Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – MSS Zone Audio Management

APIM Phoenix Domain Controller Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.0

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Version Date: September 9, 2021

FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
September 9, 2021	1.0	Initial Release	

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1 Overview

1.1 Feature Assumptions

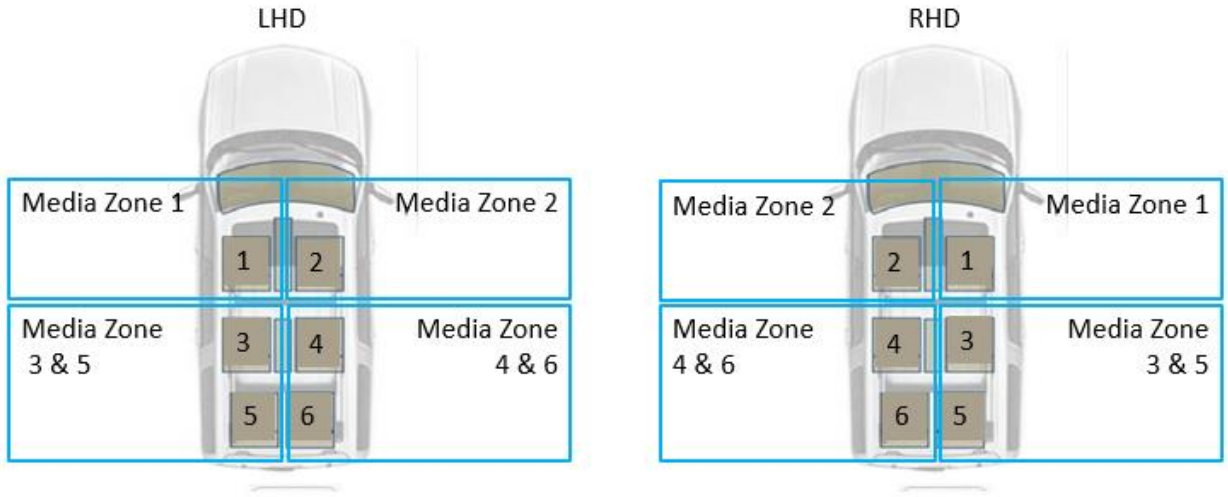
1. Cabin mode is defined when there are no individual sound zones for the Driver and other vehicle passengers. Generally, audio is played throughout the entire vehicle in cabin mode.
2. Zone mode is defined when there are individual sound zones for the Driver and other vehicle passengers. The audio is played through the individual sound zone speakers.
3. The table below shall be used to define the individual audio zones. When individual audio zones are like below the vehicle is considered in zone mode.

In a 2 Media zone system:

1. Seat 1 & 2 – shall share same media source.
2. Seat 3/5 & 4/6 – shall share same media source.

In a 4 Media zone system:

1. Seat 1 – Can be in independent (or) shared media source.
2. Seat 2 – Can be in independent (or) shared media source.
3. Seat 3/5 – Can be in independent (or) shared media source.
4. Seat 4/6 – Can be in independent (or) shared media source.



1.2 Terminology and Abbreviations

The following table lists terminologies that are used in this document along with a brief description.

Term	Description
MSS	My Seat Space
URC	Ultimate Remote control
CA	Captains Announcement
ICC	In Car Communication
BT	Bluetooth

1.3 3rd Row Seat Assumptions

In an MSS vehicle with the infotainment system operating in individual zone audio mode then

1. The seat 3 and seat 5 shall share same audio source.
2. The seat 4 and seat 6 shall share same audio source.

All the applicable requirement (like Audio source allocation/deallocation, Mute/Unmute, Volume Up/Down, DND, etc.,) that is addressed for Seat 3 and Seat 4 is also applicable to seat 5 and Seat 6 respectively. Unless until the exceptional(s) is called out explicitly in the individual feature specification.

2 Architectural Design

2.1 Deployment Table

The table below shows how the logical classes may be mapped to physical modules to support this specification.

At the time the specification was written the below table was the latest. If there are additional modules deployed to the class descriptions or the vehicle architecture changed since the spec was written and released, then the applicable implementation guide class description would cover those modules. If there is a conflict between the implementation guide and the table below the implementation guide takes precedent.

Logical Class	Physical Module (ECU)	Comments
MSS Zone Manager	APIM PDC	SW application hosted by PDC to support MSS feature
MSSApplicationServer	APIM PDC	MSS Zone Manager object
Beep Generator	APIM PDC	MSS Zone Manager object
Prompt Generator	APIM PDC	MSS Zone Manager object
Audio Resource Server	APIM PDC	Overall Audio manager
Volume Settings Server	APIM PDC	Volume master
Audio Source Client(s)	APIM PDC	Internal audio sources
URC Application Server	APIM PDC	SW application hosted by PDC to support URC feature
BT Phone Server	APIM PDC	Bluetooth connection Server for the Driver phone mapped to Seat1
Audio IO Controller	DSP AMP	Controls the audio outputted to the vehicle speakers
Passenger BT Phone Client	PAC	Client for the passenger phone(s) mapped and connected to Seat 2, Seat 3 & Seat 4
MSSOnboardClient	-	Client to handle the Infotainment HMI input/output
URC Client	-	Client to handle the URC HMI input/output

2.2 MSS-CLD-REQ-407310/A-BT Phone Server

The ‘BT Phone Server’ maintains and controls status information for everything related to the Driver Phone belongs to Zone1 (i.e. pairing, Phone Connection, and phone calls).

2.3 MSS-CLD-REQ-410679/A-MSSApplicationServer

The ‘MSSApplicationServer’ object is responsible to co-ordinate and interface between the Audio Source Client(s), Input Client(s) and ‘AudioResourceServer’. The ‘MSSApplicationServer’ is also responsible for controlling and updating the MSS Zone Manager objects when incoming service requests are received. The ‘MSSApplicationServer’ also transmits related status information to the Input client(s) (i.e. ‘MSSOnboardClient’, ‘URC Client’). The ‘MSSApplicationServer’ shall interface with ‘Passenger BT Phone Client’ to handle the passenger BT phone calling and BT Media streaming. It also requests the ‘Audio Resource Server’ if the audio resources are needed.

2.4 AUMGNTv2-CLD-REQ-410572/A-Audio IO Controller

The Audio IO Controller is the object that controls the audio outputted to the vehicle speakers.

2.5 MSS-CLD-REQ-416064/A-Passenger BT Phone Client

The ‘Passenger BT Phone Client’ is responsible for establishing BT Classic connection and Pairing with the passenger phones.

3 Functional Definition

3.1 MSS-FUN-REQ-413564/A-Media sharing and switching operation

3.1.1 Requirements

In this specification the allowable number of audio sources is represented in the below naming standards

- PDC media source 1/2/3 = AM/FM/DAB/SDARS/USB/Driver's BT Media/CarPlay/Pandora, etc.,
- Transient source = Driver Phone call/VR/TA.
- Z2_BTPhone = Zone 2 Passenger Phone Call.
- Z2_BTPhone = Zone 3 Passenger Phone Call.
- Z2_BTPhone = Zone 4 Passenger Phone Call.
- Z2_BTMedia = Zone 2 Passenger Phone BT media.
- Z3_BTMedia = Zone 3 Passenger Phone BT media.
- Z4_BTMedia = Zone 4 Passenger Phone BT media.

