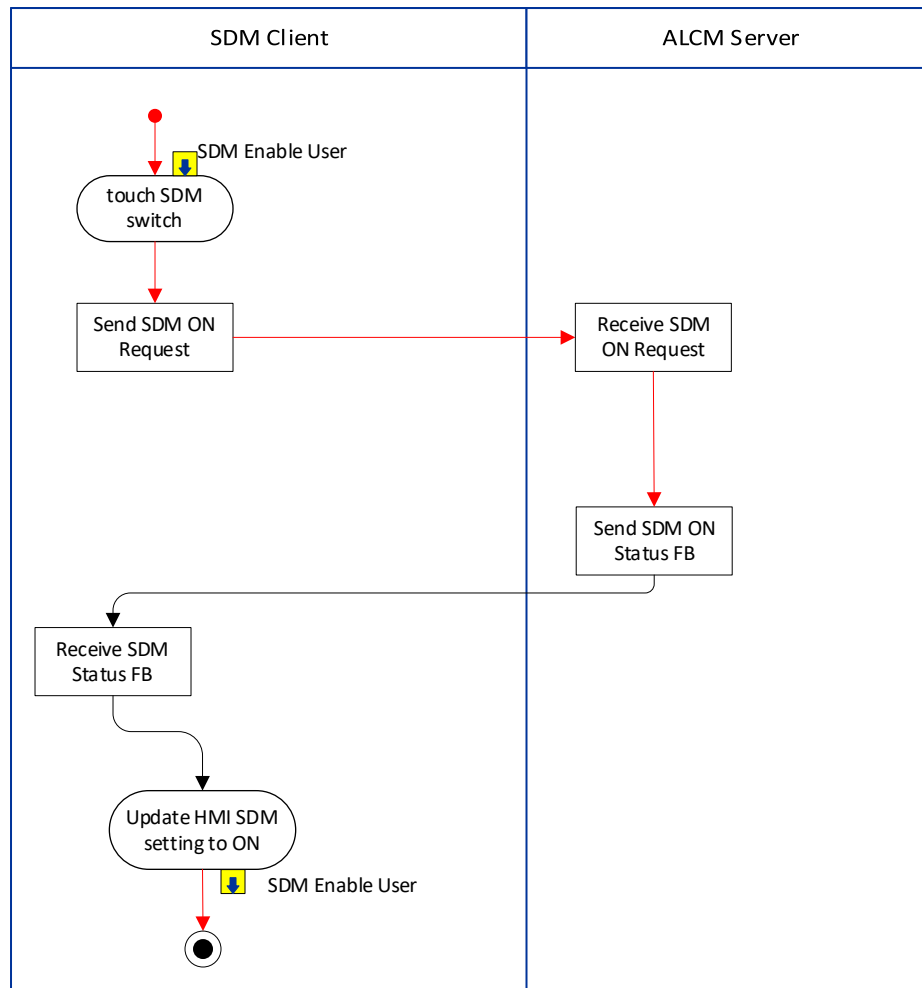
When SDM transit ON to OFF, ALCM Interface Client should display HMI based on status of ALCM.

For SDM Setting function, CAN request signal is **LghtAmbDrvMde_D_Rq**, EventPeriodic. the status feedback signal is **LghtAmbDrvMde_D_Actl**, and keeps sending the status value periodically.

