Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Selectable Drive Mode

Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.5

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
December 18, 2018	**1.0**	**Initial Release**	
July 17, 2019	**1.1**		
	MD-REQ-333094/B-SdmPostXSt		tmertiri: typo fixing
	SDM-REQ-334800/B-Soft Key Availability While SDM Faulty		tmertiri: updated wording to confirm to updated behaviour
	SDM-REQ-334801/B-SDM Selection Page		tmertiri: updated wording to confirm to correct intended feature behaviour
August 21, 2019	**1.2**		
	MD-REQ-333093/B-SdmPosX		tmertiri: clarification added
	MD-REQ-333094/B-SdmPostXSt+		tmertiri: typo fixing
	MD-REQ-333094/C-SdmPostXSt		tmertiri: clarification added
	MD-REQ-334807/B-LDisFalFbmp		tmertiri:update content with new content from feature owner
	597838/B-General Requirements		tmertiri: structure change. New req added
	SDM-REQ-361035/A-No Faulty Display		tmertiri: new req to comply with FBMP changes
	SDM-REQ-361027/A-Display Status Update		tmertiri: new req to comply with FBMP changes
	SDM-REQ-334800/B-Soft Key Availability While SDM Faulty+		tmertiri: updated wording to confirm to updated behaviour
	SDM-REQ-334800/C-Soft Key Availability While SDM Faulty		tmertiri: added content for req 334801 to make this req more inline with HMI specs
	SDM-REQ-334801/B-SDM Selection Page+		tmertiri: updated wording to confirm to correct intended feature behaviour
	SDM-REQ-334801/C-SDM Selection Page		tmertiri: removed content to make it more inline to HMI spec. Removed content was put in 334800
	SDM-REQ-335109/B-Text Display		tmertiri: update signal names
June 2, 2020	**1.3**		
	597837/B-Logical Signal Mapping		tmertiri: added LMyKey signal
	SDM-IIR-REQ-333081/B-SDMClient_Rx		tmertiri: added LMyKey signal
	MD-REQ-333093/C-SdmPosX		tmertiri: change definition. Read about value 0x1F
	MD-REQ-333094/D-SdmPostXSt		tmertiri: update definition to better describe new operation with mykey signal
	MD-REQ-333095/B-LSdmMsg		tmertiri:update signal parameters
	MD-REQ-388951/A-LMyKey		tmertiri: new signal
	597838/C-General Requirements		tmertiri: add new requirements
	SDM-REQ-334908/B-Client Faulty		tmertiri: update DTCs
	SDM-REQ-361027/B-Display Status Update		tmertiri: change timing of the disaply status update
	SDM-REQ-337301/B-Error Counter		tmertiri:add signal for which error counter is not to change
	SDM-REQ-388955/A-SDM Display Restrictions		tmertiri: new req
	SDM-REQ-388968/A-Lin Button		tmertiri: new req
	SDM-ACT-REQ-334813/B-SDM Activity Diagram		tmertiri:update diagram with mykey info
	SDM-SD-REQ-334815/B-SDM Operation SD		tmertiri:add lmykey to seq diagram
	597840/B-Appendix: Reference Documents		tmertiri: added Lin reference
August 17, 2020	**1.4**		
	597835/B-Architectural Design		tmertiri: new CLD and new signals in mapping table
	SDM-CLD-REQ-394185/A-SDM Client 2		tmertiri: new class added
	597837/C-Logical Signal Mapping		tmertiri: new signals for shortcut keys
	SDM-IIR-REQ-333081/C-SDMClient_Rx		tmertiri: added new signals for shortcut keys
	MD-REQ-333093/D-SdmPosX		tmertiri: add new engnineering name
	MD-REQ-333094/E-SdmPostXSt		tmertiri: update definition. Remove MyKey content.
	MD-REQ-333095/C-LSdmMsg		tmertiri: add additional Variant A for 0x5. Variant A is defined by configuration value.
	MD-REQ-394187/A-LDis		tmertiri: New method
	SDM-REQ-388955/B-SDM Display Restrictions		tmertiri: adding Variant A configuration
	597839/B-Functional Definition		tmertiri: add Shortcut key function
	SDM-FUN-REQ-394194/A-SDM Shortcut		tmertiri: New section
	780546/A-Shorcut Key Overview		tmertiri: New section
	780422/A-Requirements		tmertiri: New section
	SDM-REQ-394233/A-HMI Display		tmertiri: New section
	SDM-REQ-394232/A-SDM Mode Change		tmertiri: New section

	780423/A-Use Cases	tmertiri: New section
	SDM-UC-REQ-394190/A-Shortcut Key Menu SDM Display Activation	tmertiri: New section
	SDM-UC-REQ-394191/A-Shortcut Key Menu SDM Display Deactivation	tmertiri: New section
	SDM-UC-REQ-394192/A-SDM Sport Mode Activation	tmertiri: New section
	SDM-UC-REQ-394193/A-SDM Sport Mode Deactivation	tmertiri: New section
	780424/A-White Box Views	tmertiri: New section
	782217/A-Actvity Diagrams	tmertiri: New section
	SDM-REQ-394197/A-Shortcut Key Drive Mode Change	tmertiri: New section
	SDM-REQ-394195/A-Shortcut Key Operation	tmertiri: New section
	780426/A-Sequence Diagrams	tmertiri: New section
	SDM-REQ-394196/A-Shortcut Key Operations	tmertiri: New section
September 23, 2021	**1.5**	
	597837/D-Logical Signal Mapping	tmertiri: new signals LDis2 and LDisAval
	SDM-IIR-REQ-333081/D-SDMClient_Rx	tmertiri: Added new signal, LDis2
	MD-REQ-420930/A-LDis2	tmertiri: new method
	MD-REQ-442457/A-LDis3	tmertiri:new method
	SDM-IIR-REQ-333080/B-SDMClient_TX	tmertiri: added new signal LDisAval
	MD-REQ-420929/A-LDisAval	tmertiri: new method
	597838/D-General Requirements	tmertiri: new req for Display availability
	REQ-420935/A-Display Availability	tmertiri: new req
	597839/C-Functional Definition	tmertiri:added FBMP function
	SDM-FUN-REQ-444157/A-SDM FBMP	tmertiri:reorg due to new signal adding Faulty communication
	960570/A-FBMP Overview	tmertiri: new overview for this new function
	SDM-REQ-337301/C-Error Counter	tmertiri: reword error counter to remove ambiguity for ignition start
	780422/B-Requirements	tmertiri: new req for LDis2
	REQ-420936/A-Additional Shortcut Key	tmertiri: new req

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1 Overview

Selectable Drive Mode allows the user to change the driving mode as Normal or Sport as they wish. Other modes could be available, depending on vehicle type and options.