3.1.1.1 MSS-SR-REQ-410782/A-Allowed number of audio source combination in Zone Mode

MSSApplicationServer shall request the AudioResourceServer with appropriate audio source information along with the zone information (where to play the audio). Based on the user selection and Zone manager rules the possible source combinations are

When 2 Media zone is selected:

Scenario	Zone 1	Zone 2	Zone 3	Zone 4	Comment
Case 1	PDC Media Source1	PDC Media Source1	Don't Care	Don't Care	When PDC media source1 is shared in Front zone.
Case 2	PDC Media Source1	Z2_BTPhone	Don't Care	Don't Care	When PDC media source1 is shared in Front zone and when Zone 2 receives phone call.
Case 3	Transient Source (Phone)	Audio OFF	Don't Care	Don't Care	When PDC media source1 is shared in Front zone and when the Zone 1 receives phone call.
Case 4	Transient Source (Phone)	Z2_BTPhone (Privacy)	Don't Care	Don't Care	When Zone1 phone Call is active Zone2 call is pushed to private.
Case 5	Transient Source (Phone/VR)	Z2_BTMedia	Don't Care	Don't Care	When Zone 2 BT music is shared with Front zone and when Zone 1 receives phone call/VR.
Case 6	Z2_BTMedia	Z2_BTMedia	Don't Care	Don't Care	When Zone 2 BT music is shared with Front zone.
Case 7	Audio OFF	Z2_BTPhone	Don't Care	Don't Care	When Zone 2 BT music is shared with Front zone and when Zone 2 receives a phone call.
Case 8	Transient Source (VR)	Audio OFF	Don't Care	Don't Care	When Zone 2 is listening to Driver BT media/PDC Media source and when the Driver activates VR session then zone 2 shall be in Audio OFF.
Case 9	Transient Source	Z2_BTPhone	Don't Care	Don't Care	When Zone1 is in VR and when Zone2 receives a phone

	(VR)				call. Zone 2phone Call shall stay in Hands Free.
Case 10	Don't Care	Don't Care	PDC Media Source3	PDC Media Source3	When PDC media source3 is shared in rear zone.
Case 11	Don't Care	Don't Care	Zx_BTMedia	Zx_BTMedia	either Zone 3 or Zone 4 BT media is played in rear zone.
Case 12	Don't Care	Don't Care	PDC Media Source3	Z4_BTPhone	When PDC media source3 is shared in rear zone and when Zone 4 receives phone call.
Case 13	Don't Care	Don't Care	Z3_BTPhone	PDC Media Source3	When PDC media source3 is shared in rear zone and when Zone 3 receives phone call.
Case 14	Don't Care	Don't Care	Z3_BTPhone	Z4_BTPhone	Second passenger phone call is pushed to Private and the first passenger phone call shall be in Hands Free call.
Case 15	Don't Care	Don't Care	Z3_BTMedia	Z4_BTPhone	When Zone 3 BT music is shared in rear zone and when Zone 4 receives phone call.
Case 16	Don't Care	Don't Care	Z3_BTPhone	Z4_BTMedia	When Zone 4 BT music is shared in rear zone and when Zone 3 receives phone call.
Case 17	Don't Care	Don't Care	Z3_BTPhone	Audio OFF	When Zone 3 BT music is shared in rear zone and when Zone 3 receives phone call.
Case 18	Don't Care	Don't Care	Audio OFF	Z4_BTPhone	When Zone 4 BT music is shared in rear zone and when Zone 4 receives phone call.

When 4 Media zone is selected:

When the vehicle audio mode in 4 media zone mode, the MSSApplicationServer shall restrict the 'Audio Source Client(s)' not to request more than 4 different audio sources (max of 3 PDC audio source) at a time with AudioResourceServer. The PDC audio source assignment in a 4 media zone system shall be as follows (audio source includes both Media source/Transient source).

- 1 PDC audio source assigned for Seat 1.
- 1 PDC audio source assigned for Seat 2.
- 1 PDC audio source assigned for Seat 3 & 4.

The possible combination of audio source (both Media source/Transient source) combination shall be as follows

1. 3 PDC audio sources and 0 Passenger audio source.
2. 3 PDC audio sources and 1 Passenger audio source.
3. 2 PDC audio sources and 0 Passenger audio sources.
4. 2 PDC audio sources and 1 Passenger audio sources.
5. 2 PDC audio sources and 2 Passenger audio sources.
6. 1 PDC audio sources and 0 Passenger audio source.
7. 1 PDC audio source and 1 Passenger audio source.
8. 1 PDC audio source and 2 Passenger audio sources.
9. 1 PDC audio source and 3 Passenger audio sources.
10. 0 PDC audio source and 3 Passenger audio sources.
11. 0 PDC audio source and 2 Passenger audio sources.
12. 0 PDC audio source and 1 Passenger audio sources.
13. 0 PDC audio source and 0 Passenger audio sources.

3.1.1.2 MSS-SR-REQ-413566/A-Allowed number of Tuner audio source in Zone mode

When the vehicle audio mode is in Zone mode, the MSSApplicationServer shall restrict the 'Audio Source Client(s)' not to request more than one different tuner audio sources at the same time. However, the 'MSSApplicationServer' shall allow the 'Audio Source Client(s)' to share current active Tuner audio source across different zone(s).

Note: In Zone mode the number of allowed audio source and possible source combination is covered in the requirement 'MSS-SR-REQ-410782'.

3.1.1.3 MSS-SR-REQ-421035/A-Transition from Cabin to 4 media zone when a media is shared

When the vehicle audio mode is in Cabin mode and when the 'MSSApplicationServer' receives an intent from 'MSSOnBoardClient' or 'URC Client' to share one or more different media source with the Zone(s), then

1. The 'MSSApplicationServer' shall interface with Audio Source Client(s) to load the request with appropriate source information and shall place the request to 'AudioResourceServer' as mentioned below.
   - Zone 1 – may have a separate or shared media source.
   - Zone 2 – may have a separate or shared media source.
   - Zone 3 – may have a separate or shared media source.
   - Zone 4 – may have a separate or shared media source.
2. Once the source information is loaded and requested, the MSSApplicationServer shall wait for at least 50 ms before the 'MSSApplicationServer' request the 'AudioResourceServer' to switch the vehicle audio mode to zone mode.

Note: Restrictions to share the media source with other media zone may apply. Refer 'MSS-SR-REQ- 412292' for details.

Note1: Refer Audio Management SPSS requirements in function "AUMGNT-FUN-410538-Cabin and Zone mode transitions" for more details on mode transition from Zone to Cabin.

3.1.1.4 MSS-SR-REQ-421034/A-Transition from Zone to Cabin mode when a media is shared

When the vehicle audio mode is in Zone mode and when 'MSSApplicationServer' receives the intent from 'MSSOnBoardClient' or 'URC Client' to share the media source with entire Cabin, then

1. The 'MSSApplicationServer' shall interface with Audio Source Client(s) and shall request 'Audio Resource Server' with appropriate source information that need to be played on the entire Cabin.
2. In the same request, the MSSApplicationServer shall also send the request to AudioResourceServer to set VehicleAudioMode to 'Cabin'.

Note: Restrictions to share the media source with other media zone may apply. Refer 'MSS-SR-REQ- 412292' for details.

Note1: Refer Audio Management SPSS requirements in function "AUMGNT-FUN-410538-Cabin and Zone mode transitions" for more details on mode transition from Zone to Cabin.

3.1.1.5 MSS-SR-REQ-421036/A-Media share activation

When the 'MSSApplicationServer' receives the share request from 'MSSOnboardClient' or 'URC Client', then the MSSApplicationServer shall support to share the PDC Media source or passenger BT Media (Zx_BTMedia) either with

- Entire Cabin.
- Share the media either to Zone 2/3/4 (In a 4 media zone system).
- Share the media either to Zone 1&2 or Zone 3 &4 (In a 2 media zone system).