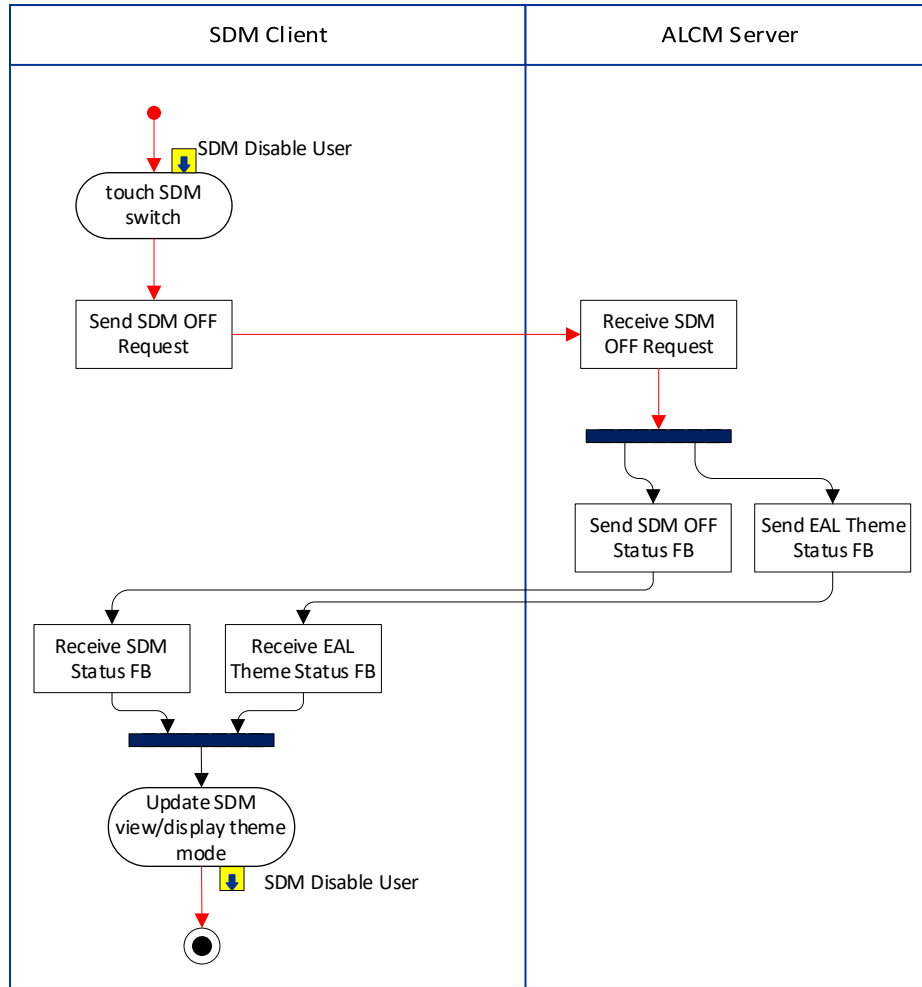
3.1.2.7 Activity Diagrams



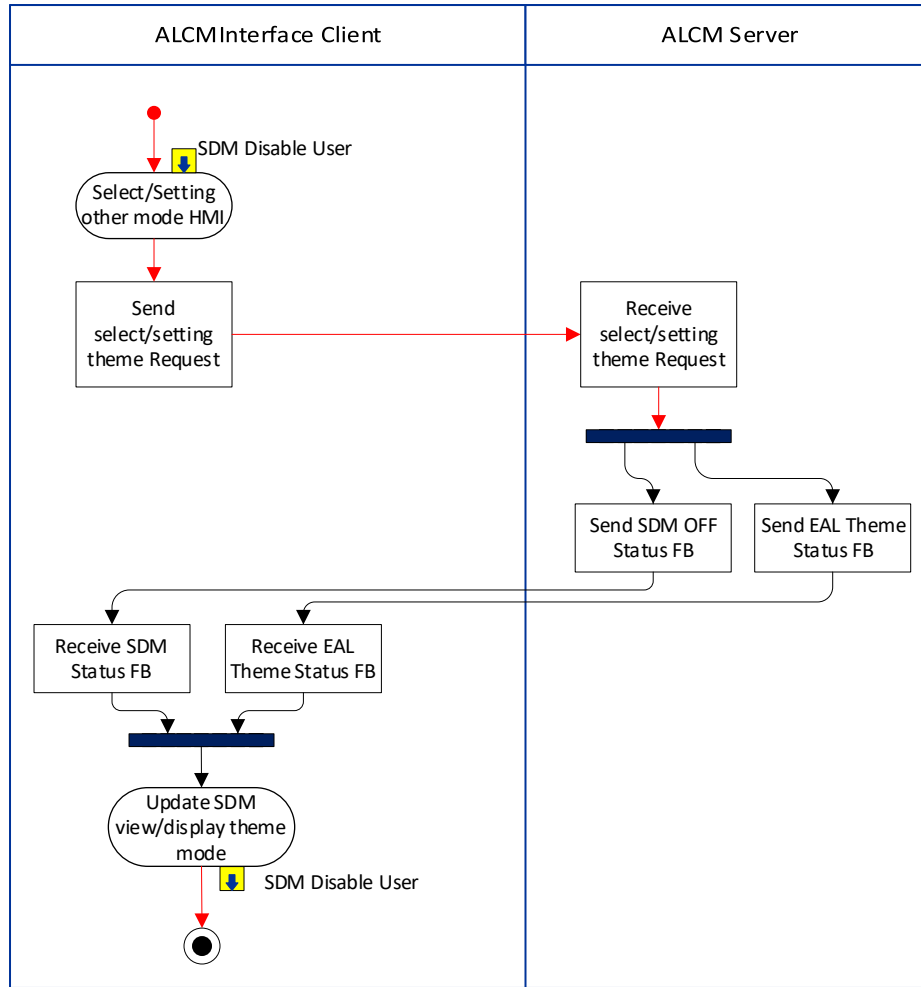
Enable SDM setting when EAL is OFF



Enable SDM setting when EAL is ON

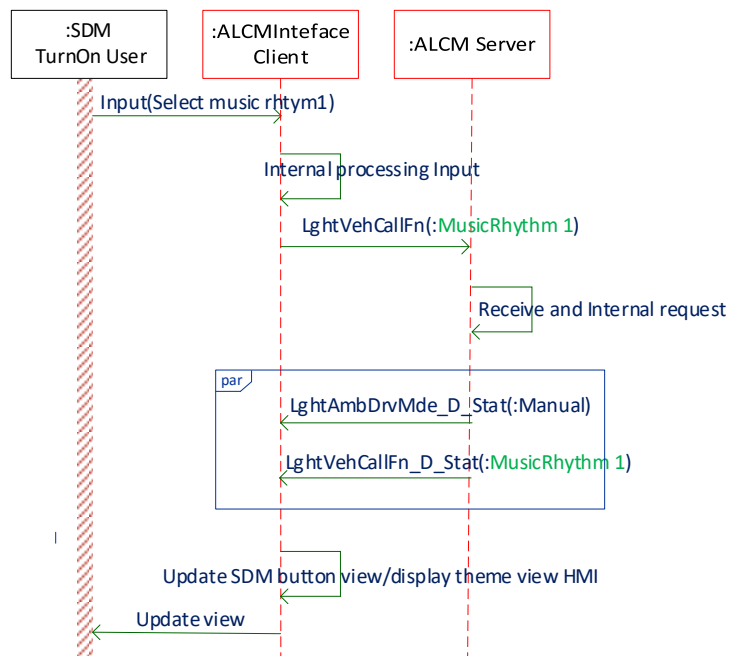


Disable SDM Setting by touch SDM button



Disable SDM Setting by select another theme

3.1.2.8 Sequence Diagrams





Disable SDM Setting by select another theme

3.1.3 Enable/Disable Temperature Setting

3.1.3.1 HMI icon

B 此处提醒功能为复选，选项可滑动，依据实际车机氛围灯效果来确定提醒功能数量

门未关提醒

下车提醒

转向提醒

空调调节提醒

来电提醒

3.1.3.2 Use cases

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON.
Scenario Description	Users operation ALCMInterface Client and click on <Temp setting reminder switch> for manually select Enable/Disable Temp Setting Reminder.
Post-conditions	Temp Setting Reminder changed on ON/OFF status based on user input. HMI updated settings.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.3.3 Requirements

No special needs.

Error Handling.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

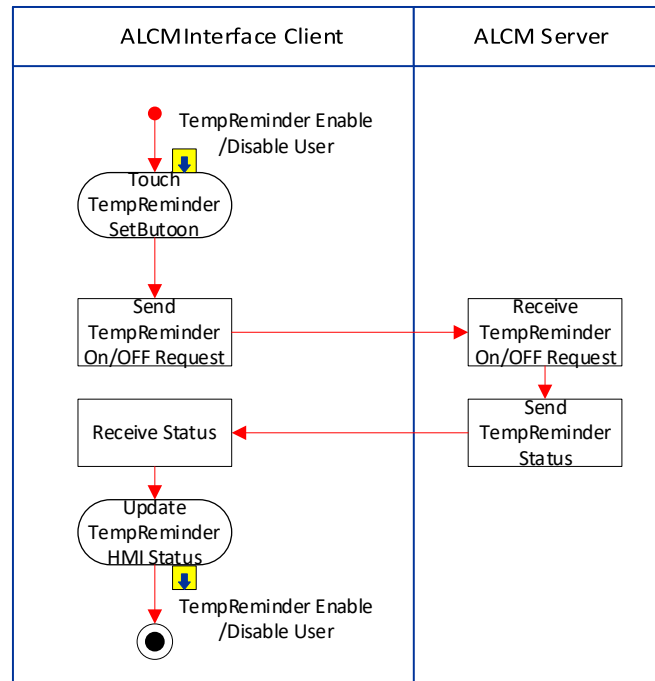
Performance requirements.

The response time from user input request to HMI change is required to be within 200ms.

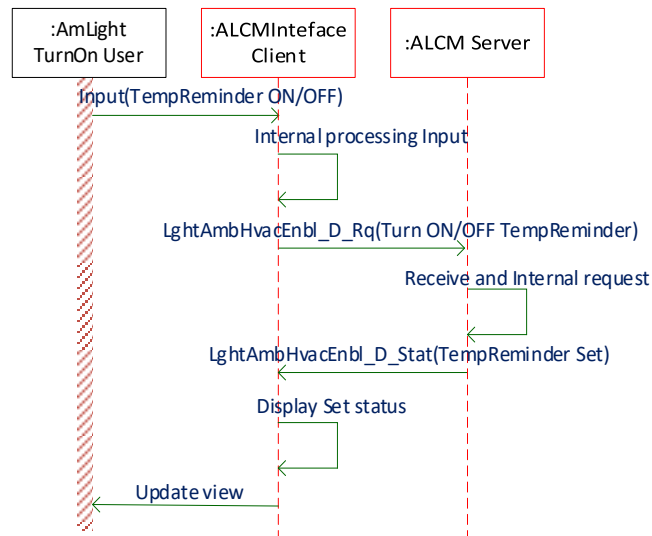
Configuration requirements.

This function can be configured.

3.1.3.4 Activity diagrams



3.1.3.5 Sequence diagrams



3.1.4 Enable/Disable Call Reminder

3.1.4.1 HMI icon

B 此处提醒功能为复选，选项可滑动，依据实际车机氛围灯效果来确定提醒功能数量





3.1.4.2 Use cases

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON.
Scenario Description	Users operation ALCMInterface Client and click on <Caller reminder switch> for manually select Enable/Disable Caller Reminder.
Post-conditions	Caller Reminder changed on ON/OFF status based on user input. HMI updated settings.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.4.3 Requirements

No special needs

Error Handling.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

Performance requirements.

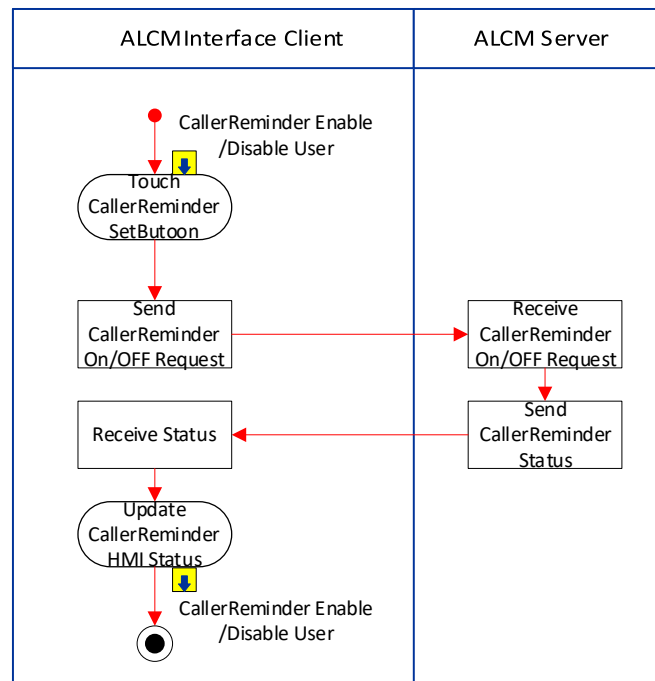
The response time from user input request to HMI change is required to be within 200ms.

Configuration requirements.

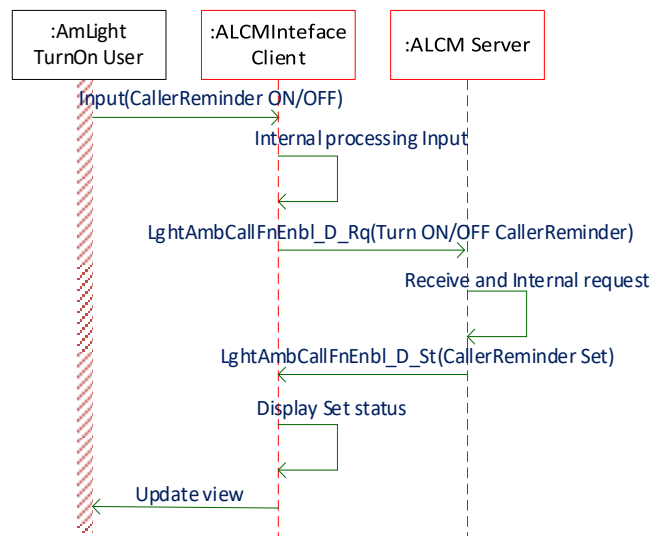
This function can be configured.



3.1.4.4 Activity diagrams



3.1.4.5 Sequence diagrams



3.1.5 Enable/Disable Navigation Turn Reminder

3.1.5.1 HMI icon

3.1.5.2 User case

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on.