2 Architectural Design

2.1 SDM-CLD-REQ-333082/A-SDM Client

Selectable Drive Mode Client provides the user with opportunity to request DM changes and various information from the server.

2.2 SDM-CLD-REQ-333083/A-SDM Server

Selectable Drive Mode Server take user's input for any particular drive mode request and does the necessary work to enable that particular drive state. Also, it can control the order of the drive modes being displayed in HMI screen.

2.3 SDM-CLD-REQ-394185/A-SDM Client 2

In some programs the feature gives the users the ability to interface with the feature through hard buttons functioning as shortcut keys. Client 2 is the module that sends user requests to Client to follow up with the requests. Further details are provided in Shortcuts Function.

2.4 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. The InfoCAN database file is the master file for the actual CAN signal names. Note: There may be cases where the actual CAN signal name is used in this documentation.

Client	Can Signal Logical Name	Can Signal Real Physical name
Rx	LActDMSt	ActvDrvMde_D2_Stat
Rx	LSDM	SelDrvMde_D2_Rq
Rx	LSDMSt	SelDrvMde_D_Stat
Rx	SdmPosX	SelDrvMdePos01_D_Stat
Rx	SdmPosX	SelDrvMdePos02_D_Stat
Rx	SdmPosX	SelDrvMdePos03_D_Stat
Rx	SdmPosX	SelDrvMdePos04_D_Stat
Rx	SdmPosX	SelDrvMdePos05_D_Stat
Rx	SdmPosX	SelDrvMdePos06_D_Stat
Rx	SdmPosX	SelDrvMdePos07_D_Stat
Rx	SdmPosX	SelDrvMdePos08_D_Stat
Rx	SdmPosX	SelDrvMdePos09_D_Stat
Rx	SdmPosX	SelDrvMdePos10_D_Stat
Rx	SdmPosX	SelDrvMdePos11_D_Stat
Rx	SdmPosX	SelDrvMdePos12_D_Stat
Rx	SdmPostXSt	SelDrvMdePos01_B_Avail
Rx	SdmPostXSt	SelDrvMdePos02_B_Avail
Rx	SdmPostXSt	SelDrvMdePos03_B_Avail
Rx	SdmPostXSt	SelDrvMdePos04_B_Avail
Rx	SdmPostXSt	SelDrvMdePos05_B_Avail
Rx	SdmPostXSt	SelDrvMdePos06_B_Avail
Rx	SdmPostXSt	SelDrvMdePos07_B_Avail
Rx	SdmPostXSt	SelDrvMdePos08_B_Avail
Rx	SdmPostXSt	SelDrvMdePos09_B_Avail
Rx	SdmPostXSt	SelDrvMdePos10_B_Avail
Rx	SdmPostXSt	SelDrvMdePos11_B_Avail
Rx	SdmPostXSt	SelDrvMdePos12_B_Avail
Rx	LSdmMsg	SelDrvMdeMsgTxt2_D_Rq

Rx	LMyKey	IgnKeyType_D_Actl
Rx	LDis	SelDrvMdeSwtch_D_Stat4
Rx	LDis2	SelDrvMdeSwtch_D_Stat2
Rx	LDis3	SelDrvMdeSwtch_D_Stat7
Tx	LSdmRqDis	SelDrvMde_D_RqDrv
Tx	LSDmStDis	SelDrvMdePage_B_Stat
Tx	SdmMsgReset	SelDrvMdeTxtRst_B_Rq2
Tx	SdmCnfMsg	SelDrvMdeCnfm_D_Stat2
Tx	LDisAval	SelDrvMdeDsply_B_Avai2
Tx	LDisFalFbmp	

LIN Signal:

Logical Input ID	Input Switch Name	Lin Encoding
ID_99	Drive Modes	0x77 ICPBtnID_DrvModes

2.5 SDM-IIR-REQ-333081/D-SDMClient_Rx

2.5.1 MD-REQ-333090/A-LActDMSt

LActDMSt
This signal is sent by the server to the client to indicate the current state of the Selectable Driver Mode.

State	Encoding
0x0	SelDrvMde01
0x1	SelDrvMde02
0x2	SelDrvMde03
0x3	SelDrvMde04
0x4	SelDrvMde05
0x5	SelDrvMde06
0x6	SelDrvMde07
0x7	SelDrvMde08
0x8	SelDrvMde09
0x9	SelDrvMde10
0xA	SelDrvMde11
0xB	SelDrvMde12
0xC	SelDrvMde13
0xD	SelDrvMde14
0xE	SelDrvMde15
0xF	SelDrvMde16
0x10	SelDrvMde17
0x11	SelDrvMde18
0x12	SelDrvMde19
0x13	SelDrvMde20
0x14	SelDrvMde21
0x15	SelDrvMde22
0x16	SelDrvMde23
0x17	SelDrvMde24
0x18	SelDrvMde25

0x19	SelDrvMde26
0x1A	SelDrvMde27
0x1B	SelDrvMde28
0x1C	SelDrvMde29
0x1D	SelDrvMde30
0x1E	SelDrvMde31
0x1F	Faulty

A state of Faulty (0x1F) could be sent by the server at startup.

2.5.2 MD-REQ-333091/A-LSDM

LSDM: This signal indicates the users selection for the new SDM option.
This feature provides user's input in externally of the client. This is what this signal represents. The user's choice (entered externally of client input system) for SDM state change. Refer to HMI specs on what Client may need to do upon RX this signal

Signal Parameter State	Encoding
0x0	SelDrvMde01
0x1	SelDrvMde02
0x2	SelDrvMde03
0x3	SelDrvMde04
0x4	SelDrvMde05
0x5	SelDrvMde06
0x6	SelDrvMde07
0x7	SelDrvMde08
0x8	SelDrvMde09
0x9	SelDrvMde10
0xA	SelDrvMde11
0xB	SelDrvMde12
0xC	SelDrvMde13
0xD	SelDrvMde14
0xE	SelDrvMde15
0xF	SelDrvMde16
0x10	SelDrvMde17
0x11	SelDrvMde18
0x12	SelDrvMde19
0x13	SelDrvMde20
0x14	SelDrvMde21
0x15	SelDrvMde22
0x16	SelDrvMde23
0x17	SelDrvMde24
0x18	SelDrvMde25
0x19	SelDrvMde26
0x1A	SelDrvMde27
0x1B	SelDrvMde28
0x1C	SelDrvMde29
0x1D	SelDrvMde30
0x1E	SelDrvMde31
0x1F	Not Used

2.5.3 MD-REQ-333092/A-LSDMSt

LSDMSt: This signal is sent by the server to the client to indicate the current state of the selected mode request.