Note1: Restrictions to share the media source with other media zone may apply. Refer MSS Zone Settings Manager SPSS for details covered in 'MSS-SR-REQ-421043'.
Note2: Restrictions to share the media source with other media zone may apply. Refer MSS Zone Audio Management SPSS 'MSS-SR-REQ- 412292' for details.

3.1.1.6 MSS-SR-REQ-421042/A-Media share deactivation

The 'MSSApplicationServer shall interface with AudioResourceServer to deallocate the PDC media source when any of the following conditions is satisfied.

- When the 'MSSApplicationServer' receives the intent for 'Stop Sharing' from 'MSSOnBoardClient', the MSSApplicationServer shall request 'Audio Resource Server' to deallocate the already allocated PDC media source for those shared Zone(s).
- When the 'MSSApplicationServer' receives the intent to enable 'DND' for a Zone, while the Zone is already playing a media shared by a different Zone(s). Then the MSSApplicationServer shall request 'Audio Resource Server' to deallocate the already allocated shared media for that Zone.

The 'MSSApplicationServer shall interface with AudioResourceServer to deallocate the Zx_BTMedia (if there were allocated already) when any of the following conditions is satisfied.

- When the 'MSSApplicationServer' receives the connection status for the already connected phone as 'Disconnected' while the passenger is actively Zx_BTMedia, then the corresponding media zone and all other shared to Zone (if applicable) need to be deallocated by MSSApplicationServer (Refer URC SPSS 'FUN-REQ-433128' for the BT connection/Disconnection handling).
- When the 'MSSApplicationServer' receives the intent as 'Stop Sharing' for the Zx_BTMedia from 'URC Client', then the corresponding media zone and all other shared to Zone (if applicable) need to be deallocated by MSSApplicationServer (Refer URC SPSS 'URC-REQ-436408' for URC stop sharing handling).
- When the 'MSSApplicationServer' receives the intent to enable 'DND' for a Zone when the Zone is already playing a media shared by a different Zone(s) , then the MSSApplicationServer shall support to request 'Audio Resource Server' to deallocate the shared media for that Zone.

Scenario	**Pre-Condition:** Active Media source				**Event:**	**Post-Condition:** Active media source				**Comments**
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**	
case 1	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	Z3_BTMedia	X (Zone3 media shared with Zone4)	Zone 3 Phone BT Connection lost	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	Audio OFF (Last active Source deallocated)	Audio OFF (Last active Source deallocated)	Similarly, when Zone 2 or 4 phone BT connection is lost while actively streaming, then the last active source shall be deallocated.
case 2	X (Zone2 media shared with Zone1)	X (Z2_BTMedia)	Z3_BTMedia	X (Zone3 media shared with Zone4)	Stop Sharing done from Zone 3 phone	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	Audio OFF (Last active Source deallocated)	Audio OFF (Last active Source deallocated)	Similarly, when Zone 2 or 4 phone user does stop sharing while actively streaming, then the last active source shall be deallocated.
Case 3	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	Z3_BTMedia	X (Zone3 media shared with Zone4)	Zone4 DND is enabled (i.e. Stop being shared)	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	Z3_BTMedia	Audio OFF (Last active Source deallocated)	Similarly, when Zone 2 or 3 phone user enables DND then the last active shared media shall be deallocated.

3.1.1.7 MSS-SR-REQ-425158/A-Summary of Cabin to 4 media zone

Based on the audio sharing request the 'MSSApplicationServer' shall pass the request to AudioResourceServer with appropriate audio source information to make a transition Cabin to 4 media zone, the below matrix shall represent the possible media source combination.

Cabin mode to 4 media zone transition when a music share is initiated

Scenario	**Pre-Condition:** Active Audio Source in Cabin	**Event:** Audio source sharing	**Post-Condition:** Audio mode transitions to 4 media zone system and below is the active audio source in zone(s)				**Comment**
			Zone1	**Zone2**	**Zone3**	**Zone4**	
case 1	X (either PDC Media Source 1 or Passenger media source)	Zone2 - BT Music shared with seat 2	X (either PDC Media Source 1 or Passenger media source)	Z2_BTMedia	X (Zone 1 media is shared with Zone 3)	X (Zone 1 media is shared with Zone 4)	Similarly, when Z4_BTMedia is shared then corresponding Zone need to be assigned with Zx_BTMedia and rest of the zone is assigned with Driver audio.
case 2	Transient Source	Zone3 - BT Music shared with seat 3	Transient Source	Audio OFF	Z3_BTMedia	Audio OFF	Similarly, when Z2_BTMedia or Z4_BTMedia is shared then corresponding Zone need to be assigned with Zx_BTMedia.
case 3	Emergency (E-Call)	Zone X - BT Music shared with seat X	(not Allowed)	(not Allowed)	(not Allowed)	(not Allowed)	Cabin to zone mode transition not allowed when in E-Call
case 4	X (either PDC Media Source 1 or Passenger media source)	Driver shares PDC Media Source 2 with Seat 4	X (either PDC Media Source 1 or Passenger media source)	X (Zone 1 media is shared with Zone 2)	X (Zone 1 media is shared with Zone 3)	X (PDC Media Source 2)	Similarly, when Driver shares with seat 2 or 3 then corresponding seat need to be assigned with new PDC source and rest of the zone is assigned with Driver audio.
case 5	Transient Source	Driver shares (PDC Media Source 2) with Seat 3	Transient Source	Audio OFF	X (PDC Media Source 2)	Audio OFF	Similarly, when Driver shares with seat 2 or 4 then corresponding seat need to be assigned with new PDC source.
case 6	Emergency (E-Call)	Driver shares (PDC Media Source 2) with Seat 4	(not Allowed)	(not Allowed)	(not Allowed)	(not Allowed)	Cabin to zone mode transition not allowed when in E-Call

Note: The above table shall not be considered as the only possible media source combination when audio mode switched from Cabin to Zone or Zone to Cabin. This table is meant to aid the understanding of different audio source combination in mode transitions.

3.1.1.8 MSS-SR-REQ-425161/A-Summary of 2 to 4 and 4 to 2 media zone

Based on the audio sharing request the 'MSSApplicationServer' shall pass the request to AudioResourceServer with appropriate audio source information to make a transition from 4 media to 2 media zone or Vice versa, the below matrix shall represent the possible media source combination.

Zone transition from 2 Media zone to 4 Media zone

When the media audio mode is switched from 2 media zone to 4 media zone on Infotainment screen, then the current active audio source on 2 media zone shall be carry forwarded to 4 media zone. Refer 'MSS-SR-REQ-434438' requirement to get the details on use case that results in a transition of source change within in 4 media zone.