	ALCM Server is active. EAL Settings is ON.
Scenario Description	Users operation ALCMInterface Client and click on <NaviTurn Reminder switch> for manually select Enable/Disable Navigation Turn Reminder.
Post-conditions	Navi Turn Reminder changed on ON/OFF status based on user input. HMI updated settings.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.5.3 Requirements

No special needs

Error Handling.

.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

Performance requirements.

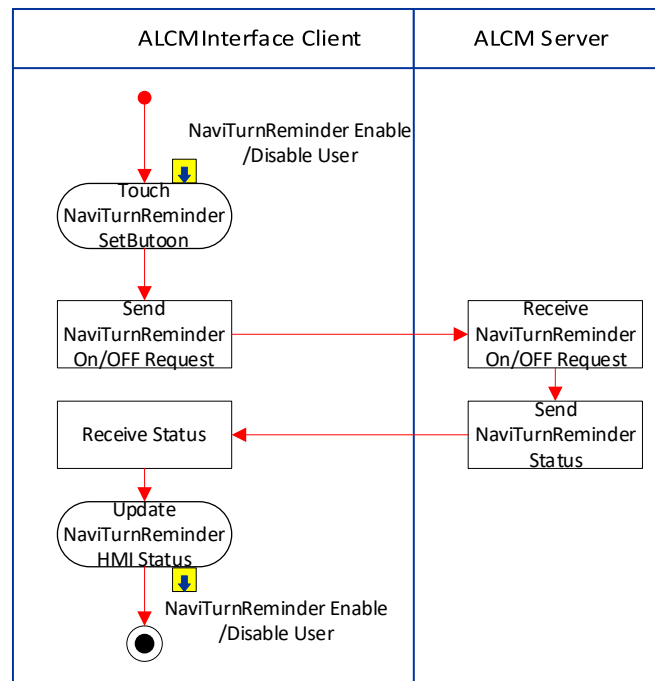
The response time from user input request to HMI change is required to be within 200ms.

Configuration requirements.

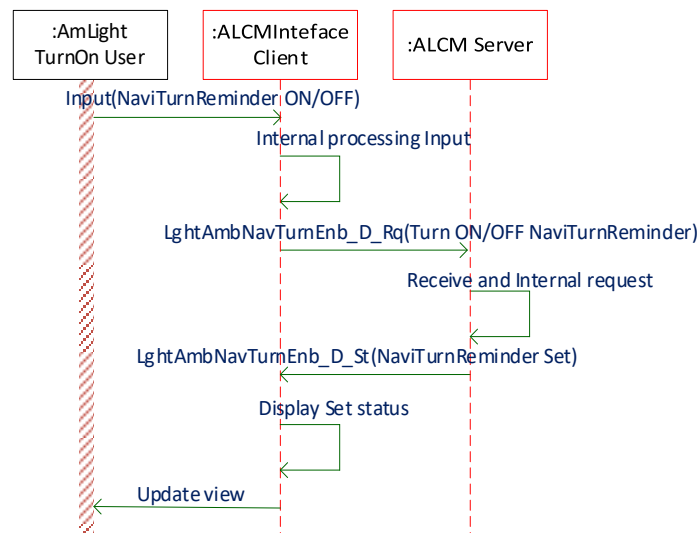
This function can be configured.



3.1.5.4 Activity diagram



3.1.5.5 Sequence diagram



3.1.6 Enable/Disable CEA Reminder

3.1.6.1 HMI icon

3.1.6.2 Use case

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on.



	ALCM Server is active. EAL Settings is ON.
Scenario Description	Users operation ALCMInterface Client and click on <CEA Reminder switch> for manually select Enable/Disable Reminder.
Post-conditions	CEA Reminder changed on ON/OFF status based on user input. HMI updated settings.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.6.3 Requirements

No special needs

Error Handling.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

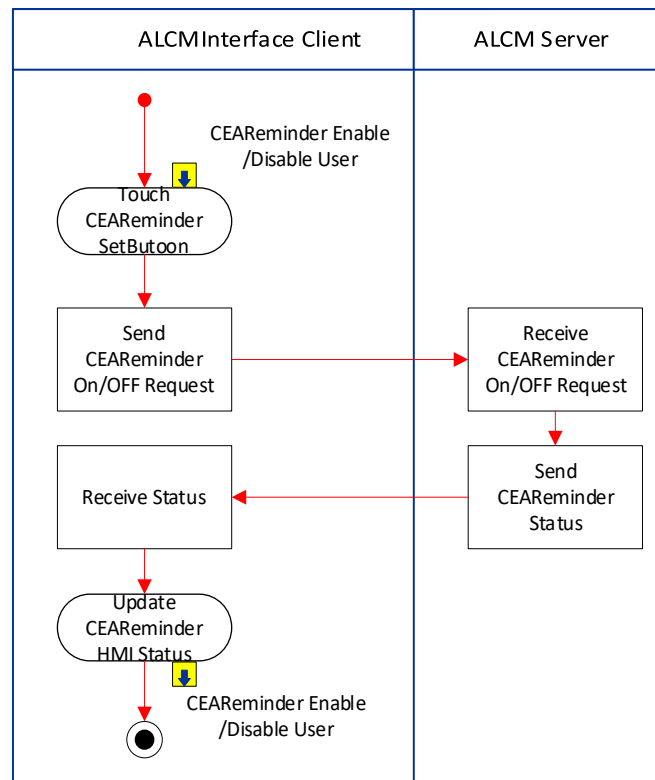
Performance requirements.

The response time from user input request to HMI change is required to be within 200ms.

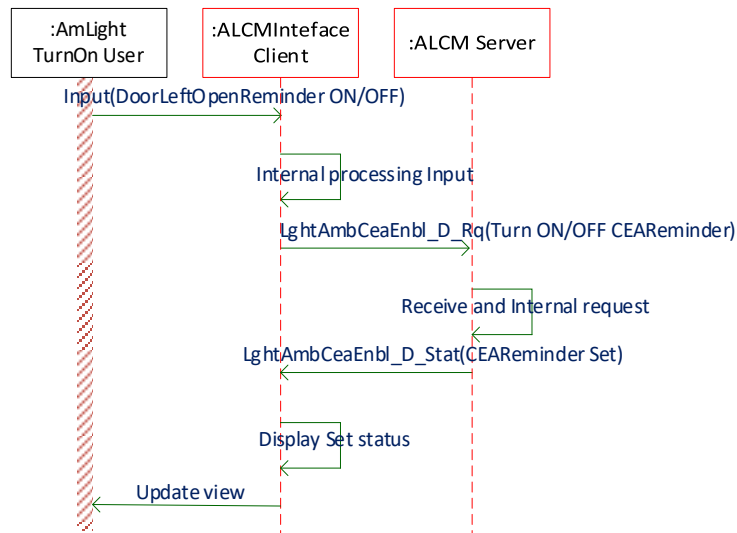
Configuration requirements.

This function can be configured.

3.1.6.4 Activity diagram



3.1.6.5 Sequence diagram



3.1.7 Enable/Disable Door Left Open Reminder

3.1.7.1 HMI icon

3.1.7.2 Use case

Actors	User, ALCM Server, ALCMInterface Client
---------------	-----------------------------------------



Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON.
Scenario Description	Users operation ALCMInterface Client and click on <DoorLeftOpen Reminder switch> for manually select Enable/Disable Reminder.
Post-conditions	Door Left Open Reminder changed on ON/OFF status based on user input. HMI updated settings.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.7.3 Requirements

No special needs

Error Handling.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

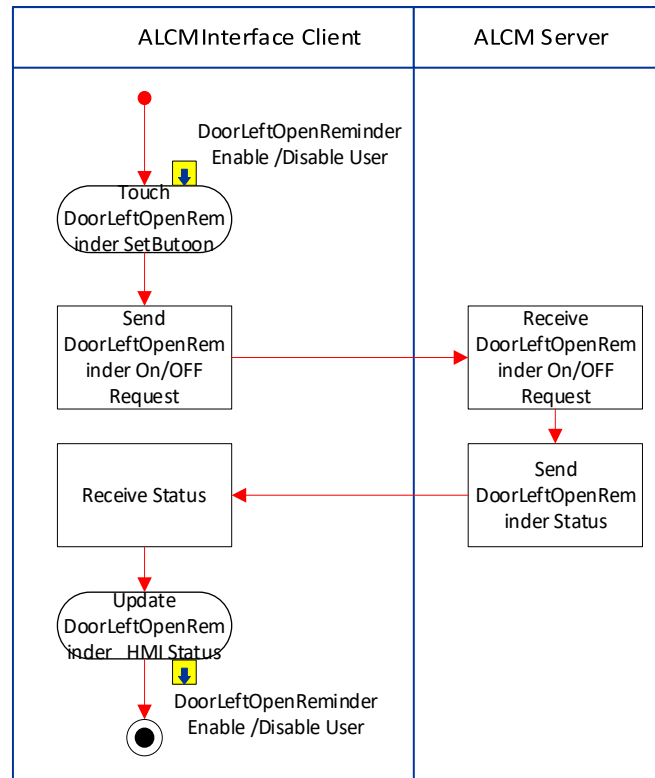
Performance requirements.

The response time from user input request to HMI change is required to be within 200ms.