Signal Parameters	Parameter Description
0x0	No Drive Mode Change Request
0x1	Drive Mode Change Selection
0x2	Drive Mode Change Request
0x3	Not used

2.5.4 MD-REQ-333093/D-SdmPosX

SdmPosX : This logical name signal represents a set of physical name signals. The real can signals are “locked” to particular position in HMI screen. Each of this signals’ parameters, provides the whole list of available drive modes. So by having this position signals, the server has control on the order of how to show in HMI the order of selectable drive modes.

If this signal has a value of 0x1F, the Client should not display anything.

This signal represents the 12 physical signals. For purpose of clarity in diagrams, those physical signals have only one logical name.

State	Encoding	Engineering Names
0x0	SelDrvMde01	Normal Mode
0x1	SelDrvMde02	Sport Mode
0x2	SelDrvMde03	Comfort Mode
0x3	SelDrvMde04	Economy Mode
0x4	SelDrvMde05	Economy Comfort Mode
0x5	SelDrvMde06	Low Mu Mode
0x6	SelDrvMde07	Tow Haul Mode
0x7	SelDrvMde08	Mud/Rut Mode
0x8	SelDrvMde09	Sand Mode
0x9	SelDrvMde10	Rock Crawl Mode
0xA	SelDrvMde11	Normal 2H Mode
0xB	SelDrvMde12	Normal 4A Mode
0xC	SelDrvMde13	Normal 4L Mode
0xD	SelDrvMde14	Rough Road Mode
0xE	SelDrvMde15	Track Mode
0xF	SelDrvMde16	EV Now Mode
0x10	SelDrvMde17	EV Later/Charge Mode
0x11	SelDrvMde18	Baja Mode
0x12	SelDrvMde19	Drag Mode
0x13	SelDrvMde20	Custom Mode
0x14	SelDrvMde21	Snow/Sand Assist
0x15	SelDrvMde22	Off Road
0x16	SelDrvMde23	Not Used
0x17	SelDrvMde24	Not Used
0x18	SelDrvMde25	Not Used
0x19	SelDrvMde26	Not Used
0x1A	SelDrvMde27	Not Used

0x1B	SelDrvMde28	Not Used
0x1C	SelDrvMde29	Not Used
0x1D	SelDrvMde30	Not Used
0x1E	SelDrvMde31	Not Used
0x1F	Faulty	Faulty (Default Drive Mode)

2.5.5 MD-REQ-333094/E-SdmPostXSt

SdmPostXSt: This signal represents a set of physical signals. This signal control the display state of SdmPosX signals. The client is able to control in HMI various states of drive mode display, such as not display the drive mode at all, gray out (disabled) or enabled. For visual affects refer to HMI documentation.

This signal represents the 12 physical signals. For purpose of clarity in diagrams, those physical signals have only one logical name.

Signal parameter	Parameter Description
0x0	Not Available
0x1	Available

2.5.6 MD-REQ-333095/C-LSdmMsg

LSdmMsg : This signal provides drive mode status information that should be presented to the driver.

Original :

State	Encoding	Description
0x0	No Message	No Message
0x1	Message 1	Selection pop-up window (W3540)
0x2	Message 2	SDM not available (W3541)
0x3	Message 3	SDM reduced (W3542)
0x4	Message 4	SDM preconditions not met (W3543)
0x5	Message 5	EV Mode Not Available (W3544)
0x6	Message 6	Change To Normal for best towing (W3633)
0x7	Message 7	Return to X mode (W4146 / W4147)
0x8	Message 8	Not used
0x9	Message 9	Not used
0xA	Message 10	Not used
0xB	Message 11	Not used
0xC	Message 12	Not used
0xD	Message 13	Not used
0xE	Message 14	Not used
0xF	Message 15	Not used

Variant A:

0x5	Message 5	Selected Drive Mode Not Available to Maintain System Performance (W4378)

About Variant A:

This is another way to do something such as display a text or specific client behavior. **Variant A** is linked to specific car models, so a Configuration value determines if **Variant A** or **Original** is to be operated.

2.5.7 MD-REQ-388951/A-LMyKey

LMyKey: This signal indicates the key in ignition cycle.

Encoding Meaning	Signal Encoding
Key_Read_In_Progress	0x0
Key_In_Ign_Standard_Key	0x1
Key_In_Ign_My_Key	0x2
Key_Not_Prgrm_Read_Failure	0x3
Unknown	0xE
Invalid	0xF

2.5.8 MD-REQ-394187/A-LDis

LDis: This signal is sent form SDM client 2 to the client to indicate particular user requests. Refer to shortcut function for further details. The signal states are like below.

State	Encoding	Description
0x0	Not pressed	None button pressed
0x1	Switch State 1	SDM Button pressed
0x2	Switch State 2	Sport Button pressed
0x3	Faulty	Error detected

2.5.9 MD-REQ-420930/A-LDis2

LDis2: This signal is sent form SDM client 2 to the client to indicate particular user requests. Refer to shortcut function for further details. The signal states are like below.

State	Encoding	Description
0x0	Not pressed	None button pressed
0x1	Switch State 1	SDM Button pressed
0x2	Switch State 2	Sport Button pressed
0x3	Faulty	Error detected

2.5.10 MD-REQ-442457/A-LDis3

LDis3: This signal is sent form SDM client 2 to the client to indicate particular user requests. Refer to shortcut function for further details. The signal states are like below.

State	Encoding	Description
0x0	Not pressed	None button pressed
0x1	Switch State 1	SDM Button pressed
0x2	Switch State 2	Sport Button pressed
0x3	Faulty	Error detected

2.6 SDM-IIR-REQ-333080/B-SDMClient_TX

2.6.1 MD-REQ-333097/A-SdmMsgReset

SdmMsgReset: This signal is sent by the client to the server to to tell the server that the message has been cleared due to another higher priority message or the user cleared it manually.

Signal Parameter	Signal Description
0x0	No
0x1	Yes

2.6.2 MD-REQ-333098/A-SdmCnfMsg

SdmCnfMsg: This signal provides the confirmation status of the message on the client side for the message sent by the server.

State	**Encoding**	**Engineering Names**
0x0	Null	No SDM pop-ups shown or user does not confirmed the SDM warning
0x1	NotAccepted	SDM warning has been exited/cancelled.
0x2	Accepted	SDM warning has been confirmed and accepted.
0x3	NotUsed_1	Not used

2.6.3 MD-REQ-334802/A-LSdmRqDis

LSdmRqDis: This signal provides the requested selectable drive mode as selected by the user through the Client HMI interface.

