Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Map Dome Lights

Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.0

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Version Date: August 19, 2021

FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
August 19, 2021	1.0	Initial Release	

Table of Contents

1 Architectural Design

1.1 Overview

The dome lights are interior lighting features which comprises of the lights located in Rear Dome (between first and second row, optional between second and third row). They are provided to light the cabin. The feature has multiple ways of input like Global On/Off, Door Defeat/Auto Mode.

The map lights are individual reading lights which are either part of front dome and rear dome or available on side roof panel. The user can access them by button press (Local On/Off, Global On/Off) on HMI and physical switch. They light up individual region so as not to disturb other people in vehicle.

This feature allows the user to control map lights and dome lights through HMI.

1.2 CLD-REQ-421124/A-MDL Client

MDL (Map Dome Lights) Client will take input from user to turn the map and dome lights On/Off via HMI and transmit it to MDL (Map Dome Lights) Server for implementation.

1.3 CLD-REQ-421125/A-MDL Server

MDL (Map Dome Lights) Server will take the commands from MDL (Map Dome Lights) Client and turn the map and dome lights On/Off as needed.

1.4 Physical Mapping of Classes

The table below shows how the logical classes that make up the Electro Mechanical Registers feature may be mapped into physical modules. This mapping example is specific to Electro Mechanical Registers architecture and does not necessarily carryover to other carlines or vehicle architectures.

Logical Class	Physical Module (ECU)
MDLClient	APIM PDC
MDLServer	HCM

1.5 Logical Signal Mapping

The CAN signals mentioned throughout this document shall refer to the CAN signal's logical name. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping.

Logical Name	CAN Signal Name
GlobalLights_Rq	OvrhdLamp_B_Rq
DoorDefeat_Rq	DrDefeatMde_B_Rq
LocalLamp_Fmid_Rq	OvrhdLampFmid_B_Rq
LocalLamp_R2Left_Rq	OvrhdLampR2Left_B_Rq
LocalLamp_R2Right_Rq	OvrhdLampR2Right_B_Rq
LocalLamp_R3Mid_Rq	OvrhdLampR3Mid_B_Rq
DoorDefeat_St	DrDefeatMde_B_Stat

1.6 IIR-REQ-421126/A-MDL Client _Tx

1.6.1 MD-REQ-422077/A-GlobalLights_Rq

Message Type: Request
This signal shall be sent by the MDLClient as request to the MDLServer to turn On/Off all map and dome lights

Name	Literals	Value	Description

GlobalLights_Rq	-	-	turn On/Off all map and dome lights
	Not Pressed	0x0	
	Pressed	0x1	

1.6.2 MD-REQ-422078/A-DoorDefeat_Rq

Message Type: Request
This signal shall be sent by the MDLClient as request to the MDLServer to Enable/Disable door defeat mode

Name	Literals	Value	Description
DoorDefeat_Rq	-	-	Enable/Disable door defeat mode
	Disabled	0x0	
	Enabled	0x1	

1.6.3 MD-REQ-427883/A-LocalLamp_Fmid_Rq

Message Type: Request
This signal shall be sent by the MDLClient as request to the MDLServer to turn On/Off Front Center local map/dome light.

Name	Literals	Value	Description
LocalLamp_Fmid_Rq	-	-	turn On/Off Front Center local map/dome light
	Not Pressed	0x0	
	Pressed	0x1	

1.6.4 MD-REQ-422081/A-LocalLamp_R2Left_Rq

Message Type: Request
This signal shall be sent by the MDLClient as request to the MDLServer to turn On/Off Second Row Left local map/dome light.

Name	Literals	Value	Description
LocalLamp_R2Left_Rq	-	-	turn On/Off Second Row Left local map/dome light
	Not Pressed	0x0	
	Pressed	0x1	

1.6.5 MD-REQ-422082/A-LocalLamp_R2Right_Rq

Message Type: Request
This signal shall be sent by the MDLClient as request to the MDLServer to turn On/Off Second Row Right local map/dome light.

Name	Literals	Value	Description
LocalLamp_R2Right_Rq	-	-	turn On/Off Second Row Right local map/dome light
	Not	0x0	
	Pressed	0x1	

1.6.6 MD-REQ-427886/A-LocalLamp_R3Mid_Rq

Message Type: Request
This signal shall be sent by the MDLClient as request to the MDLServer to turn On/Off Third Row local map/dome light.