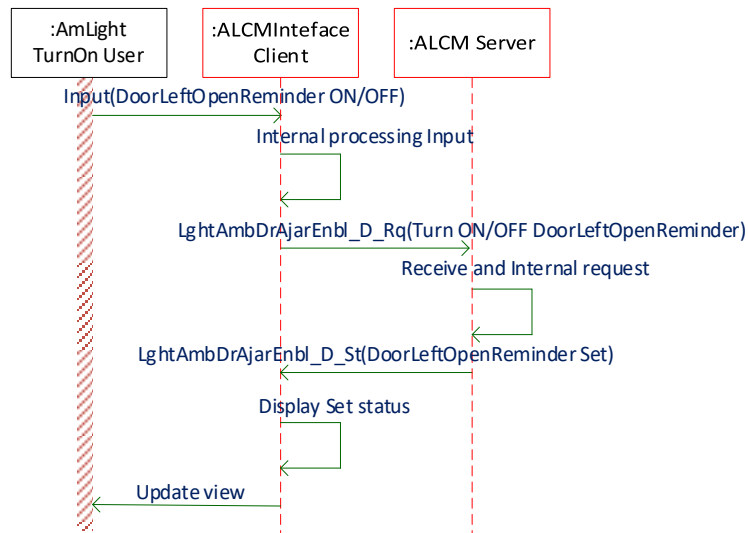
Configuration requirements.

This function can be configured.

3.1.7.4 Activity diagram



3.1.7.5 Sequence diagram



3.2 EAL Function-Theme select



3.2.1 Manually Select Theme

3.2.1.1 HMI icon

特定节日里会在主题模式中显示线上彩蛋，设计预留； TBD

自定义 音乐律动 主题1 主题2 主题3 主题4 主题5 主题6 彩蛋1 彩蛋2



3.2.1.2 Use Case- Select theme when SDM is manual

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON.
Scenario Description	User select ambient lighting theme through ALCM Interface Client theme list
Post-conditions	1, ALCM Server feedback status signal to ALCMClient . 2, Client HMI update according to the selected theme.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.2.1.3 Use Case-Select theme when SDM is Auto

Same as 3.1.2.5

3.2.1.4 Requirements

Theme lists include 6 preset theme, 1 music rhythm, 1 customer theme, and if a hidden theme is triggered, the hidden theme will also be shown in this list, up to two hidden themes can be displayed at the same time.

The number of themes in the theme list is configurable, up to 31.

When user choices one theme, the request signal **LghtAmbVehFn_D_Rq** should immediately send the corresponding request value, 5 frames continually, and then resume no request. After ALCM Server received the request, immediately processes and sends the status feedback signal **LghtAmbVehFn_D_St**, and keeps the status value periodically.



If user select customer theme, customer-defined theme parameters display area should be displayed according to the status information of the cache, and the floor area and corresponding parameters should be displayed every time you enter this interface.

When user repeatedly clicks on the same selected theme, it cannot be unselected.

Error Handling.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

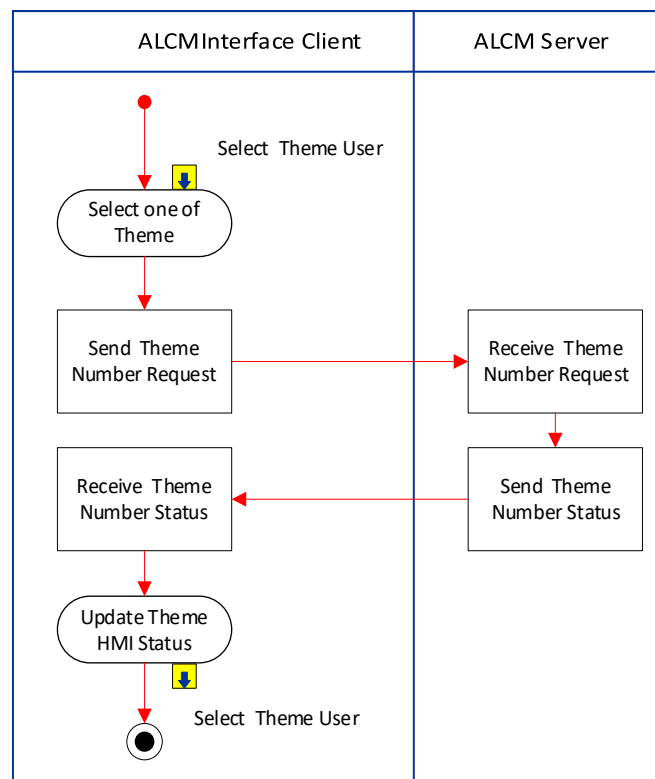
Performance requirements.

The response time from user input request to HMI change is required to be within 200ms.

Configuration requirements.

This function can be configured.

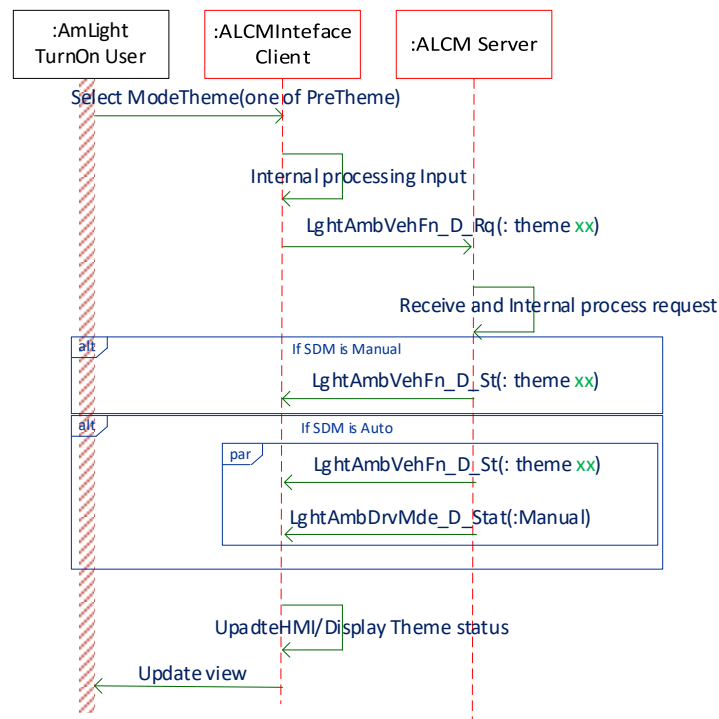
3.2.1.5 Activity diagram



Select theme when SDM is manual



3.2.1.6 Sequence diagram



3.3 EAL Function-Manually defined ambient lighting parameters

Users can set various parameters of Custom Theme, such as Zone settings, animation effect, color and intensity settings for each Zone.

3.3.1 User-Defined Theme Zone

3.3.1.1 HMI icon

地板
门板
中控
整车同步

3.3.1.2 Use cases

Actors	User, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. EAL Settings is ON. Custom theme is selected.
Scenario Description	user selects zone in Zone setting area.
Post-conditions	Client HMI update according to the selected zone.
List of	



Exception Use Cases	
Interfaces	HMI, CAN

3.3.1.3 Requirements

Zones including floor, Door, IP and Vehicle

When a zone is selected, the color, brightness and animation effects should be displayed according to the status signals of each parameter in the corresponding zone. If the whole vehicle synchronization zone is selected, the current zone parameters will be synchronized to give all request signals and sent to ALCM.

When adjusting the intensity and color, the relevant request signals are sent to the ALCM according to the currently selected Zone.

Zone1 corresponding Floor

Zone2 corresponding Door

Zone3 corresponding IP

Vehicle synchronization button does not have a corresponding CAN signal.

Error Handling.

When the signal value of the request signal from IVI is out of the valid value range, ALCM will ignore this request.

Performance requirements.

The response time from user input request to HMI change is required to be within 10ms.

Configuration requirements.

Five Zones can be configuration separately.

3.3.2 User-Defined Theme Color

3.3.2.1 HMI icon



3.3.2.2 Use cases

Actors	User, ALCM Server, ALCMInterface Client
--------	-----------------------------------------



Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON. Custom theme is selected.
Scenario Description	User adjusts ambient light color through ALCM Interface Client HMI.
Post-conditions	1, ALCM Server is implemented according to the selected color. 2, Client HMI update according to the selected color.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.3.2.3 Requirements

The ambient light color adjustment is through the setting of each zone color parameters, setting parameters by RGB three parameters, a total of 15 signals, the value of each signal range of 0-255, where 124 is No_Request.

Zone1:

LghtColrBValZn1_No_Rq;

LghtColrGValZn1_No_Rq;

LghtColrRValZn1_No_Rq;

Zone2:

LghtColrBValZn2_No_Rq;

LghtColrGValZn2_No_Rq;

LghtColrRValZn2_No_Rq;

Zone3:

LghtColrBValZn3_No_Rq;

LghtColrGValZn3_No_Rq;

LghtColrRValZn3_No_Rq;

When the user sets the color of a certain zone, the color setting request signal of the corresponding zone is sent to the ALCM Server, after which if there is no new request, No_Request is restored, and the ALCM will send the color setting signal of the corresponding zone immediately after processing the request and keep sending the status feedback. Client updates the HMI according to the color setting status feedback, and when the user sets the color for the vehicle synchronization button, the color setting signal for all zones should send the same request.