Zone transition from 4 Media zone to 2 Media zone

Scenario	**Pre-Condition:** Active Media source in 4 media audio zone system				**Event:**	**Post-Condition:** Audio mode transitions to 2 media zone system and below is the active media source				**Comments**
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**	
case 1	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	X (PDC Media Source 2)	X (Z4_BT Media)	4 media to 2 media zone	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	X (Zone4 media shared with Zone3)	X (Z4_BTMedia)	Always Zone1 takes precedence over Zone2. When Z4_BTMedia is actively streaming but not Z3_BTMedia, then Z4_BTMedia takes precedence over Zone3.
Case 2	X (Zone2 media shared with Zone1)	X (Z2_BTMedia)	X (Z3_BTMedia)	X (PDC Media Source 2)	4 media to 2 media zone	X (Zone2 media shared with Zone1)	X (Z2_BTMedia)	X (Z3_BTMedia)	X (Zone3 media shared with Zone4)	Always Zone1 takes precedence over Zone2. When Z3_BTMedia is actively streaming but not Z4_BTMedia, then Z3_BTMedia takes precedence over Zone4.
case 3	X (PDC Media Source 1)	X (PDC Media Source 2)	X (Z3_BTMedia)	X (Z4_BT Media)	4 media to 2 media zone	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	X (Z3_BTMedia)	X (Zone 4 shares Zone 3 media)	When both Z3_BTMedia & Z4_BTMedia are actively streaming, then Z3_BTMedia takes precedence over Zone4.
case 4	X (PDC Media Source 1)	X (Z2_BTPhone)	X (Z3_BTPhone)	X (Z4_BT Media)	4 media to 2 media zone	X (PDC Media Source 1)	X (Z2_BTPhone -When Phone call ends Zone1 media becomes active).	X (Z3_BTPhone - When Z3_BTPhone call ends, Z4_BTMedia becomes active).	X (Z4_BTMedia)	When Z4_BTMedia is actively streaming, then Z4_BT Media takes precedence.

case 5	X (PDC Media Source 1)	X (PDC Media Source 2)	X (Z3_BTMedia)	X (Z4_BT Phone)	4 media to 2 media zone	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	X (Z3_BTMedia)	X (Z4phone - When Z4_BTPhone call ends, Z3_BTMedia becomes active).	When Z3_BTMedia is actively streaming, then Z3_BTMedia takes precedence.

Note: The above table shall not be considered as the only possible media source combination when audio mode switched from Cabin to Zone or Zone to Cabin. This table is meant to aid the understanding of different media source combination in mode transitions.

3.1.1.9 MSS-SR-REQ-425218/A-Summary of Zone to Cabin mode

Based on the audio sharing request the 'MSSApplicationServer' shall pass the request to AudioResourceServer with appropriate audio source information to make a transition from Zone to Cabin mode, the below matrix shall represent the possible media source combination.

Zone mode to Cabin mode transition

Scenario	**Pre-Condition:** Current active audio source in 4 (or) 2 media zone				**Event:**	**Post-Condition:** New active audio source in Cabin	**Comments**
	Zone1	**Zone2**	**Zone3**	**Zone4**			
Case 1	X (PDC Media Source 1)	X (either PDC Media Source 2 or Z2_BTMedia)	X (either PDC Media Source 3 or Z3_BTMedia)	X (either PDC Media Source 3 or Z4_BTMedia))	'Passenger Zonal Audio Request = Disabled'	X (PDC Media Source 1)	Always last active Zone 1 audio source takes precedence and becomes active in Cabin.
Case 2	X (Zone2 media shared with Zone1)	X (Z2_BTMedia)	X (either PDC Media Source 3 or Z3_BTMedia)	X (either PDC Media Source 3 or Z4_BTMedia)	'Passenger Zonal Audio Request = Disabled'	X (Last active Zone 1 media Source i.e. Z2_BTMedia)	The same use case is also applicable when the Z3_BTMedia or Z4_BTMedia is shared with Zone1.
Case 3	X (In phone call)	X (Z2_BTMedia)	X (Z3_BTMedia)	X (either PDC Media Source 3 or Z4_BTMedia)	'Passenger Zonal Audio Request = Disabled'	(not allowed)	When the Driver is in phone call then mode transition shall not be allowed.
Case 4	Transient Source	X (Z2_BTMedia)	X (either PDC Media Source 3 or Z3_BTMedia)	X (Zone 3 media is shared with Zone 4)	'Passenger Zonal Audio Request = Disabled'	Transient Source	Always last active Zone 1 audio source takes precedence and becomes active in Cabin.
Case 5	X (Zone2 media shared with Zone1)	X (Z2_BTMedia)	X (In phone call)	X (either PDC Media Source 3 or Z4_BTMedia)	'Passenger Zonal Audio Request = Disabled'	(not allowed)	When the passenger is in phone call then mode transition shall not be allowed.
Case 6	X (PDC Media Source 1)	X (either PDC Media Source 2 or Z2_BTMedia)	X (either PDC Media Source 3 or Z3_BTMedia)	X (either PDC Media Source 3 or Z4_BTMedia))	Z2_BTMedia is shared with entire Cabin	X (Z2_BTMedia)	Similarly, when Z3_BTMedia and Z4_BTMedia passenger media is shared with entire Cabin the source info shall be updated.
Case 7	X (PDC Media Source 1)	X (Z2_BTMedia)	X (Zone2 media shared with Zone3)	X (Zone2 media shared with Zone4)	Z2_BTMedia is shared with Zone1	X (Z2_BTMedia)	When the new media share request ends up all the zones listening to same media source then the MSSApplicationServer shall transition to Cabin mode.
Case 8	X	X	(Z3_BTMedia)	X	Zone 1 Media is	X (PDC Media Source 1)	Sharing Zone 1 media with zone 3 & 4 would result in all zone

	(PDC Media Source 1)	(Zone1 media shared with Zone2)		(Zone3 media shared with Zone4)	shared with Zone 3 & 4		listening to same media source, so before doing the source transition the audio mode shall switch to Cabin mode.
Case 9	X (PDC Media Source1)	X (Z2_BTMedia)	X (either PDC Media Source 3 or Z3_BTMedia)	X (either PDC Media Source 3 or Z4_BTMedia)	Driver Share PDC media source 1 with entire Cabin	X (PDC media source 1 is played in entire Cabin)	Transition occurs when Driver media or passenger media is shared with entire Cabin.
Case 10	X (Zone2 media shared with Zone1)	X (Z2_BTMedia)	X (either PDC Media Source 3 or Z3_BTMedia)	X (either PDC Media Source 3 or Z4_BTMedia)	'Emergency' (E-Call)	X (Emergency)	On Emergency Full cabin mode becomes active.

Note: The above table shall not be considered as the only possible media source combination when audio mode switched from Zone to Cabin. This table is meant to aid the understanding of different media source combination in mode transitions.

3.1.1.10 MSS-SR-REQ-433246/A-Summary of source change within 2 media zone

When the audio mode is in Zone mode (2 media zone system) and when the media source of the shared zone (or) the Shared to zone is updated, then based request the 'MSSApplicationServer' shall pass the request to AudioResourceServer with appropriate audio source information, the below matrix shall represent the possible media source switching within zone mode.

Scenario	**Pre-Condition:** Active Media source in zone mode (2 media zone system)				**Event:**	**Post-Condition:** Active Media source in zone mode (2 media zone system)				**Comments**
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**	
Case 1	X (PDC Media Source 1)	X (PDC Media Source 1)	Don't Care	Don't Care	Audio OFF (Driver action)	X (Audio OFF)	X (Audio OFF)	Don't Care	Don't Care	If the driver is listening to PDC media source, then the audio should turn off for the driver and anyone listening to the driver source.
Case 2	X (Z2_BT Media)	X (Z2_BT Media)	Don't Care	Don't Care	Audio OFF (Driver action)	X (Audio OFF)	X (Z2_BT Media)	Don't Care	Don't Care	This should stop sharing the Passenger media to the driver but continue playing for whoever the source is allocated to.

Note: The above table shall not be considered as the only possible media source combination when audio mode switched from Cabin to Zone or Zone to Cabin. This table is meant to aid the understanding of different media source combination in mode transitions.