Name	Literals	Value	Description
LocalLamp_R3Mid_Rq	-	-	turn On/Off Third Row Center local map/dome light
	Not	0x0	
	Pressed	0x1	

1.7 IIR-REQ-421129/A-MDL Client _Rx

1.7.1 MD-REQ-422085/A-DoorDefeat_St

Message Type: Status
This signal shall be sent by the MDLServer to the MDLClient as status of door defeat mode - Enabled/Disabled

Name	Literals	Value	Description
DoorDefeat_St	-	-	door defeat mode - Enabled/Disabled
	Disabled	0x0	
	Enabled	0x1	

2 General Requirements

2.1 REQ-422086/A-Feature Availability

MDLClient shall process this feature signals while Ignition = ACC/Run/Start.
When Ignition ≠ ACC/Run/Start MDLClient shall disable the display for map and dome lights on HMI and user cannot make any selection to control map and dome lights on HMI.

2.2 REQ-422087/A-Signals default after feature availability

When Ignition = ACC/Run/Start (On) and feature is available all the signals except DoorDefeat_Rq transmitted by MDLClient shall default to 0x0 (Not Pressed).
DoorDefeat_Rq signal value is as per the door defeat mode at the time of Ignition On.

2.3 REQ-422088/A-HMI requirements for feature

HMI display for this feature is available only when Ignition = ACC/Run/Start and HMI screen for Interior lightening is selected and active.
Further details of how to navigate to the screen, look/placement/accessing of buttons and timing requirements for button presses is covered in HMI specification document (X31q_Lighting).

Note: In case of discrepancy in the HMI requirements defined in this spec and HMI specification document the HMI specification document shall take precedence.

3 Functional Definition

3.1 MDL-FUN-REQ-421113/A-Global On/Off

3.1.1 Requirements

3.1.1.1 REQ-422089/A-Global On/Off signal state

MDLClient shall determine the signal GlobalLights_Rq based on the following logic for normal operation:
- Transmit state “Not Pressed” all the time if there was no valid click event.
- Transmit state “Pressed” as an impulse after a valid click event has been identified (Button Pressed).

3.1.1.2 REQ-422090/A-Global On/Off all lights

MDLClient shall allow user to turn On/Off all map and dome lights by pressing “All Lights” button on HMI.

When user presses “All Lights” button on the HMI, MDLClient shall send GlobalLights_Rq = 0x1 (Pressed) request to MDLServer.

MDLServer upon receiving this request shall turn all map and dome lights to On or Off.
MDLServer has the logic to decide if the individual lights (map and dome) must be turned On or Off when “All Lights” request is received.

MDLClient doesn’t display status for “All Lights” button press as it doesn’t receive feedback from MDLServer.

Note: During Courtesy or Welcome/Farewell On, all lights cannot be turned On/Off. Arbitration for this is done in MDLServer. MDLClient shall send signal status as Pressed for GlobalLights_Rq on HMI but MDLServer shall ignore the request.