Color setting area HMI as below



There are two type of color setting, one is clicked to select, one is slid to select. After user setting color, HMI display should be update based on color feedback status signals.

For slide setting, the color request signal is sent at an interval of 20ms, if the user drags slider from red to green, the span passes through 100 color values and lasts 100ms, the request signal will be sent 5 times, and the display of the set value will be updated and changed according to the feedback status value. The adjustment process is as follows (assuming a delay of 60ms between the request and the display update).

- 1, the first time to move the slider from red to dark red, after 20ms, send a request value of dark red.
- 2, After 20ms, the request value is purple
- 3, After 20ms, the request value is light purple
- 4, After 20ms, the request value is dark green - HMI display from red to dark red.
- 5, After 20ms, the request value is green, the user is not touching the color palette - HMI display from dark red to purple.
- 6, After 20ms, HMI display from purple to light purple.
- 7, After 20ms, HMI display from light purple to dark green.
- 8, After 20ms, the HMI display goes from dark green to green.

For click setting, slider move to click point directly.

Error Handling.

When the signal value of the request signal from IVI is out of the valid value range, ALCM will ignore this request.

Performance requirements.

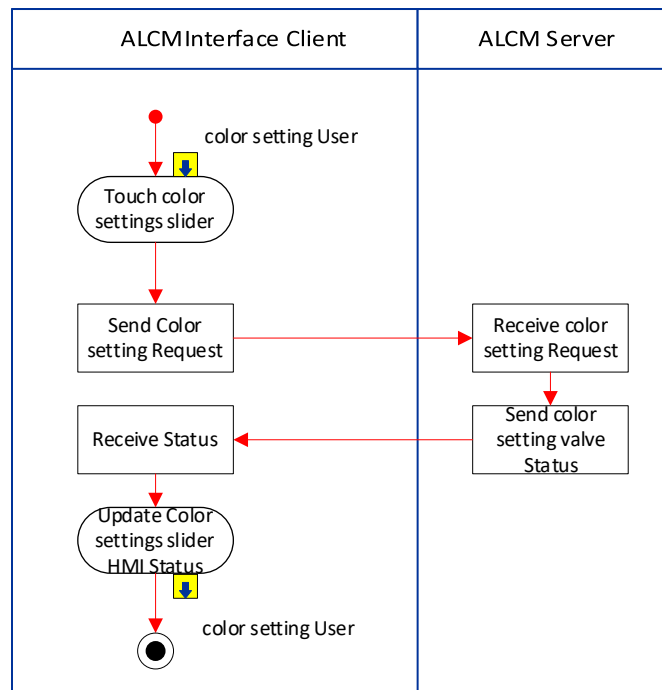
The response time from user input request to HMI change is required to be within 80ms.

Configuration requirements.

Color setting function can be configuration.

Color number can be configuration.

3.3.2.4 Activity diagrams





3.3.2.5 Sequence diagrams





3.3.3 User-Defined Theme Intensity

3.3.3.1 HMI icon



3.3.3.2 Use cases

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active. EAL Settings is ON. Custom theme is selected.
Scenario Description	User adjusts ambient light intensity through ALCM Interface Client HMI.
Post-conditions	1, ALCM Server is implemented according to the selected intensity. 2, Client HMI update according to the selected intensity.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.3.3.3 Requirements

The ambient light intensity adjustment is through the setting of each zone intensity parameters, a total of 5 signals, the value of each signal range of 0-100.

Zone1: floor

LghtAmbIntnsZn1_Pc_Rq.

Zone 2: door

LghtAmbIntnsZn2_Pc_Rq.

Zone 3: IP

LghtAmbIntnsZn3_Pc_Rq.

When the user sets the intensity of a certain zone, the intensity setting request signal of the corresponding zone is sent to the ALCM Server, after which if there is no new request, No_Request is restored, and the ALCM will send the intensity status signal of the corresponding zone immediately after processing the request and keep sending the status feedback. Client updates the HMI according to the intensity setting status feedback, and when the user sets the intensity for the vehicle button, the intensity setting signals for all zones should send the same request.



HMI of Intensity Bar



There are two types of intensity setting, one is clicked to select, one is slid to select. After user setting intensity, HMI display should be update based on intensity feedback status signals.

For slide setting, the intensity request signal is sent at an interval of 20ms, if the user drags slider from 30 to 80, the span passes through 50 values and lasts 100ms, the request signal will be sent 5 times, and the display of the set value will be updated and changed according to the feedback status value. The adjustment process is as follows (assuming a delay of 60ms between the request and the display update).

- 1, the first time to move the slider from 30 to 40, after 20ms, send a request value of 40.
- 2, After 20ms, the request value is 50
- 3, After 20ms, the request value is 60
- 4, After 20ms, the request value is 70 - HMI display from 30 to 40.
- 5, After 20ms, the request value is 80, the user is not touching the intensity bar - HMI display from 40 to 50.
- 6, After 20ms, HMI display from 50 to 60.
- 7, After 20ms, HMI display from 60 to 70.
- 8, After 20ms, the HMI display goes from 70 to 80.

For click setting, slider move to click point directly.

Error Handling.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

Performance requirements.

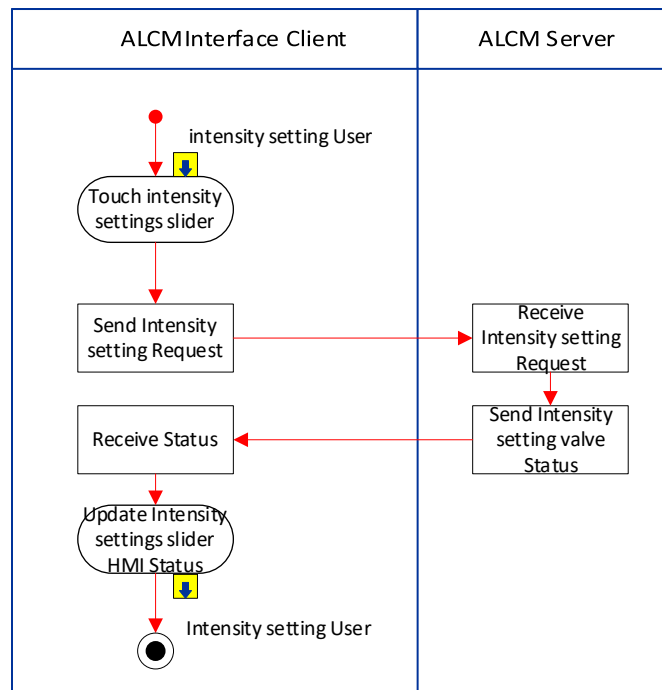
The response time from user input request to HMI change is required to be within 80ms.

Configuration requirements.

intensity setting function can be configuration.

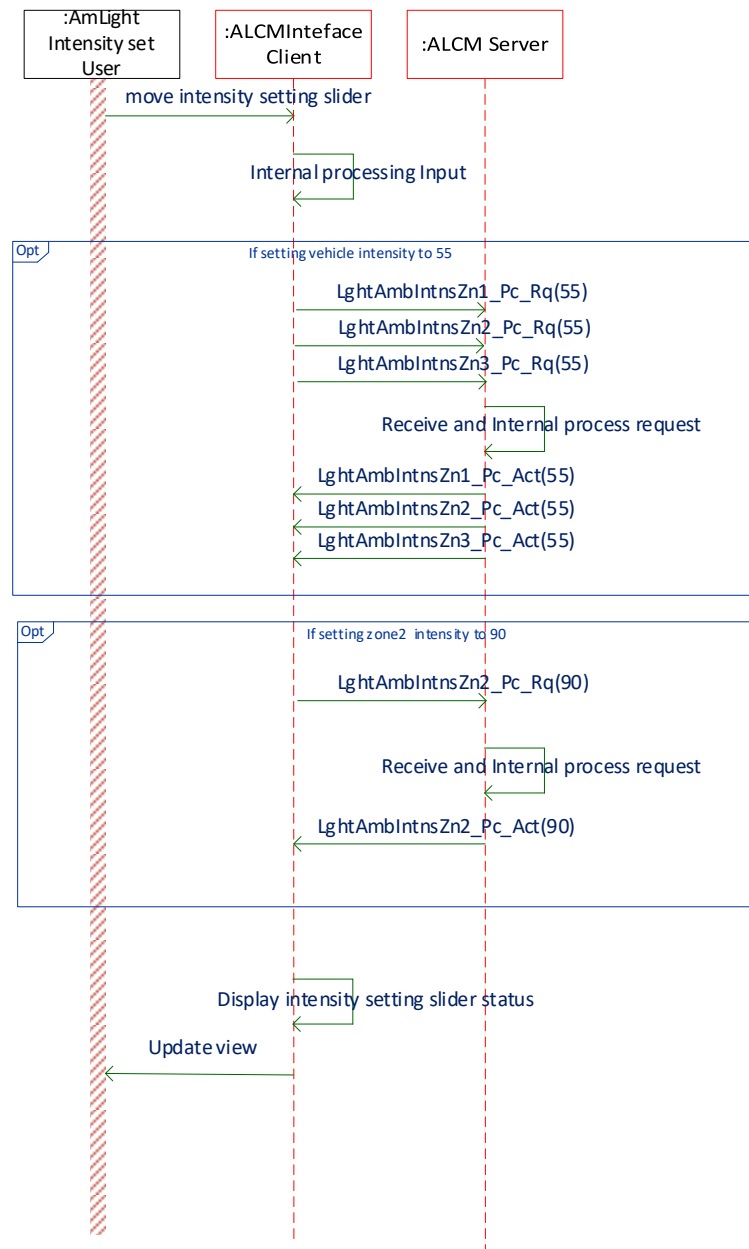


3.3.3.4 Activity diagrams





3.3.3.5 Sequence diagrams



3.3.4 User-Defined Theme Dynamic animation

3.3.4.1 HMI icon

静态 呼吸 流水 变色

3.3.4.2 Use cases

Actors	User, ALCM Server, ALCMInterface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on.