State	Encoding
0x0	SelDrvMde01
0x1	SelDrvMde02
0x2	SelDrvMde03
0x3	SelDrvMde04
0x4	SelDrvMde05
0x5	SelDrvMde06
0x6	SelDrvMde07
0x7	SelDrvMde08
0x8	SelDrvMde09
0x9	SelDrvMde10
0xA	SelDrvMde11
0xB	SelDrvMde12
0xC	SelDrvMde13
0xD	SelDrvMde14
0xE	SelDrvMde15
0xF	SelDrvMde16
0x10	SelDrvMde17
0x11	SelDrvMde18
0x12	SelDrvMde19
0x13	SelDrvMde20
0x14	SelDrvMde21
0x15	SelDrvMde22
0x16	SelDrvMde23
0x17	SelDrvMde24
0x18	SelDrvMde25
0x19	SelDrvMde26
0x1A	SelDrvMde27
0x1B	SelDrvMde28
0x1C	SelDrvMde29
0x1D	SelDrvMde30
0x1E	SelDrvMde31
0x1F	Faulty

2.6.4 MD-REQ-334803/A-LSdmStDis

LSdmStDis: This signal is sent from the client to the server to indicate the current screen state of the Client HMI.

State	Encoding	Description
0x0	Inactive	SDM Selection page not shown
0x1	Active	SDM Selection page shown

Whenever Client HMI is in SDM feature, the signal value is Active.

2.6.5 MD-REQ-334807/B-LDisFalFbmp

LDisFalFbmp : This signal is sent by the client to the server to indicate display status or any potential fault with the feature on the client side, such as HMI interface not working or other possible fault states.

This signal uses Feature Based Messaging Protocol. Feature ID 0x0030.
Set values are:

Value	Description
0x0	Not Used
0x1	No Display Fault
0x2	Display Faulted
0x3	SDM Failure

Refer to FBMP SPSS for Feature Based Messaging Protocol operational details. Req 361027 takes precedence over any FBMP SPSS content.

2.6.6 MD-REQ-420929/A-LDisAval

LDisAval: This signal is sent from client. It indicates the client states.

Signal Parameter	Parameter Description
0x0	Not Available
0x1	Available

3 General Requirements

3.1 SDM-REQ-334799/A-SDM Soft Key Availability

The Drive Mode Switch soft key shall be greyed out as long as the Ignition Status is different from Run or Start.

3.2 SDM-REQ-334800/C-Soft Key Availability While SDM Faulty

The SDM soft key switch shall be available (not depending on the state of the feature faulty or not) however, the selectable drive modes should be grayed out when Server is faulty. If user selects any of the drive modes, even when they are grayed out, the client shall send the proper mode request change to the server.

3.3 SDM-REQ-334801/C-SDM Selection Page

When the Drive Mode Switch soft key is selected, the Client HMI shall display the SDM selection screen.
As long as SDM selection page is shown, Client shall set the signal LSdmStDis equal to Active.
The Client shall close the SDM selection page and set the LSdmStDis CAN signal equal to Inactive when another page is selected by the user.

3.4 SDM-REQ-335109/B-Text Display

There are multiple actions that the client should do, when LSdmMsg with a value of non 0x0 is delivered to the client.

The text popup is to be displayed for as long as LSdmMsg has a value different from 0x0. When LSdmMsg is again set to 0x0, the popup should be removed.

These two Client Tx signals, are linked to LSdmMsg parameters;
SdmMsgReset
SdmCnfMsg

When LSdmMsg has the values 0x2, 0x3,0x4, 0x5 or 0x6 , the values of the two Client TX signals should be like below:

SdmMsgReset send a 0x0 (No) whenever the warning is displayed.
SdmCnfMsg is sent with a value of 0x0 (Null) .

When user clicks on the popup,
SdmMsgReset sends 0x1 (Yes)
SdmCnfMsg is sent with a value of 0x0 (Null)

When LSdmMsg has the value 0x7 , the values of the two Client TX signals should be like below:

SdmMsgReset send a 0x0 (No) whenever the warning is displayed.
SdmCngMsg is sent with a value of 0x1 or 0x2 , depending on user’s response.

3.5 SDM-REQ-335110/A-Change Mode Rq Server Replies

When a user requests a SDM change, they expect the mode to change. There may be cases where the mode may not change.

In cases where a user SDM change was done, but the state of SDM is the same, then the Client shall keep track of this server inaction in an error variable.

In cases where a user SDM change was done, but the state of SDM changes, however it is not the SDM that the user requested, then the Client shall consider this operation as successful behavior of server and no error is to be recorded.

3.6 SDM-REQ-336981/A-Remembering Modes And Positions

The client should remember available drive modes and their respective positions in HMI screen through an ignition cycle.

Background info: The drive modes are transmitted at large period of times (100 sec) from the server. The first time the signal is sent, it could be missed by the client. To not keep the feature screen blank until the next signal data, the client should remember the states before ignition cycle and repopulate the feature HMI screen with previous ignition cycle content.

3.7 SDM-REQ-336983/A-Requesting Drive Mode Change

The signal that request drive mode is LSdmRqDis. The value of this signal should be all the time 0x1F, unless the user requests a mode change, in which case, it should be the proper hex value. Once the proper change request has been sent to the bus once, the value should go back to 0x1F.

3.8 SDM-REQ-388955/B-SDM Display Restrictions

Original :
When SdmPostXSt is Unavailable, the modes indicated by SdmPosX should not be displayed to the user.

Variant A :
When LMyKey = 0x2 and any drive modes for which SdmPostXSt is Unavailable, the modes indicated by SdmPosX should not be displayed to the user.

When LMyKey != 0x2 and any drive modes for which SdmPostXSt is Unavailable, the modes indicated by SdmPosX should be disabled.

*Remember when SdmPosX = 0x1F, that drive mode is not to be displayed at all to the user.

3.9 SDM-REQ-388968/A-Lin Button

Some vehicle programs could use a hard button that links directly to Client through LIN interface instead of through CAN signal communication. Upon receiving a specific LIN signal, the Client shall display a particular screen as defined in HMI requirements.

For those programs that use LIN button connection, the Logical Input ID ID_99 should be used. For further details about hard buttons through LIN connections refer to Appendix reference documentation.

3.10 REQ-420935/A-Display Availability

Client needs to transmit the signal LDisAval with the value 0x0 (Not Available) when the display is not available to the user to enter input.
Client needs to transmit the signal LDisAval with the value 0x1 (Available) when the display is available to the user to enter input. This signal is used by the server for internal operation, hence the need for the client to transmit it.