3.1.2 Use Cases

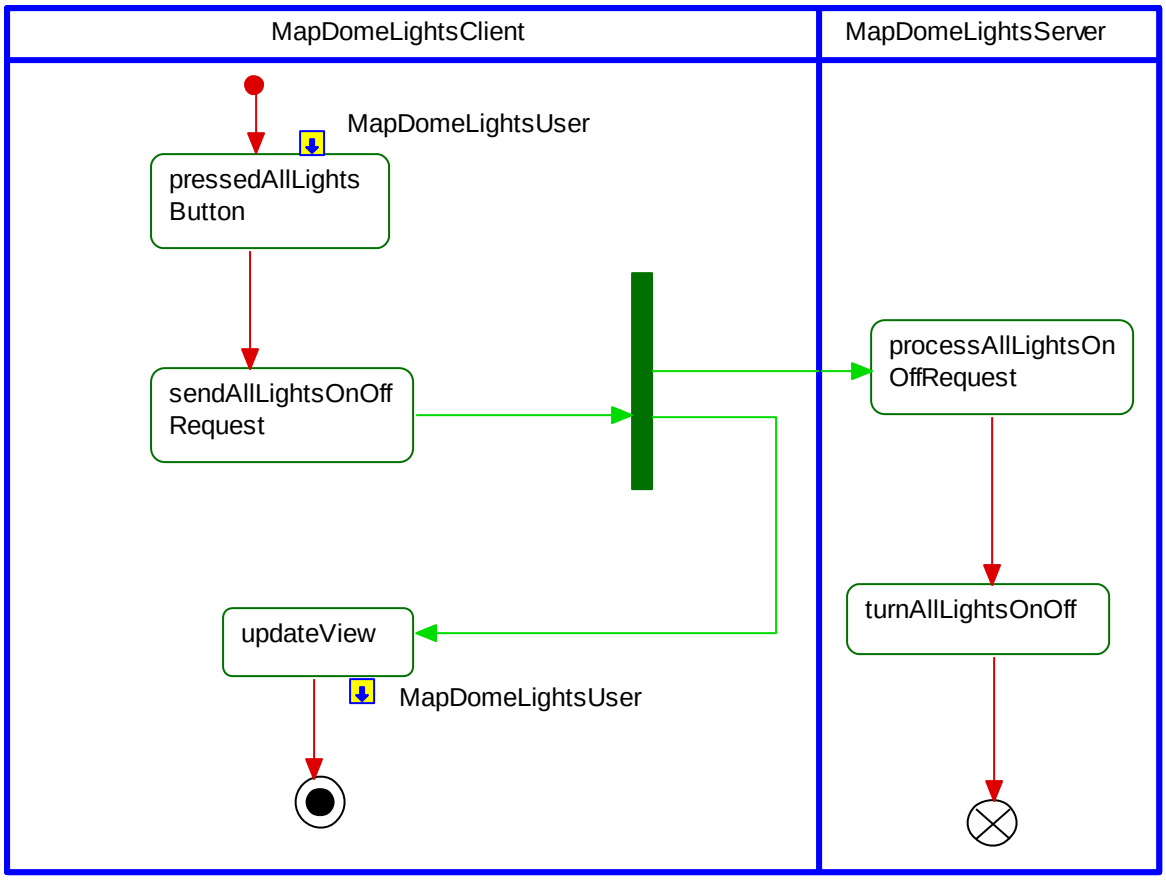
3.1.2.1 UC-REQ-422096/A-Global On/Off all lights

Actors	User, MDLClient
Pre-conditions	Infotainment system is powered ON. MDLClient is active. MDLClient screen is ON.
Scenario Description	User presses “All Lights” button on the HMI.
Post-conditions	All Map & Dome lights turn On or Off depending on logic in MDLServer.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.1.3 White Box Views