	ALCM Server is active. EAL Settings is ON. Customtheme is selected.
Scenario Description	User adjusts ambient light animation through ALCM Interface Client HMI.
Post-conditions	1, ALCM Server is implemented according to the selected animation. 2, Client HMI update according to the selected animation.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.3.4.3 Requirements

The ambient light animation effect setting is for the vehicle, the number of animations is 4.

CAN signal is **LghtAmbAnmtCycZn1_T_Rq**, signal requirements are the same as for other Switch request signals

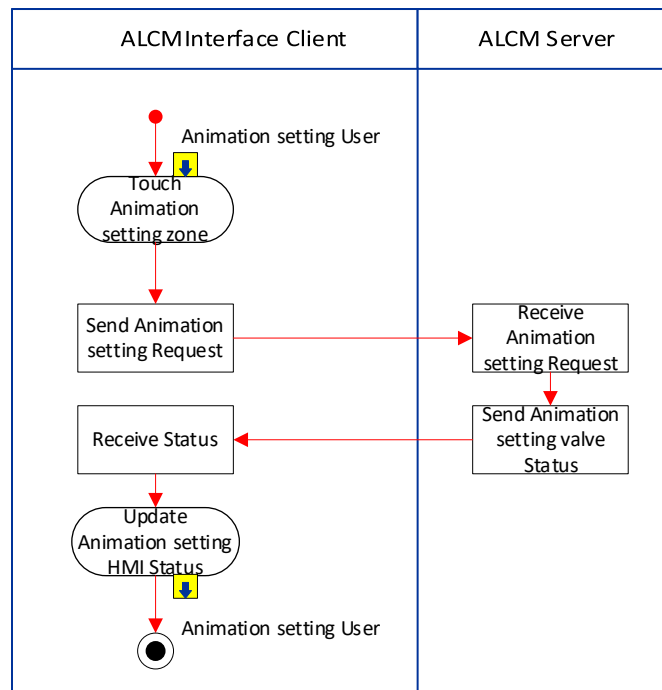
Error Handling.

When the request signal is sent, and the status signal feedback value is different, the HMI shall follow the status feedback signal display.

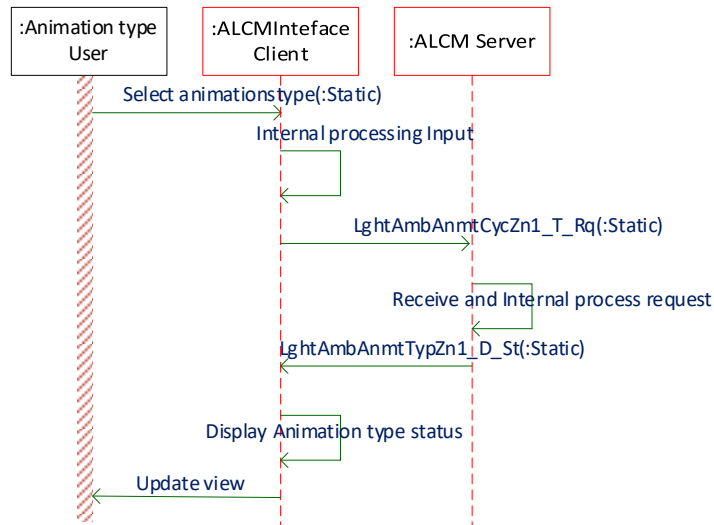
Configuration requirements.

anima setting function can be configuration.

3.3.4.4 Activity diagrams



3.3.4.5 Sequence diagrams



3.4 EAL Function- Status Transmission of APIM

APIM will send some informations to ALCM

3.4.1 APIM Send BT-Phone Status

3.4.1.1 Use Cases

APIM Send BT-Phone Status

Actors

User, ALCM Server, ALCMInterface Client, BT Phone Server



Pre-conditions	Infotainment system is powered ON. BT Phone Server is active. ALCM is powered on. ALCM Server is active.
Scenario Description	While BT phone in incoming or connect or hang up or second incoming, ambient lighting will have some actions.
Post-conditions	APIM send BT phone status to ALCM Server.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.4.1.2 Requirements

APIM need to get BT Phone status from BT Server. And When BT Phone status is transit to incoming or connect or hang up or second incoming, APIM need to send BT Phone status value to ALCM server. To BT phone other status, ALCM Server not responding.

CAN signal- **IncmngCall_D_Stat**, usually the signal sends a value of NULL, if the Bluetooth phone status has changed to the incoming call status, then the signal immediately sends Incoming value, and keep the cycle of sending until the status changes, other Bluetooth phone status is handled the same.

Error Handling.

If the call results in failure, the signal value is still sent null

Performance requirements.

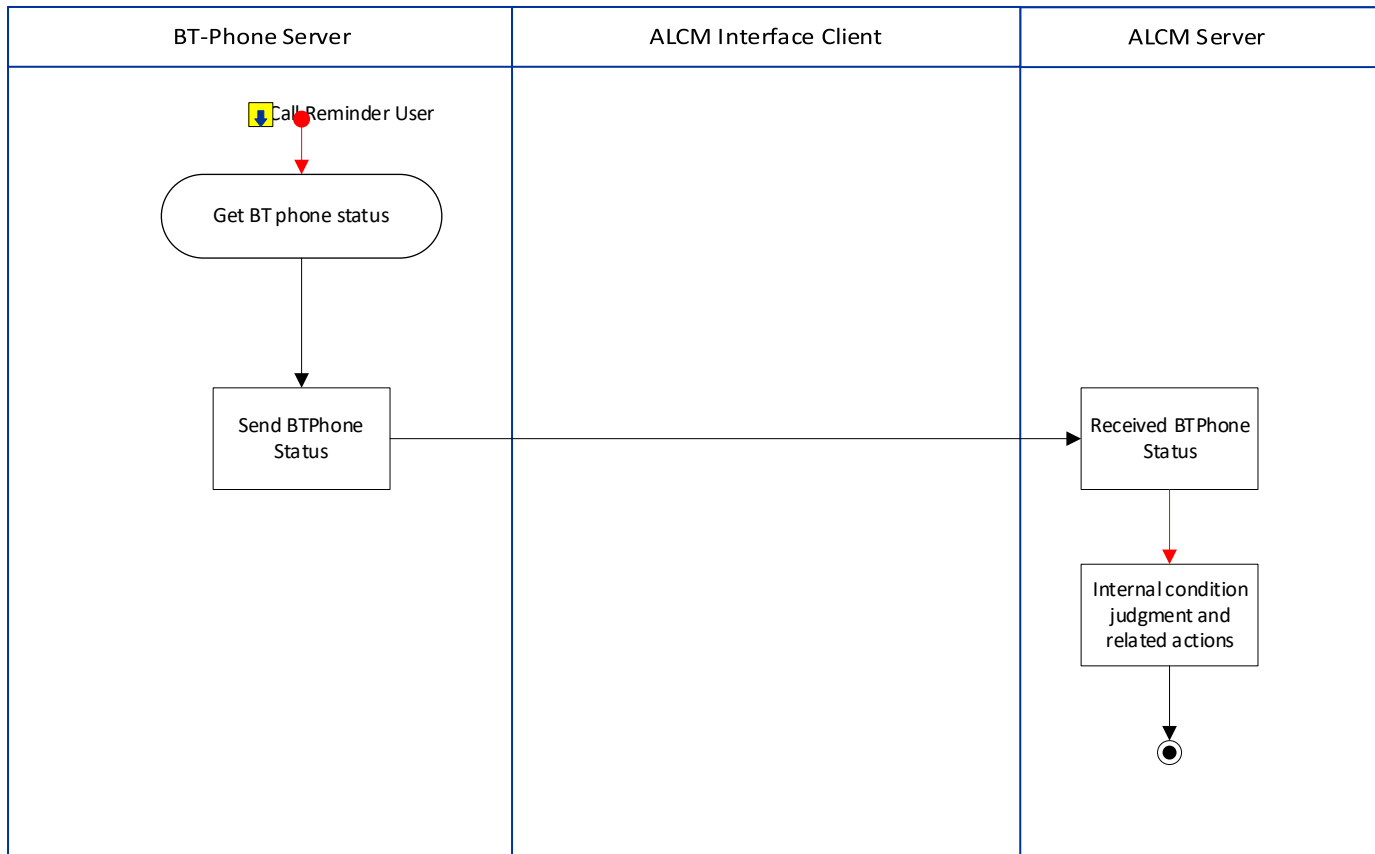
The response time from BT phone input request to ambient lighting change is required to be within **200ms**.