3.1.1.11 MSS-SR-REQ-434438/A-Summary of source change within 4 media zone

When the audio mode is in Zone mode (4 media zone system) and when the media source of the shared zone (or) the Shared to zone is updated, then based request the 'MSSApplicationServer' shall pass the request to AudioResourceServer with appropriate audio source information, the below matrix shall represent the possible media source switching within zone mode.

Scenario	Pre-Condition: Active Media source in zone mode (4 media zone system)				Event:	Post-Condition: Active Media source in zone mode (4 media zone system)				Comments
	Zone1	Zone2	Zone3	Zone4		Zone1	Zone2	Zone3	Zone4	
Case 1	X (PDC Media Source 1)	X (Zone1 media is shared with Zone2)	Don't Care	Don't Care	Audio OFF (Driver action)	X (Audio OFF)	X (Audio OFF)	Don't Care	Don't Care	If the driver is listening to PDC media source, then the audio should turn off for the driver and anyone listening to the driver source.
Case 2	X (Z2_BT Media)	X (Z2_BT Media)	Don't Care	Don't Care	Audio OFF (Driver action)	X (Audio OFF)	X (Z2_BT Media)	Don't Care	Don't Care	This should stop sharing the Passenger media to the driver but continue playing for whoever the source is allocated to.
Case 3	X (PDC Media Source 1)	X (PDC Media Source 2)	X (Zone1 media shared with Zone3)	X (Zone1 media shared with Zone4)	Zone2 media shared with zone1	X (Zone2 media shared with Zone1)	X (PDC Media Source 2)	X (Audio OFF)	X (Audio OFF)	Similarly, when the Zone that is sharing the media with other zone is being assigned with new media source then the other shared to zone(s) shall take Audio OFF.
Case 4	X (PDC Media Source 1)	X (PDC Media Source 2)	X (Zone2 media shared with Zone3)	X (Zone2 media shared with Zone4)	New PDC media source3 is shared with zone4	X (PDC Media Source 1)	X (PDC Media Source 2)	X (Zone2 media shared with Zone3)	X (new PDC media source 3)	Similarly, when the media of shared to zone is being assigned with new media source then the other shared zone shall not be affected.
case 5	X (PDC Media Source 1)	X (PDC Media Source 1)	X (Z3_BT Media)	X (Z3_BT Media)	New PDC Media Source 2 requested for Seat 2	X (PDC Media Source 1)	X (new PDC Media Source 2)	X (Z3_BT Media)	X (Z3_BT Media)	Similarly, when Zone 3 or 4 is selected for new media source then correspondin

										g zone shall be updated.
case 6	X (Z2_BT Media)	X (Z2_BT Media)	X (Z3_BT Media)	X (Z3_BT Media)	New PDC Media Source 2 requested for Seat 2	X (Audio OFF)	X (new PDC Media Source 2)	X (Z3_BT Media)	X (Z3_BT Media)	When the media source of a Zone is updated, then the shared to media Zone will take No audio.
Case 7	X (PDC Media Source 1)	X (PDC Media Source 1)	X (Z3_BT Media)	X (Z3_BT Media)	New PDC Media Source 2 requested for Seat 3	X (PDC Media Source 1)	X (PDC Media Source 1)	X (new PDC Media Source 2)	X (Audio OFF)	When the media source of a Zone is updated, then the shared to media Zone will take No audio.
case 8	Transient Source	Audio OFF (last active Zone1 source is stacked)	X (Z4_BT Media)	X (Z4_BT Media)	Z3_BT Media requested by passenger for seat 3	Transient Source	Audio OFF (last active Zone1 source is stacked)	X (Z3_BT Media)	X (Z4_BT Media)	Similarly, when Zone 2 or 4 is selected for new media source then corresponding Zone shall be updated.
Case 9	X (PDC Media Source 1)	X (Z2_BT Phone)	X (Z3_BT Media)	X (Z3_BT Media)	New PDC Media Source 2 requested for Seat 4	X (PDC Media Source 1)	X (Z2_BT Phone)	X (Z3_BT Media)	X (PDC Media Source 2)	when phone call is ended for Zone2 then last active source prior to phone call becomes active.

Note: The above table shall not be considered as the only possible media source combination when audio mode switched from Cabin to Zone or Zone to Cabin. This table is meant to aid the understanding of different media source combination in mode transitions.

3.1.1.12 MSS-SR-REQ-410784/A-Error handling for vehicle audio mode switching

When the vehicle audio mode is switched from Cabin to Zone mode

1. The 'MSSApplicationServer' shall support to check if the status signal reported by the 'Audio IO Controller' is updated to 'DSP_VehicleAudioMode_Rsp=Zone', if not then after 5000 ms the MSSApplicationServer shall request the AudioResourceServer to switch the vehicle audio mode back to Cabin.
2. The audio source for the Cabin shall be updated to last active Zone 1 audio source (i.e. driver).

When the vehicle audio mode is switched from Zone to Cabin mode

1. The 'MSSApplicationServer' shall support to check if the status signal reported by the 'Audio IO Controller' is updated to 'DSP_VehicleAudioMode_Rsp=Cabin', if not then after 5000 ms the MSSApplicationServer shall request the AudioResourceServer to switch the vehicle audio mode back to Zone.
2. The audio source for those zone(s) shall be updated to last active audio source (if available), if not available shall be assigned with 'Audio OFF'.

MSSApplicationServer shall support to record the audio mode transition failure in terms of DTC. Refer IDS specification for more information.

3.1.1.13 MSS-SR-REQ-412292/A-Restriction to switch vehicle audio modes

When MSSApplicationServer receives the intent to switch the vehicle audio mode from Zone to Cabin,

1. When any of the passenger phone call (or) Driver Phone Call is active, the MSSApplicationServer **shall not** switch the vehicle audio mode to 'Cabin'. Only when the Driver phone call and/or Passenger phone call is not active, the MSSApplicationServer shall support to switch the vehicle audio mode to Cabin.

When MSSApplicationServer receives the intent to switch the vehicle audio mode from Cabin to Zone,

1. The MSSApplicationServer shall support to switch the vehicle audio mode to zone mode.
2. When any of the passenger phone call is active prior to the zone mode transition then the phone shall be continued in same mode (i.e. Privacy).

Note: Refer MSS Passenger phone call SPSS 'MSS-SR-REQ-418391' to get signal indicators of passenger phone call status.

3.1.2 Use cases

3.1.2.1 Passenger Media share - Use Cases

3.1.2.1.1 MSS-UC-REQ-422159/A-Passenger shares phone media with entire cabin

Actors	Vehicle User
Pre-conditions	• Infotainment System is ON. • Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. • Vehicle in full cabin mode. • Minimum of one phone is connected and mapped to passenger seat (i.e. either Seat 2/3/4). • All occupants listening to the media source selected by the Driver(ex. AM/FM,USB, Driver BT Media, SXM, iPod).
Scenario Description	• Front passenger (i.e. zone2 passenger) initiates Z2_BTMedia for entire cabin. • Driver allows the request from zone2 passenger.
Post-conditions	• Vehicle shall remain in full cabin mode. • BT Media shared by zone2 passenger shall play in full cabin mode.
List of Exception Use Cases	•
Notes	• The above use case is also applicable to zone3 and zone4 passenger with paired BT device.
Interfaces	Passenger BT Phone Client, MSSApplicationServer, Audio IO Controller, HMI, CAN

3.1.2.1.2 MSS-UC-REQ-422165/A-Passenger share phone media to their own media zone while vehicle in cabin mode

Actors	Vehicle User
Pre-conditions	• Infotainment System is ON. • Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. • Vehicle in full cabin mode. • 1 Phone is paired and mapped to the Zone1 (i.e. Driver phone).