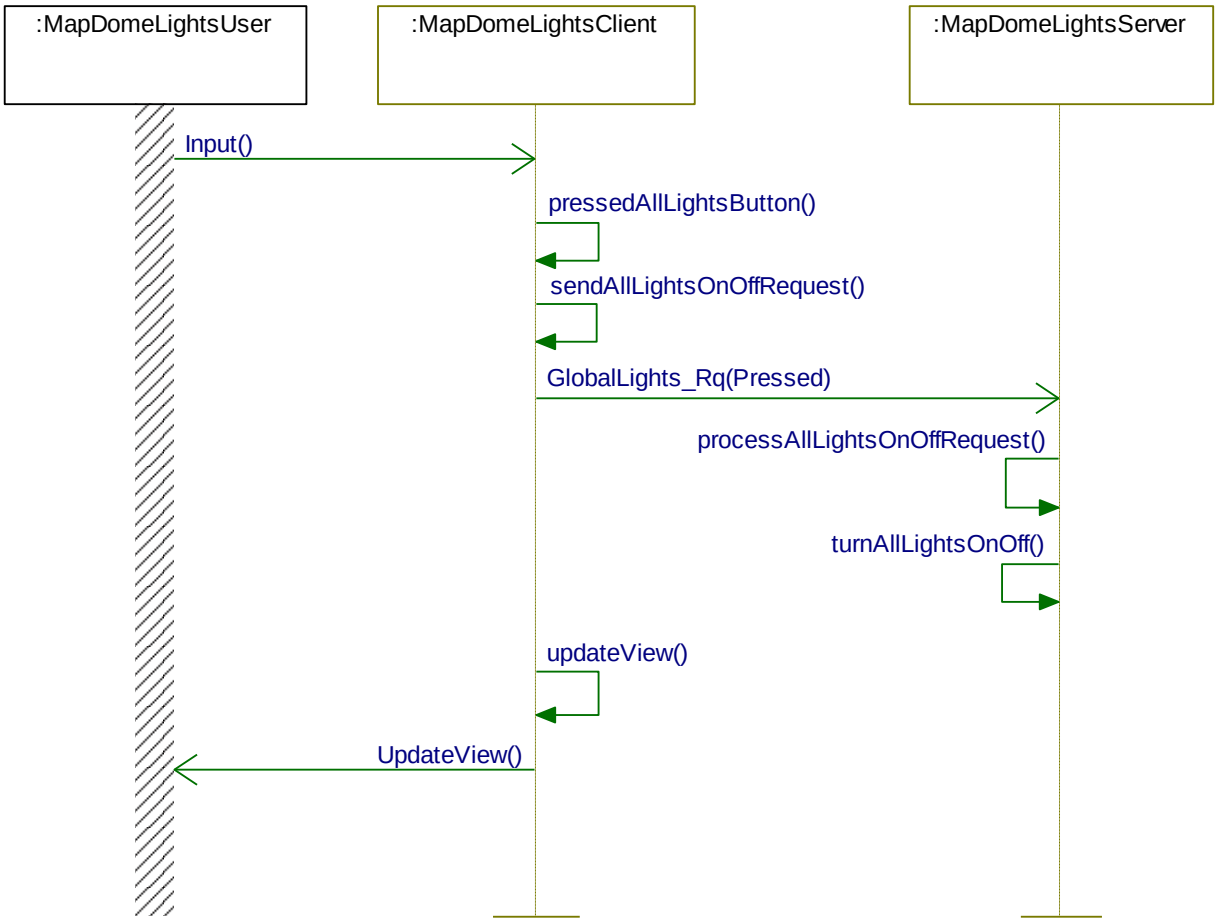
3.1.3.1 Activity Diagrams

3.1.3.1.1 MDL-ACT-REQ-422063/A-Global On/Off



3.1.3.2 Sequence Diagrams

3.1.3.2.1 MDL-SD-REQ-422067/A-Global On/Off



3.2 MDL-FUN-REQ-421118/A-Door Defeat

3.2.1 Requirements

3.2.1.1 REQ-422091/A-Door Defeat Mode Status while Ignition On

MDLServer would save the status of door defeat mode in its memory and shall update it whenever the mode is changed.

When Ignition = ACC/Run/Start (On) MDLServer shall send door defeat mode status to MDLClient in DoorDefeat_St signal.
MDLClient shall update DoorDefeat_Rq signal as per this status.

3.2.1.2 REQ-422092/A-Door Defeat Enable

Door defeat enable mode suppresses courtesy lamps and welcome/farewell lamps input.

MDLClient allows user to enable door defeat mode by pressing “Dome Defeat” button on HMI while door defeat is in disabled state.

When user presses “Dome Defeat” button on the HMI while mode in disabled status, MDLClient shall update and send DoorDefeat_Rq = 0x1 (Enable) request to MDLServer.
MDLServer upon receiving this request shall change door defeat mode to enabled and send DoorDefeat_St = 0x1 (Enable) to MDLClient.
MDLClient upon receiving the status shall update HMI to show door defeat is in enabled state.

3.2.1.3 REQ-422093/A-Door Defeat Disable

Door defeat disable mode allows courtesy lamps and welcome/farewell lamps input.

MDLClient allows user to disable door defeat mode by pressing “Dome Defeat” button on HMI while door defeat is in enabled state.

When user presses “Dome Defeat” button on the HMI while mode in enabled status, MDLClient shall update and send DoorDefeat_Rq = 0x0 (Disable) request to MDLServer.
MDLServer upon receiving this request shall change door defeat mode to disabled and send DoorDefeat_St = 0x0 (Disable) to MDLClient.
MDLClient upon receiving the status shall update HMI to show door defeat is in disabled state.