Configuration requirements.

This function can be configuration.



3.4.1.3 Activity Diagram



3.4.2 APIM Send Navigation Turn Information Status

3.4.2.1 Use Case

Actors	User, ALCM Server, Navi Server, ALCM Interface Client
Pre-conditions	Infotainment system is powered ON. ALCM Interface Client is active. ALCM is powered on. ALCM Server is active. EAL Setting is on.
Scenario Description	The user starts navigation after clicking on the route selection, and the ambient light module makes a reminder when it is necessary to turn.



Post-conditions	ALCM Server received the Turn type and Remaining distance information from ALCM Interface Client.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.4.2.2 Requirements

The ALCMInterface Client needs to get the remaining distance and turn type from the navigation application, then send to the ALCM Server.

These two CAN signals will be applied.

Error Handling.

If the call results in failure, the signal value is still sent no request.

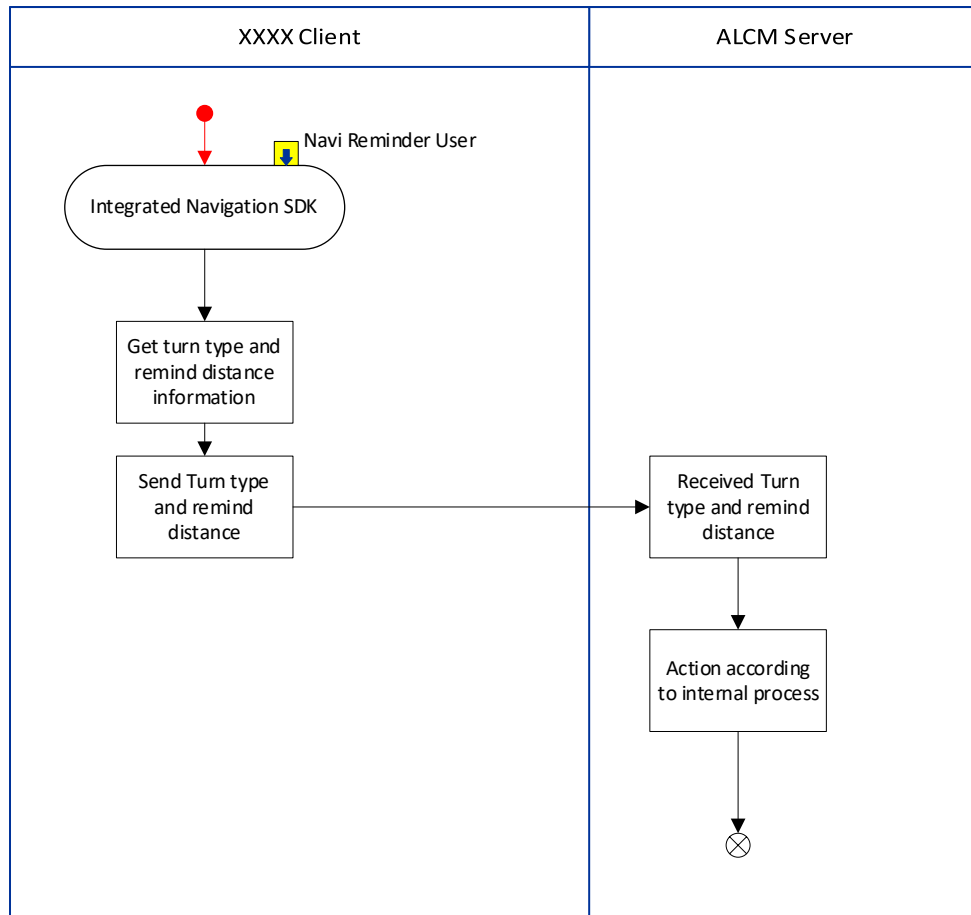
Performance requirements.

The response time from Navi turn type status request to ambient lighting change is required to be within 200ms.

Configuration requirements.

This function can be configuration.

3.4.2.3 Activity Diagram



3.4.3 APIM Send AC Temperature Information Request

This function is for ALCM Server to receive the CAN signal of the driver temperature adjustment request and the CAN signal of the passenger temperature adjustment request, and make internal judgment and processing to make relevant temperature adjustment reminding actions.

The bus signals are Drv_Set_Temp and Psngr_Set_Temp, which do not need to be processed by ALCM Interface Client in the current design.

3.4.4 APIM Send Music Rhythm parameters to ALCM

3.4.4.1 Use Case- user play music

Actors	User, ALCM Server, Audio Player, DSP, ALCM Interface Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. ALCM is powered on. ALCM Server is active.
Scenario Description	The users play music by some app, include online music app, BT music, USB player, KTV and etc..



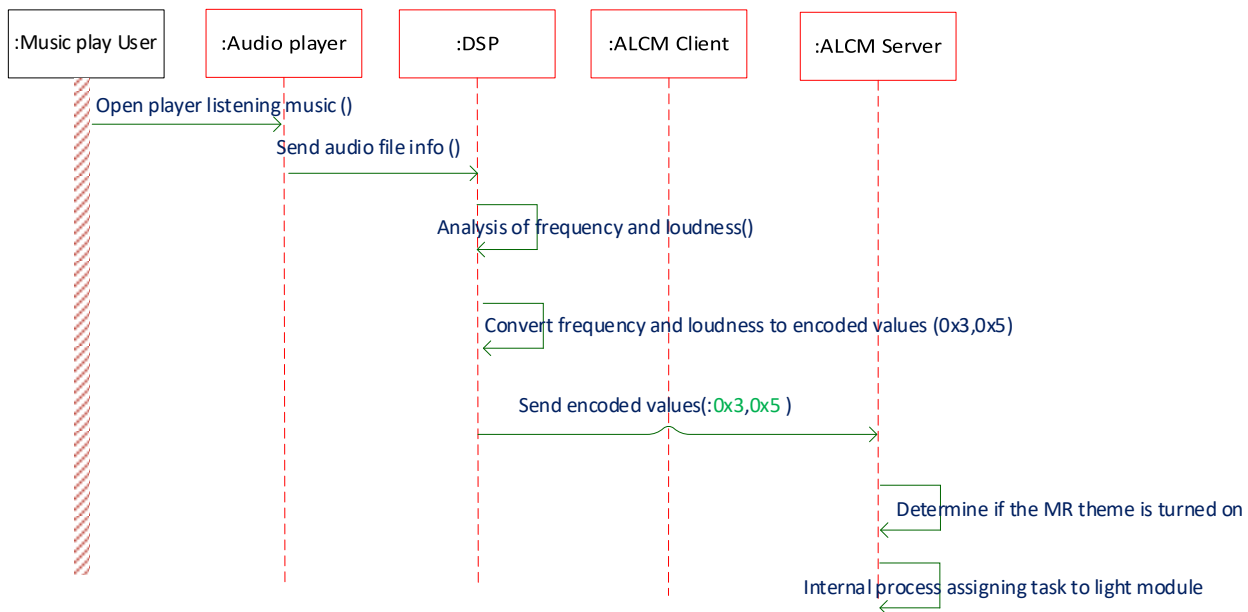
Post-conditions	ALCM Server received MR frequency and loudness encoded values from DSP.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.4.4.2 Requirement

When there is music playing, the bus signal should be updated once in 200ms, the value will be calibrated later and should support modification.

Which channel to analyze requires further discussion

3.4.4.3 Sequence diagram



3.5 EAL Function-hidden mode (Reserved, not developed)

3.5.1.1 HMI icon

特定节日里会在主题模式中显示线上彩蛋，设计预留； TBD



3.5.1.2 Use Case-hidden theme is available

Actors	User, ALCM Server, ALCMInterface Client, MC Server, MCInterfacer Client
--------	-------------------------------------------------------------------------



Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. MC Server is active. MC Interface Client is active. ALCM is powered on. ALCM Server is active.
Scenario Description	a hidden theme triggered on a specific day (New year, Christmas, Chinese New Year, etc.).
Post-conditions	A notification will activate in MCInterfacer Client. ALCMInterface Client update theme list. This theme will be available during this holiday.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.5.1.3 Use Case-hidden theme is unavailable

Actors	User, ALCM Server, ALCMInterface Client, MC Server, MCInterfacer Client
Pre-conditions	Infotainment system is powered ON. ALCMInterface Client is active. MC Server is active. MC Interface Client is active. ALCM is powered on. ALCM Server is active.
Scenario Description	The holiday corresponding to the hidden theme has ended (New year, Christmas, Chinese New Year, etc.).
Post-conditions	A notification will activate in MCInterfacer Client. ALCMInterface Client update theme list. Update selected theme based on feedback status.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.5.1.4 Requirements

The client needs to pre-build the hidden theme into the theme list.