4 Functional Definition

4.1 SDM-FUN-REQ-333084/A-SDM

4.1.1 Use Cases

4.1.1.1 SDM-UC-REQ-334792/A-Open Selection Screen

Actors	Driver
Pre-conditions	The ignition is on. Client disaply is in a non SDM screen
Scenario Description	The driver touches SDM feature access in Client screen.
Post-conditions	- Client displays the SDM selection screen o the CAN signal Drive Mode Position communicates the drive modes and the sequence that the modes shall be displayed o the CAN signal Drive Mode Position Availability communicates the drive modes that shall be grayed out / hidden - Client communicates SDM Main Arbitration via the CAN signal SDM Selection Page Active the status of the selection screen
List of Exception Use Cases	- SDM Feature is faulted out, communicated via Active Drive Mode = Faulty. o SDM soft button shall be greyed out
Interfaces	Client HMI screen.

4.1.1.2 SDM-UC-REQ-334793/A-Selecting Drive Mode

Actors	Driver
Pre-conditions	The ignition is on. Client displays the SDM selection screen with the available drive modes
Scenario Description	The driver touches and releases the soft button of a drive mode a. Client highlighted the touched drive mode as the selected drive mode b. Client via the CAN signal “SDM Driver Selected Drive Mode” the selected drive mode to SDM Main Arbitration Center stack waits confirmation from SDM Main Arbitration
Post-conditions	Server confirms the selection Client highlights the drive mode according to the CAN signals “Drive Mode Request” and “Drive Mode Request Status”
List of Exception Use Cases	i) Server does not send a feedback a. Client removes the highlight from selected drive mode
Interfaces	Client Hmi interface

4.1.1.3 SDM-UC-REQ-334794/A-Close Selection Screen

Actors	User
Pre-conditions	Ignition is On. Client displays the SDM selection screen with the available drive modes.
Scenario Description	User selects another feature in Client HMI screen. Client send feature screen state to the server through LSdmStDis signal.
Post-conditions	LSdmStDis signal status is 0x0 (Inactive)
List of Exception Use Cases	
Interfaces	

4.1.1.4 SDM-UC-REQ-334795/A-Client Warning Display

Actors	SDM Main Arbitration
Pre-conditions	The ignition is on.
Scenario Description	SDM Server detects a condition that shall be communicated to the driver SDM Server requests SDM Client to display a SDM Warning
Post-conditions	SDM Client HMI displays the requested SDM Warning
List of Exception Use Cases	
Interfaces	SDM Client HMI

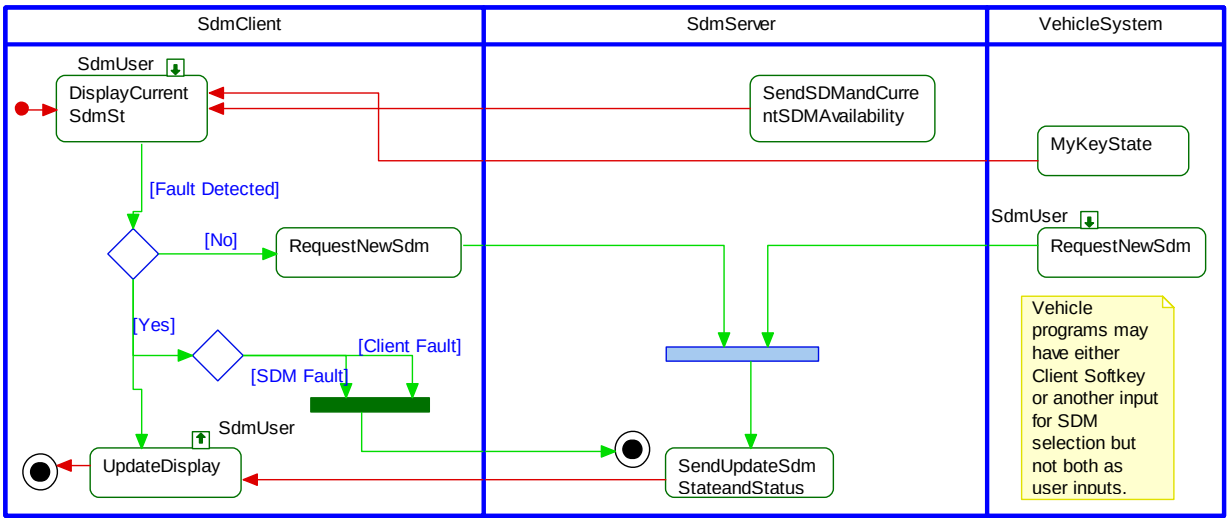
4.1.1.5 SDM-UC-REQ-334796/A-Server Warning Arbitration

Actors	SDM Server
Pre-conditions	The ignition is on.
Scenario Description	SDM Client HMI is displaying a SDM Warning User acknowledges the warning pressing OK / Cancel
Post-conditions	SDM Client HMI displays close the SDM Warning SDM Client communicates SDM Main Arbitration the warning is closed via “SDM Display Message Text Reset”
List of Exception Use Cases	
Interfaces	SDM Client HMI