3.2.2 Use Cases

3.2.2.1 UC-REQ-422097/A-Door Defeat Enable

Actors	User, MDLClient
Pre-conditions	Infotainment system is powered ON. MDLClient is active. MDLClient screen is ON. Door Defeat mode is Disabled.
Scenario Description	User presses “Dome Defeat” button on the HMI.
Post-conditions	Door Defeat mode is Enabled. HMI Shall display updated status.
List of Exception Use Cases	
Interfaces	HMI, CAN

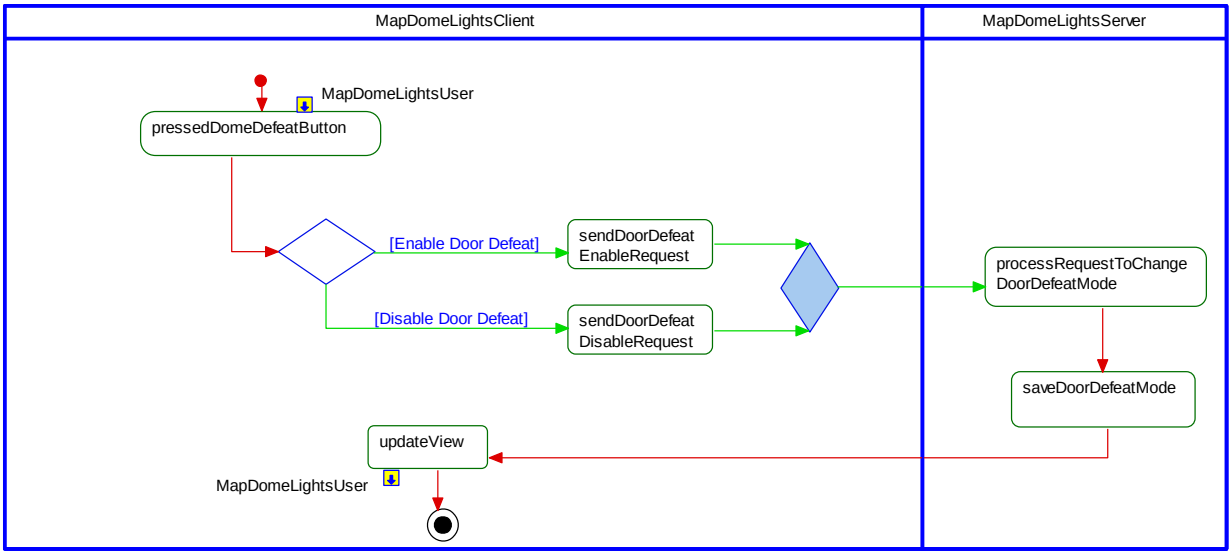
3.2.2.2 UC-REQ-422098/A-Door Defeat Disable

Actors	User, MDLClient
Pre-conditions	Infotainment system is powered ON. MDLClient is active. MDLClient screen is ON. Door Defeat mode is Enabled.
Scenario Description	User presses “Dome Defeat” button on the HMI.
Post-conditions	Door Defeat mode is Disabled. HMI Shall display updated status.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.2.3 White Box Views