	• Minimum of one is connected and mapped to the passenger Seat (i.e. either Seat 2/3/4). • All occupants listening to the media source selected by the Driver(ex. AM/FM,USB, Driver BT Media, SXM, iPod).
Scenario Description	• Front passenger (i.e. zone2 passenger) initiates Z2_BTMedia share for zone2. • Driver allows the media share request from zone2 passenger.
Post-conditions	• Vehicle shall transition from full cabin mode to 4 media zone mode. • BT Media shared by zone2 passenger shall play through their zone2 speakers. Zone 1,3,4 – shall listen to Driver media source. Zone 2 – Zone 2 Phone media
List of Exception Use Cases	
Notes	• Depending upon the zone selection (2 media zone or 4 media zone) the audio source shall be played across the media zone. • The above use case is also applicable to zone3 and zone4 passenger with paired BT device sharing audio for rear zone and in this case rear zone will listen to BT Media shared by zone3 or zone4 passenger and front zone shall play infotainment audio in front zone speakers.
Interfaces	Passenger BT Phone Client, MSSApplicationServer, Audio IO Controller, HMI, CAN

3.1.2.1.3 MSS-UC-REQ-422169/A-Zone3 passenger initiates phone media share with rear zone

Actors	Vehicle User
Pre-conditions	• Infotainment System is ON. • Vehicle audio mode transition between ‘Cabin’ and ‘Zone‘ mode is allowed. • Vehicle is in 2 media zone mode. • 1 Phone is paired and mapped to the Zone1 (i.e. Driver phone). • Minimum of one BT device is connected and mapped to the passenger seat (i.e. anywhere between Seat 2 to Seat 4). • Driver and front passenger are listening to media source selected by the driver (ex. PDC media source 1) or front passenger. • Rear passengers are listening to different media source selected by Driver. (ex. PDC media source 2)
Scenario Description	• Zone3 passenger initiates to Z3_BTMedia play with Zone 3 and Zone 4. • Driver accepts the share request.
Post-conditions	• Vehicle remains in zone mode. • Rear zone shall play audio from Zone3 BT device.
List of Exception Use Cases	
Notes	• The above use case is also applicable when zone4 passenger initiates BT media share.
Interfaces	Passenger BT Phone Client, MSSApplicationServer, Audio IO Controller, HMI, CAN

3.1.2.1.4 MSS-UC-REQ-422170/A-When passenger sharing Zx_BTMedia receives phone call

Actors	Vehicle User
Pre-conditions	• Infotainment System is ON. • Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. • Vehicle in 4 media zone mode. • 1 Phone is paired and mapped to Zone1 (i.e. Driver phone). • Minimum of one phone is connected and mapped to the passenger Seat (i.e. either Seat 2/3/4). • Zone2 passenger streaming BT Media to front zone receives/makes phone call. • While the zone2 passenger phone call is active, driver shall have no audio. (i.e. Audio OFF).
Scenario Description	• Driver selects new media for Driver zone(ex. AM/FM,USB, Driver BT Media, SXM, iPod).
Post-conditions	• The vehicle audio mode shall remain in zone mode. • The active phone call session for zone2 passenger shall go through zone speakers. • Driver shall listen to infotainment audio in zone speakers. • When the zone2 passenger active call is ended, it shall play from the last active audio source for Zone2 i.e. BT Media through Zone2 speakers.
List of Exception Use Cases	
Notes	• The above use case is also applicable to zone3 and zone4 passenger active phone call while playing BT Media. Front zone audio is uninterrupted in this case.
Interfaces	Passenger BT Phone Client, MSSApplicationServer, Audio IO Controller, HMI, CAN

3.1.2.1.5 MSS-UC-REQ-422163/A-When the full cabin is listening to Driver phone Call the passenger shares Zx_BTMedia with other zone(s)

Actors	Vehicle User
Pre-conditions	• Infotainment System is ON. • Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. • Vehicle in full cabin mode. • 1 Phone is paired and mapped to the Zone1 (i.e. Driver phone). • Minimum of one phone is connected and mapped to the passenger Seat (i.e. either Seat 2/3/4). • Driver is in phone call session and the last active cabin audio source shall be stacked and the entire cabin shall be listening to driver phone call.
Scenario Description	• When the Driver is in Phone call, Zone2 passenger shares its Z2_BTMedia to its own zone and then with the other Zones too(say zone 3/4). • Driver allows both the request from zone2 passenger.
Post-conditions	• Vehicle shall transition from full cabin mode to 4 media zone mode.

	• The active phone call session for the driver shall be through zone speakers. • Z2_BTMedia shall be played through Seat 2/3/4 speakers. • When the driver active call is ended, the vehicle audio mode shall remain in zone mode and Zone1 – shall be in driver media source Zone 2/3/4 – shall be in Z2_BTMedia.
List of Exception Use Cases	
Notes	• This same use case is also applicable when the Phone media is shared by the other zone passenger(s) when the driver is in phone call.
Interfaces	MSSApplicationServer, AudioResourceServer, Audio IO Controller, HMI, CAN

3.1.2.1.6 MSS-UC-REQ-422164/A-When the passenger sharing Zx_BTMedia with entire cabin is interrupted by phone call

Actors	Vehicle User
Pre-conditions	1. Infotainment System is ON. 2. Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. 3. Vehicle in full cabin mode. 4. 1 Phone is paired and mapped to the passenger Seat (ex. Zone3). 5. Zone 3 phone media is actively played through entire cabin.
Scenario Description	1. When the Zone 3 receives a phone call.
Post-conditions	1. Zone 3 phone call shall be pushed to private and when the Zone 3 is in phone call session, the audio source for entire cabin shall be in no audio. 2. Only when the Driver/other passenger selects new media, the selected media source shall be played in entire cabin. 3. When no media share is done while Zone 3 is in phone call then upon zone 3 phone call is ended, the last active zone 3 phone media for entire cabin shall be resumed.
List of Exception Use Cases	
Notes	1. The above use case is applicable to any passenger Seat that is sharing the phone media and when the media source is interrupted by phone call.
Interfaces	MSSApplicationServer, AudioResourceServer, Audio IO Controller, HMI, CAN

3.1.2.1.7 MSS-UC-REQ-422171/A-When in Zone mode the Front passenger shares Z2_BTMedia when driver is in phone call

Actors	Vehicle User
Pre-conditions	• Infotainment System is ON. • Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. • Vehicle in zone mode. • 1 Phone is paired and mapped to the Zone1 (i.e. Driver phone).