4.1.2 White Box Views

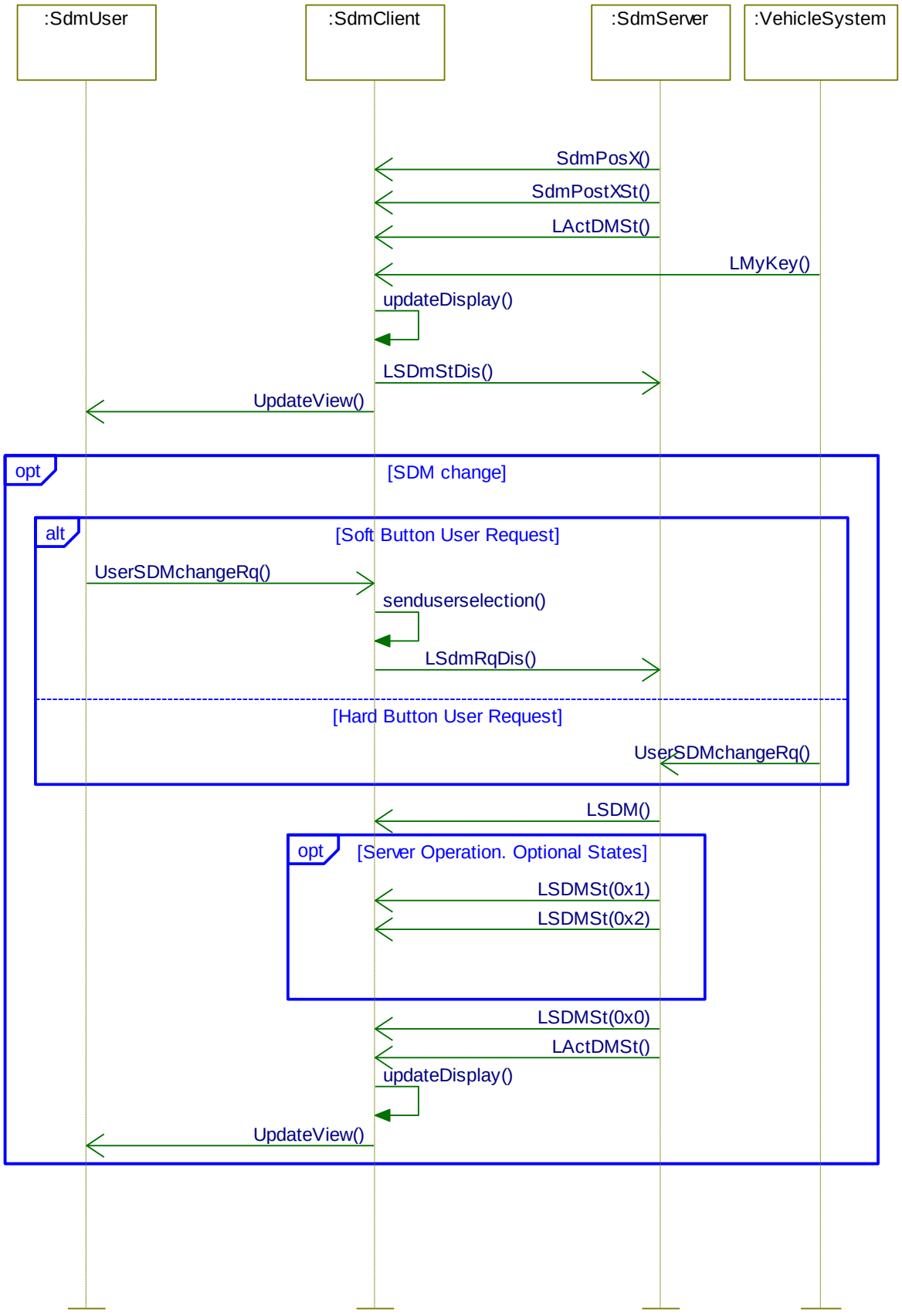
4.1.2.1 Activity Diagrams

4.1.2.1.1 SDM-ACT-REQ-334813/B-SDM Activity Diagram



4.1.2.2 Sequence Diagrams

4.1.2.2.1 SDM-SD-REQ-334815/B-SDM Operation SD


:SdmUser
:SdmClient
:SdmServer
:VehicleSystem
SdmPosX()
SdmPostXSt()
LActDMSt()
LMyKey()
updateDisplay()
LSDmStDis()
UpdateView()
opt
[SDM change]
alt
[Soft Button User Request]
UserSDMchangeRq()
senduserselection()
LSdmRqDis()
[Hard Button User Request]
UserSDMchangeRq()
LSDM()
opt
[Server Operation. Optional States]
LSDMSt(0x1)
LSDMSt(0x2)
LSDMSt(0x0)
LActDMSt()
updateDisplay()
UpdateView()

4.2 SDM-FUN-REQ-444157/A-SDM FBMP

4.2.1 FBMP Overview

Initial release of SDM made use of FBMP to communicate errors in the feature. However due to the nature of the FBMP, to avoid any conflict with Settings in Centerstack or cause any unintentional delay, a new signal was acquired to provide same functionality in the new generation.
To differentiate between what technique to use, FBMP or the new replacing signal, I think its best to look at configuration value.

The rest of the function, has a group of requirements that are tied up/ applicable only when APIM executes the FBMP variant of the feature. LDisAval is the signal that replaces FBMP functionality.

4.2.2 SDM-REQ-333124/A-Missing Signals

In case a signal goes missing for longer than 5 signal periods, the client shall log a “Lost Communication” DTC.

The client shall also send LDisFalFbmp (FeatureID 0x0030, Configuration = Set, Config = 0x3, PerIndex= Vehicle).

4.2.3 SDM-REQ-333125/A-Invalid Signals

The client shall consider invalid any signal that comes with values not used or with values that are not applicable due to configurations.

The client shall also send LDisFalFbmp (FeatureID 0x0030, Configuration = Set, Config = 0x3, PerIndex= Vehicle).

4.2.4 SDM-REQ-334908/B-Client Faulty

In case client has detected any internal fault with HMI input, it shall send the signal like below (if it is able to do that)

The client shall also send LDisFalFbmp (FeatureID 0x0030, Configuration = Set, Config = 0x2 [Display Faulted] , PerIndex= Vehicle).

Any DTC from the list below should generate the above message:

DTC 0x908E01 - Display General Electrical Failure
DTC 0x908E4A - Display Incorrect Component Installed
DTC 0x908E02 - Display General Signal Failure
DTC 0xC16200 - Lost Communication With Navigation Display Module No Sub Type Information
DTC 0x908E87 - Display Missing Message
DTC 0xF00041 - Control Module General Checksum Failure
DTC 0xF00317 - Battery Voltage Circuit Voltage Above Threshold
DTC 0xF00316 - Battery Voltage Circuit Voltage Below Threshold
DTC 0x908E02 - Display General Signal Failure

Client shall use LDisFalFbmp (FeatureID 0x0030, Configuration = Set, Config = 0x2 [Display Faulted] , PerIndex= Vehicle) only for SDM relevant faults.

4.2.5 SDM-REQ-361035/A-No Faulty Display

In cases where there are no missing signals, or invalid signals or any errors as mentioned in SDM-Req-334908 the client shall send the data below:

The client shall also send LDisFalFbmp (FeatureID 0x0030, Configuration = Set, Config = 0x1 [No Display Fault], PerIndex= Vehicle).

4.2.6 SDM-REQ-361027/B-Display Status Update

The message LDisFalFbmp should be sent with the applicable feature configuration value every (one) 1 sec (period of 1000ms) for 100ms.

4.2.7 SDM-REQ-337301/C-Error Counter

When client sends a request for mode change and the new drive mode state doesn't come within timer MaxResponeTimer, the error counter SDMFeedbackError will be incremented.

SDMFeedbackError will increment every time the condition above is satisfied.
At each new ignition cycle, i.e. each time the ignition status changes to run / start, the Client shall clear the error, set SDM Center Stack Status to Available and the error counter <SDMFeedbackError> equal 0.

This value is reset to 0 at ignition cycle or if a SDM mode change comes within allowed time.

SDMFeedbackError does not change value when LActDMSt is 0x31 (Faulty)

When MaxSDMFeedbackError is reached, the client shall send LDisFalFbmp (FeatureID 0x0030, Configuration = Set, Config = 0x3, PerIndex= Vehicle).

MaxResponeTimer is a configurable parameter. Check with Diagnostics spec for this value. It represents the max allowed time for server to provide new SDM change signal.