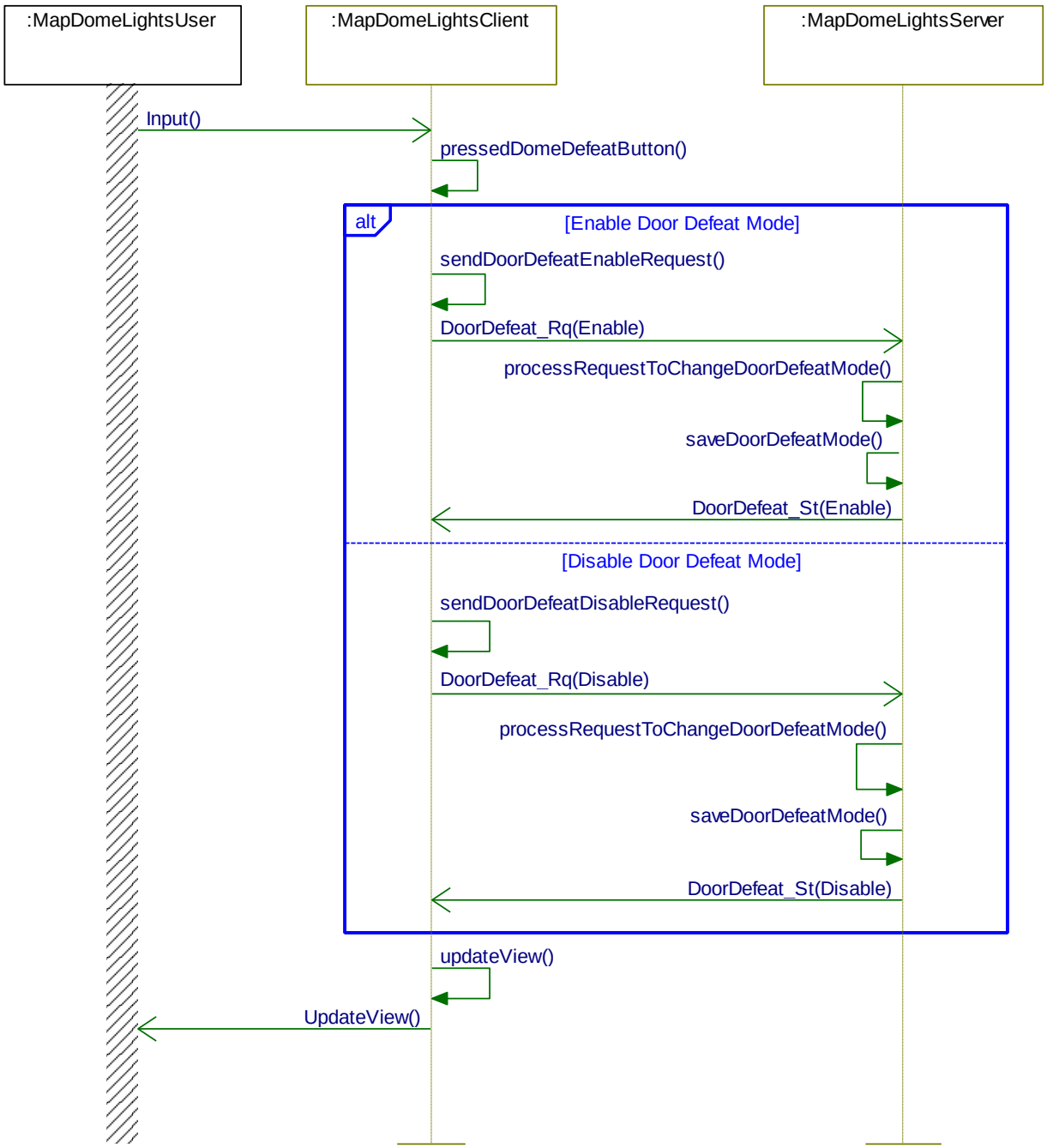
3.2.3.1 Activity Diagrams

3.2.3.1.1 MDL-ACT-REQ-421112/A-Door Defeat



3.2.3.2 Sequence Diagrams

3.2.3.2.1 MDL-SD-REQ-421117/A-Door Defeat



3.3 MDL-FUN-REQ-422069/A-Local Map/Dome Lights

3.3.1 Requirements

3.3.1.1 <u>REQ-422094/A-Map/Dome Light signal state</u>

MDLClient shall determine the individual local map/dome lights signal value based on the following logic for normal operation:

- Transmit state “Not Pressed” all the time if there was no valid click event for the button associated to that individual map/dome light signal.

- Transmit state “Pressed” as an impulse after a valid click event has been identified (Button Pressed) for the button associated to that individual map/dome light signal.

3.3.1.2 REQ-422095/A-Individual Map/Dome Light On/Off

MDLClient shall allow user to turn On/Off individual map/dome light (reading light) by pressing “Map Light” or “Dome Light” button on HMI associated to that individual map/dome light.

When user presses “Map Light” or “Dome Light” button on the HMI, MDLClient shall send request to MDLServer depending on the light selected as follows:

LocalLamp_Fmid_Rq = 0x1 (Pressed) if user presses Front Center Map/Dome Light button
Or
LocalLamp_R2Left_Rq = 0x1 (Pressed) if user presses 2nd Row Left Map/Dome Light button
Or
LocalLamp_R2Right_Rq = 0x1 (Pressed) if user presses 2nd Row Right Map/Dome Light button
Or
LocalLamp_R3Mid_Rq = 0x1 (Pressed) if user presses 3rd Row Center Map/Dome Light button

MDLServer upon receiving this request shall turn that individual map/dome light to On or Off.