	• Minimum of one phone is connected and mapped to the passenger Seat (i.e. either Seat 2/3/4). • Driver streaming phone Media to both Driver zone and Front Zone passenger. • Rear Passenger(s) is listening to different audio source. • When sharing the phone media, the driver receives a phone call. The active phone call session shall go through driver zone speakers and the Zone2 passenger shall be in no audio.
Scenario Description	• Zone2 passenger initiates to share BT Media play for their own zone.
Post-conditions	• The vehicle audio mode shall remain in zone mode. • The active phone call session for the driver shall go through zone speakers. • Zone2 shall listen to BT audio in zone speakers. • When the driver phone call is ended, the driver phone media audio shall resume play back through driver zone1 speakers.
List of Exception Use Cases	
Notes	
Interfaces	MSSApplicationServer, AudioResourceServer, Audio IO Controller, HMI, CAN

3.1.2.1.8 MSS-UC-REQ-412224/A-Vehicle audio mode is switched to Zone Mode, when driver phone call is in progress

Actors	Vehicle Occupant
Pre-conditions	1. Infotainment System is Powered ON. 2. 'Passenger Zonal Audio Request = Enabled' by the vehicle user from the HMI. 3. 1 Phone is paired and mapped to the zone1 (i.e. Driver phone). Minimum of one phone is connected and mapped to the seat anywhere between 2 to 4. 4. Vehicle audio mode is in Full Cabin mode. 5. All the passengers in the vehicle is listening to the same common audio source and the audio is played through all cabin speakers (ex. FM Audio source). 6. Driver receives an incoming Phone call.
Scenario Description	1. Drivers phone ringing/Active Call is played through the Cabin. 2. Passenger from Zone 3 initiates Media share with zone3 only and the Driver accepts the media share.
Post-conditions	1. The vehicle audio mode shall be switched to Zone mode. 2. The active phone call session for the driver shall be continued through driver zone speakers. 3. The audio source for the passenger zone 2 and 4 shall be in Audio OFF. 4. The audio source for the passenger zone 3 shall be allocated with BT media from Zone 3(Z3_BTMedia). 5. The audio shall be played through their zone speakers. 6. When the active call is ended, the vehicle audio mode shall remain in Zone mode.

List of Exception Use Cases	
Notes	
Interfaces	MSSApplicationServer, AudioResourceServer, Audio IO Controller, G-HMI, Phone URC App.

3.1.2.2 Driver Media share Use Cases

3.1.2.2.1 MSS-UC-REQ-422161/A-Driver shares different media source with zone 3 when Driver phone call is active

Actors	Vehicle User
Pre-conditions	1. Infotainment System is ON. 2. Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. 3. Vehicle in full cabin mode. 4. 1 Phone is paired and mapped to the Zone1 (i.e. Driver phone). 5. Driver is in phone call and the entire cabin shall be able to listen to driver phone call.
Scenario Description	1. When the Driver is in Phone call, the Driver selects new media source for Zone 3 (ex. AM/FM,USB, Driver BT Media, SXM, iPod).
Post-conditions	1. The Driver shall be able to select and play media source for Zone 3 (other than the last stacked media source). 2. When the new source selection is initiated, the vehicle audio mode shall switch to 4 media zone. ~~3.~~ The active phone call session for driver shall be through zone1 speakers and Zone 2 & 4 source shall be audio OFF. 4. Zone 3 Passengers shall be able to listen to the shared media source.
List of Exception Use Cases	
Notes	1. The above use case is also applicable when the media is selected for Zone 4, zone 2 &3 source info is updated accordingly.
Interfaces	MSSApplicationServer, AudioResourceServer, Audio IO Controller, HMI, CAN

3.1.2.2.2 MSS-UC-REQ-422166/A-Driver shares different media source with the rear zone while vehicle in cabin mode

Actors	Vehicle User
Pre-conditions	1. Infotainment System is ON. 2. Vehicle audio mode transition between 'Cabin' and 'Zone' mode is allowed. 3. Vehicle in full cabin mode. 4. Driver and the passengers are listening to same cabin audio source. (ex. USB)
Scenario Description	1. The Driver intends to select a different media source(ex. AM/FM, Driver BT Media, SXM, iPod) for Zone 4 passengers.
Post-conditions	1. When the selection is initiated, the vehicle audio mode shall switch to 4 media zone mode. 2. Both the Driver and the Passenger zone(s) shall be able to listen to independent media source played through zone speakers.

	3. Depending upon driver selections and zone mode settings the audio shall be played through zone speakers. Zone 1,2,3 – continue listening to cabin media source Zone 4 – Newley selected media source.
List of Exception Use Cases	
Notes	
Interfaces	MSSApplicationServer, AudioResourceServer, Audio IO Controller, HMI, CAN

3.1.2.2.3 MSS-UC-REQ-412213/A-Vehicle audio mode is switched from Zone mode to Full cabin mode

Actors	Vehicle Occupant
Pre-conditions	1. Infotainment System is Powered ON. 2. 'Passenger Zonal Audio Request = Enabled' by the vehicle user from the HMI. 3. 1 Phone is paired and mapped to zone1 (i.e. Driver phone). Minimum of one phone is connected and mapped to passenger zone (i.e. anywhere between seat 2 to seat 4). 4. Vehicle audio mode is in Zone mode. (ex. Zone 1&2 – USB Media, Zone 3&4 – Z3_BTMedia)
Scenario Description	1. Vehicle Driver share driver media source with entire Cabin.
Post-conditions	1. Vehicle audio mode shall switch to Full cabin mode. 2. All the passengers in the vehicle shall be able to listen to Driver audio source (i.e. Full cabin – USB Media). 3. The Audio which was played earlier in the rear zone may be paused (or) released from passenger phone(s).
List of Exception Use Cases	
Notes	
Interfaces	MSSApplicationServer, AudioResourceServer, G-HMI, URC Client.

3.1.2.2.4 MSS-UC-REQ-412211/A-Full Cabin to Zone Mode transition when media is shared by Driver

Actors	Vehicle Occupant
Pre-conditions	1. Infotainment System is Powered ON. 2. 'Passenger Zonal Audio Request = Enabled' by the vehicle user from the HMI. 3. Vehicle audio mode is in Full Cabin mode and the vehicle is playing Driver preferred audio source. 4. No Phone is connected and mapped to passenger or Driver seat. 5. The audio shall sound through all cabin speakers.
Scenario Description	1. Vehicle Driver selects and share different PDC media source to the passenger zone 3.
Post-conditions	1. Vehicle audio mode shall switch to 4 media Zone mode. 2. When the audio mode is switched to zone mode Zone1 & 2 – Last active Driver media source. Zone 3 – newly selected PDC media source

	Zone 4 - Last active Driver media source. 3. The audio shall sound through Zone speakers.
List of Exception Use Cases	
Notes	This use case is also applicable to Zone 2 or 4, when the Driver shares the media, the vehicle audio mode shall transition to 4 media zone and the other zone(s) shall take last active media source.
Interfaces	MSSApplicationServer, Audio Resource Server, G-HMI

3.1.2.2.5 MSS-UC-REQ-413569/A-Restriction in selecting different Tuner audio source from the infotainment system

Actors	Vehicle Occupant
Pre-conditions	1. Infotainment System is Powered ON. 2. MSS vehicle audio mode is in Zone mode. 3. No Phone Call is active in the vehicle. 4. Front Media Zone is listening to FM Tuner audio. 5. Rear Media zone is listening to USB Media.
Scenario Description	1. Vehicle driver from the infotainment system tries to select and play a different media source with Rear Media zone.
Post-conditions	1. The infotainment system shall be restricted to select and play a different tuner source, but the current active FM tuner shall be shared with other zone(s). 2. The infotainment system shall be allowed to select and play other available media sources (ex. CD, iPod, BT Media, etc.,) or infotainment streaming audio sources (ex. Pandora, Sportify, etc.,) to the Rear Media zone.
List of Exception Use Cases	
Notes	1. No two different Tuner audio sources can be active at the same time in the infotainment system.
Interfaces	MSSOnboardClient, MSSApplicationServer, G-HMI.