MaxSDMFeedbackError is a configurable error counter parameter. Check with Diagnostics spec for this value. This parameter represent total number of errors allowed before client transmits SDM failure signal to the server.

4.3 SDM-FUN-REQ-394194/A-SDM Shortcut

4.3.1 Shorcut Key Overview

Some vehicles may have dedicated buttons to act as shortcut keys for SDM feature. One button would activate/deactivate the SDM HMI screen in the client and another button toggles between Sport Mode and Normal mode.

4.3.2 Requirements

4.3.2.1 SDM-REQ-394233/A-HMI Display

When Signal LDis is received with parameter Switch State 1 Pressed, the Client should toggle between activating and deactivating the SDM screen.

4.3.2.2 SDM-REQ-394232/A-SDM Mode Change

When LDis signal is received with parameter Switch State 2, the client shall request SDM change to Sport Mode.
In cases where SDM mode is already Sport Mode, any Switch State 2 detection , the client shall request Normal Mode request to the server.

Switch State 2 does not affect the Client HMI SDM feature display.

4.3.2.3 REQ-420936/A-Additional Shortcut Key

Some programs have had the necessity to add additional hard button to function as shortcut key. There are multiple signals that functions as Hotkey operation. Various programs make use of various signals hence the existence of multiple CAN signals.
Signals LDis2 and LDis3 have the same operation and requirements as LDis.

4.3.3 Use Cases

4.3.3.1 SDM-UC-REQ-394190/A-Shortcut Key Menu SDM Display Activation

Actors	Vehicle Occupant
Pre-conditions	The ignition status is Run/Start The infotainment system is powered on. Vehicle is equipped with an SDM shortcut key feature. SDM selection screen is Off.
Scenario Description	Customer presses shortcut key SDM button once.
Post-conditions	HMI shall display SDM selection screen. Client communicates SDM Main Arbitration the status of the selection screen to the server.
List of Exception Use Cases	
Interfaces	Shortcut Key Button, Client HMI

4.3.3.2 SDM-UC-REQ-394191/A-Shortcut Key Menu SDM Display Deactivation

Actors	Vehicle Occupant
Pre-conditions	The ignition status is Run/Start The infotainment system is powered on. Vehicle is equipped with an SDM shortcut key feature. SDM selection screen is On.
Scenario Description	Customer presses shortcut key SDM button once.
Post-conditions	Client HMI shall remove SDM selection screen. Client communicates SDM Main Arbitration the status of the selection screen to the server.
List of Exception Use Cases	
Interfaces	Shortcut Key button, Client HMI

4.3.3.3 SDM-UC-REQ-394192/A-SDM Sport Mode Activation

Actors	Vehicle Occupant
Pre-conditions	The ignition status is Run/Start The infotainment system is powered on. Vehicle is equipped with an SDM Sport Mode shortcut key feature. SDM Active Drive Mode is different from Sport Mode
Scenario Description	Customer presses shortcut key SDM Sport Mode button once.
Post-conditions	Client communicates the selection to server via the CAN signal “SDM Driver Selected Drive Mode” the “Sport Mode” HMI shall highlight the “Sport Mode” button as selected.
List of Exception Use Cases	SDM Active Drive Mode is equal to Faulty Drive Mode No HMI actions (SDM Main Arbitration handle recover / warning).
Interfaces	

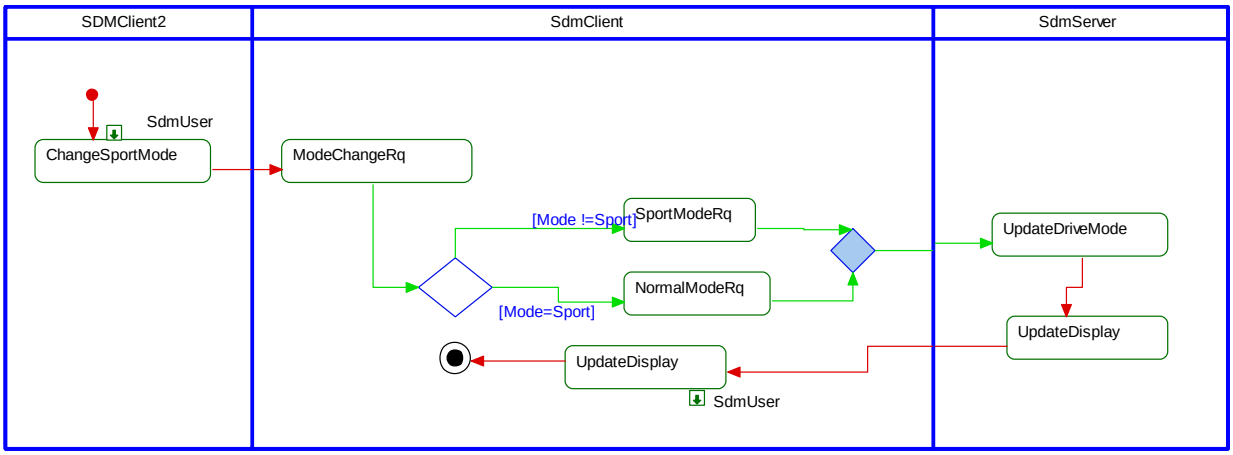
4.3.3.4 SDM-UC-REQ-394193/A-SDM Sport Mode Deactivation

Actors	Vehicle Occupant
Pre-conditions	The ignition status is Run/Start The infotainment system is powered on. Vehicle is equipped with an SDM Sport Mode shortcut key feature. SDM Active Drive Mode is equal to “Sport Mode”
Scenario Description	Customer presses shortcut key SDM Sport Mode button once.
Post-conditions	Client communicates the selection to Server via the CAN signal “SDM Driver Selected Drive Mode” the “Normal Mode” HMI shall highlight the “Normal Mode” button as selected
List of Exception Use Cases	
Interfaces	