MDLServer has the logic to decide if the individual lights (map and dome) must be turned On or Off when button pressed.

MDLClient doesn’t display status for individual “Map Light” button press as it doesn’t receive feedback from MDLServer.

Note: During Courtesy On or Global ON, individual lights cannot be turned OFF. Arbitration for this is done in MDLServer. MDLClient shall send signal status as Pressed for the individual light operated on HMI but MDLServer shall ignore the request.

3.3.2 Use Cases

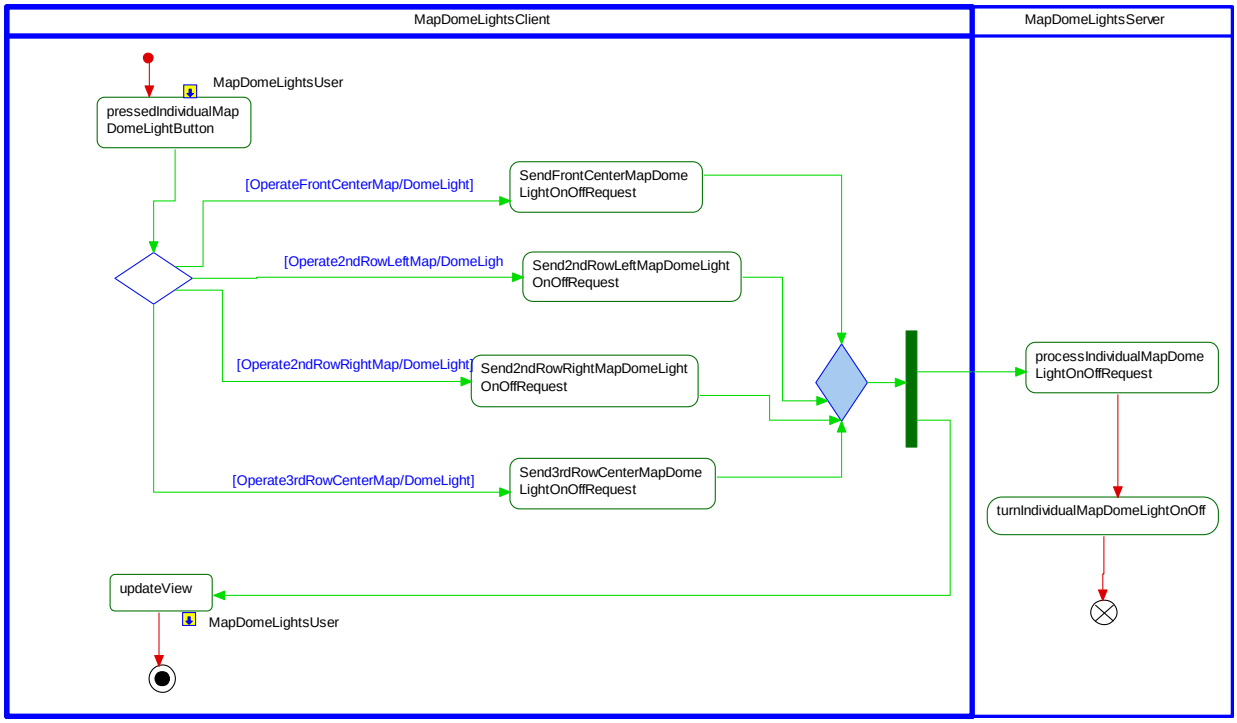
3.3.2.1 UC-REQ-422099/A-Individual Map/Dome Light On/Off

Actors	User, MDLClient
Pre-conditions	Infotainment system is powered ON. MDLClient is active. MDLClient screen is ON.
Scenario Description	User presses individual “Map Light” or “Dome Light” button on the HMI.
Post-conditions	Individual map/dome light associated to the button pressed is turned On or Off depending on logic in MDLServer.
List of Exception Use Cases	
Interfaces	HMI, CAN

3.3.3 White Box Views

3.3.3.1 Activity Diagrams

3.3.3.1.1 MDL-ACT-REQ-422065/A-Local Map/Dome Light



3.3.3.2 Sequence Diagrams

3.3.3.2.1 MDL-SD-REQ-422068/A-Local Map/Dome Light

4 Appendix: Reference Documents

Reference #	Document Title
1	
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