Define SPECIFIC DATE:



No	Holiday	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
No.1	New Year	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
No.2	Chinese New Year	2.1	1.29	2.17	2.6	1.26	2.13	2.3	1.23	2.11	1.31
No.3	Valentine's Day	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14
No.4	Women's Day	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
No.5	Labor's Day	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
No.6	Duan Wu Jie	6.1	5.31	6.19	6.9	5.28	6.16	6.5	6.24	6.12	6.1
No.7	Zhong Qiu Jie	9.17	10.6	9.25	9.15	10.3	9.22	9.12	10.1	9.19	9.8
No.8	China National Day	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
No.9	Christmas Eve	12.24	12.24	12.24	12.24	12.24	12.24	12.24	12.24	12.24	12.24

The SPECIFIC DATE can be updated by OTA.

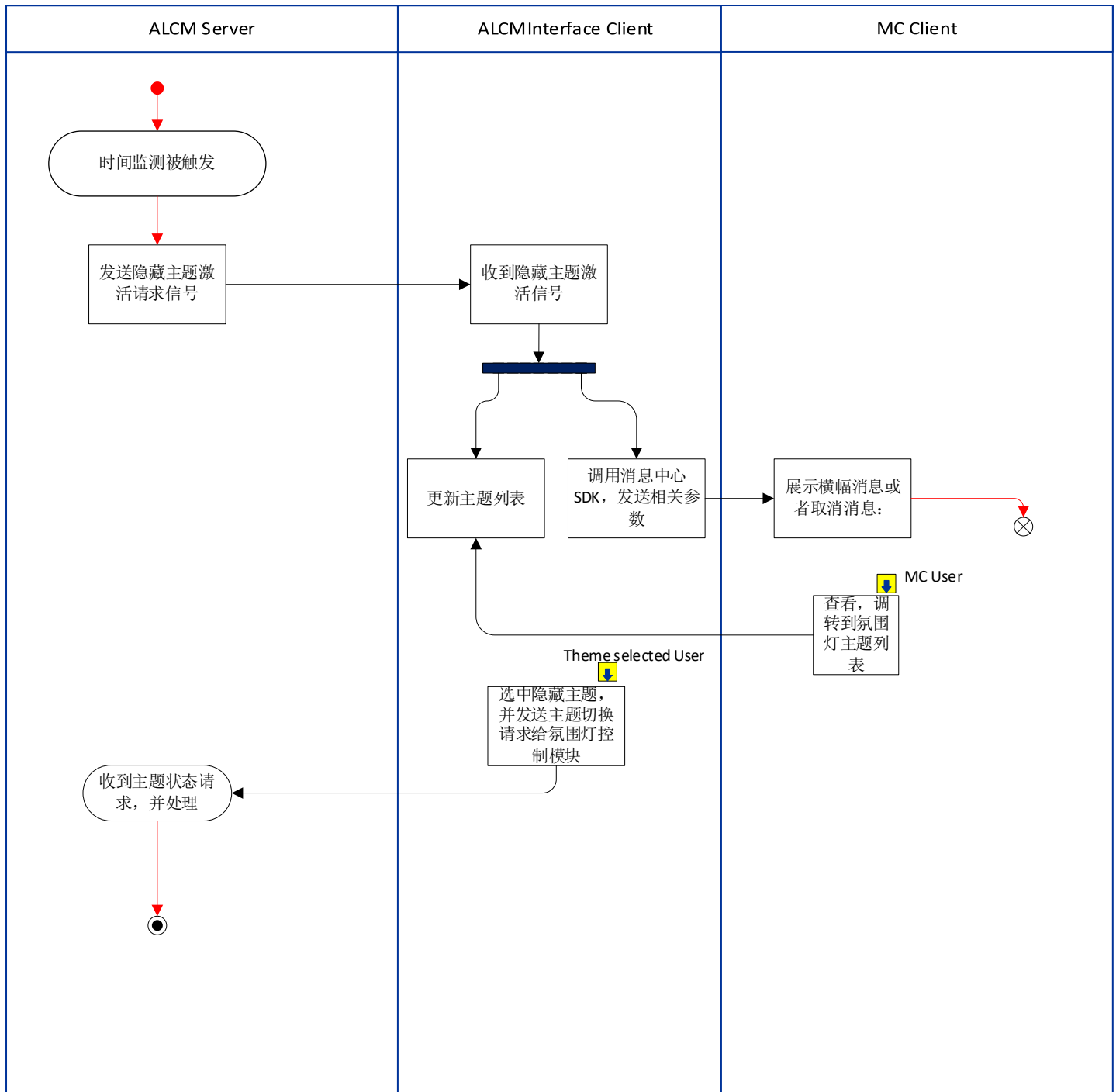
ALCM server will send hide theme active or inactive request, when the client received request, it should update theme list and activate/inactivate hidden theme 1 button or hidden theme 2 button, and recall Message Center SDK, has a notification to remainder user, details refer to Message Center SDK Spec.

When the hide theme is inactive, Client should receive command which theme should be selected from Server

When user view notification, the page will jump to ambient lighting theme list page, if EAL setting is off, it just jump ambient lighting client interface, and EAL setting is off.

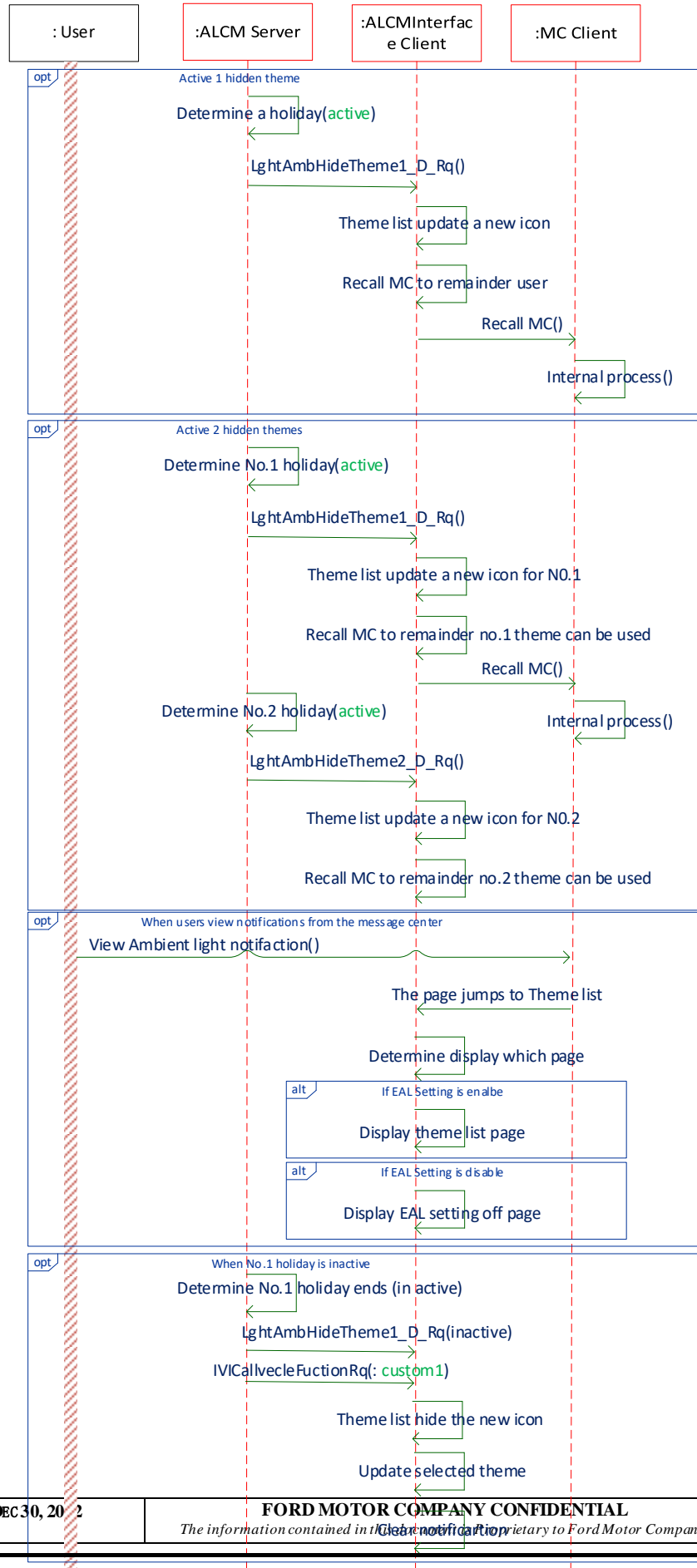


3.5.1.5 Activity Diagram





3.5.1.6 *Sequence Diagram*





3.6 EAL Function-VR control

VR feature will recall API server to request some settings, please refer to as below list. Setting logic as same as ALCMInterface Client HMI settings.



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1.xlsx

3.7 EAL Function-Relax mode

Relax mode feature will recall API server to request some ambient light theme, and when end relax mode, it also will restore ambient light status.



4 Appendix: Reference Documents

Reference #	Document Title
1	AmbientLightingF00063_CX821CX771_FD0803
2	AmbientLightingF00063_CX821CX771_FGS0803
3	AmbientLightingF00063_CX821CX771_FIS0803
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