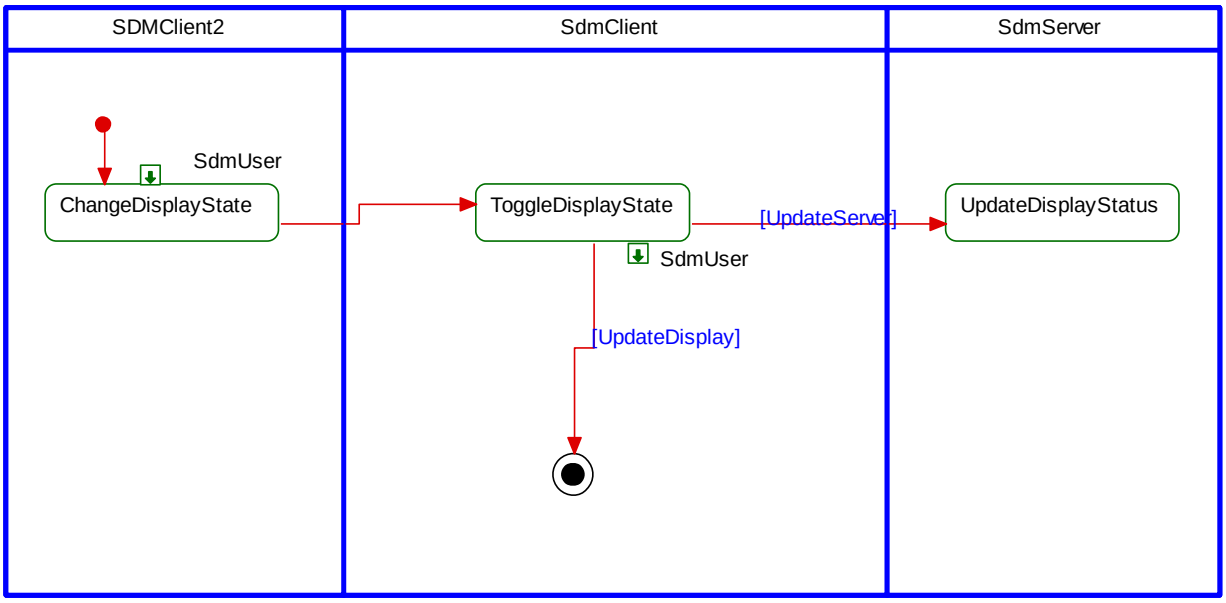
4.3.4 White Box Views

4.3.4.1 Actvity Diagrams

4.3.4.1.1 SDM-REQ-394197/A-Shortcut Key Drive Mode Change

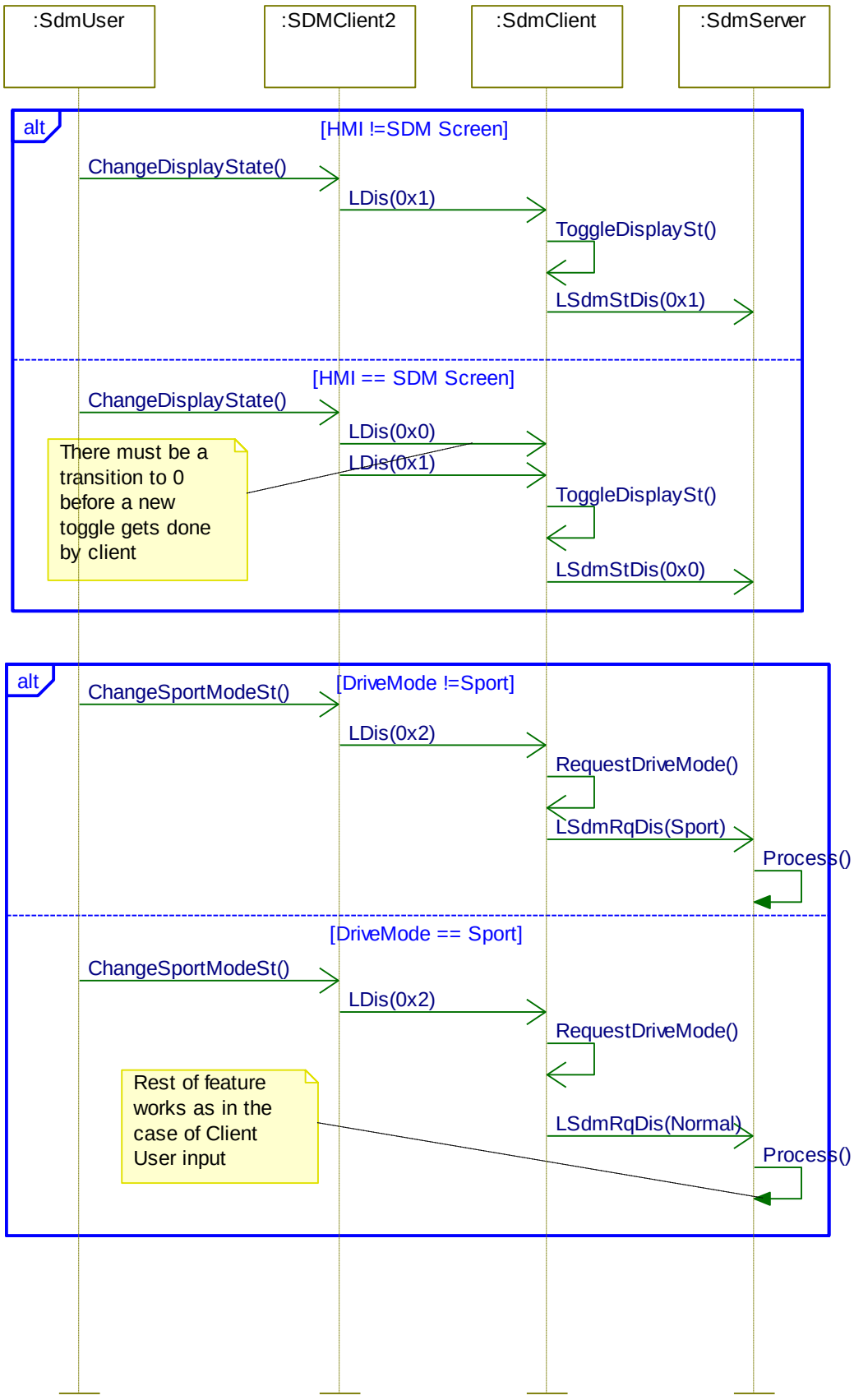


4.3.4.1.2 SDM-REQ-394195/A-Shortcut Key Operation



4.3.4.2 Sequence Diagrams

4.3.4.2.1 SDM-REQ-394196/A-Shortcut Key Operations


:SdmUser
:SDMClient2
:SdmClient
:SdmServer
alt
[HMI !=SDM Screen]
ChangeDisplayState()
LDis(0x1)
ToggleDisplaySt()
LSdmStDis(0x1)
[HMI == SDM Screen]
ChangeDisplayState()
LDis(0x0)
LDis(0x1)
There must be a transition to 0 before a new toggle gets done by client
ToggleDisplaySt()
LSdmStDis(0x0)
alt
ChangeSportModeSt()
[DriveMode !=Sport]
LDis(0x2)
RequestDriveMode()
LSdmRqDis(Sport)
Process()
[DriveMode == Sport]
ChangeSportModeSt()
LDis(0x2)
RequestDriveMode()
Rest of feature works as in the case of Client User input
LSdmRqDis(Normal)
Process()

5 Appendix: Reference Documents

1	APIM Feature Based Messaging Protocol
2	Global Input Translation Matrix
3	Button Strategy SPSS
4	