3.1.2.3 MSS-UC-REQ-412215/A-Zone to Cabin switch is not allowed when the passenger/Driver is in phone call

Actors	Vehicle Occupant
Pre-conditions	1. Infotainment System is Powered ON. 2. 'Passenger Zonal Audio Request = Enabled' by the vehicle user from the HMI. 3. 1 Phone is paired and mapped to zone1 (i.e. Driver phone). Minimum of one phone is connected and mapped to the zone (i.e. anywhere between Zone 2 to Zone 4). 4. Vehicle audio mode is in Zone mode. 5. The passengers are listening to media source played through Zone speakers. (ex. Zone1&Zone2 = FM Source, Zone3= Phone Call3 and Zone4 = USB Media).

Scenario Description	1. Vehicle audio mode is switched from Zone mode to Full cabin mode. (ex. 'Passenger Zonal Audio Request = Disabled' (or) Media share is initiated by the Driver/passenger to entire Cabin).
Post-conditions	1. Audio mode transition from Zone to Cabin is not allowed, the system shall remain in Zone mode as long as the Phone call is active.
List of Exception Use Cases	
Notes	This use case also applicable to any of the rear zone passenger phone calls or when the Driver is in phone call session.
Interfaces	MSSApplicationServer, AudioResourceServer, G-HMI, URC Client.

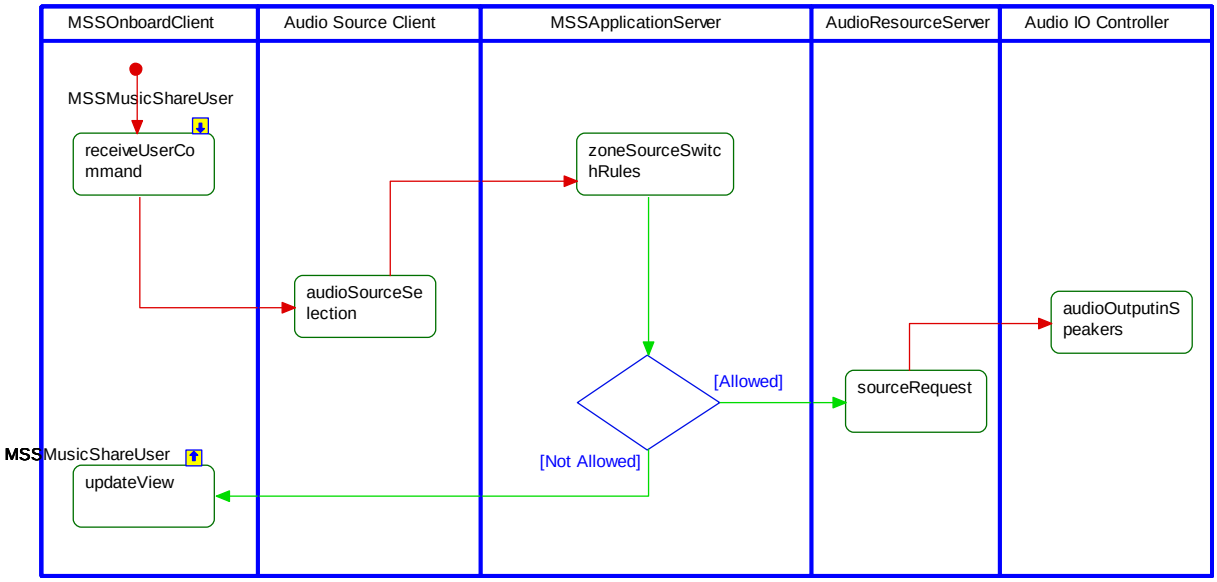
3.1.2.4 MSS-UC-REQ-412214/A-While Passenger shares phone media and when the phone loses BT connection

Actors	Vehicle Occupant
Pre-conditions	1. Infotainment System is Powered ON. 2. 'Passenger Zonal Audio Request = Enabled' by the vehicle user from the HMI. 3. One phone is paired and connected to the infotainment system and is mapped to rear zone passenger (ex. Phone3). 4. Vehicle audio mode is in Zone mode. 5. The passengers in the vehicle shall be able to listen the audio that is played through Zone speakers. (ex. Zone1 & Zone2 = USB Media, Zone3 & Zone4 = Z3_BTMedia)
Scenario Description	1. The Phone that is streaming the BT audio losses BT Connectivity with PAC. (ex. Seat 3 phone, BTConnection_Rsp(Opcode=Disconnected; SeatLocation=Seat3)
Post-conditions	1. Vehicle audio mode shall remain in Zone mode. 2. The media source for Zone 3 & 4 shall be in Audio OFF(last active BT media source is deallocated).
List of Exception Use Cases	
Notes	1. Refer Media share SPSS for requirements on phone connection handling when sharing passenger BT media, 'MSS-REQ-421042'. 2. Refer URC SPSS 'FUN-REQ-433128' for the BT connection/Disconnection handling.
Interfaces	MSSApplicationServer, AudioResourceServer, G-HMI, URC Client.

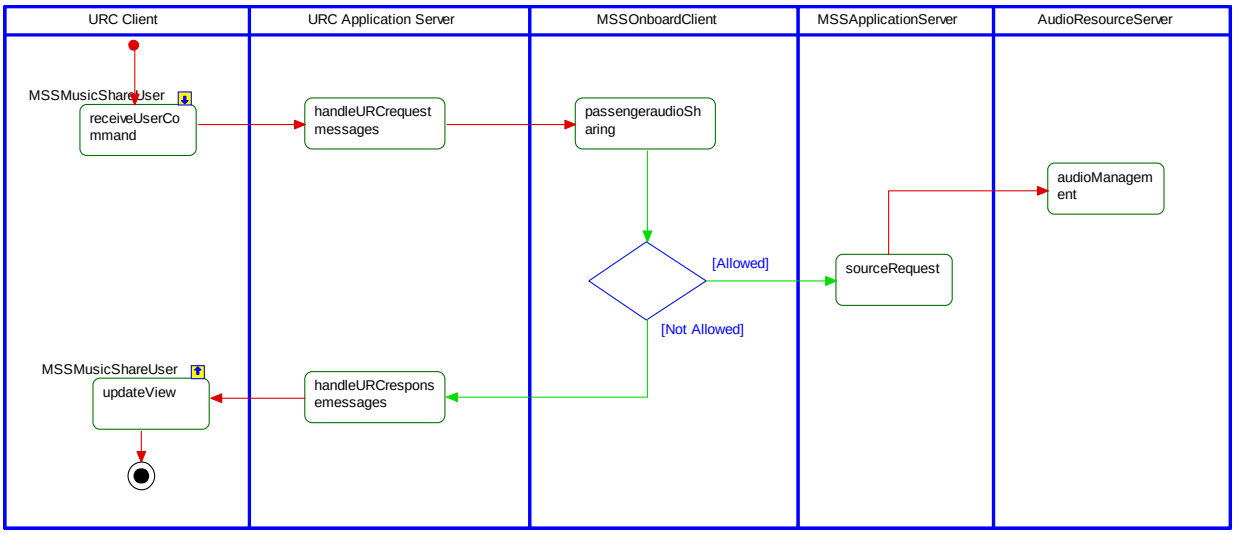
3.1.3 White Box View

3.1.3.1 Activity Diagrams

3.1.3.1.1 ACT-REQ-421031/A-Audio Source selection in Cabin & Zone mode



3.1.3.1.2 ACT-REQ-421032/A-Passenger BT Audio source operation



3.1.3.2 Sequence Diagrams

3.1.3.2.1 MSS-SD-REQ-412319/A-Vehicle Audio mode is switched from Zone mode to Cabin mode

Pre-condition

1. Vehicle Audio is in Zone Mode.
2. Vehicle Front Media Zone (i.e. Zon1 & Zone2) is listening to FM Tuner.
3. Vehicle Rear Media Zone (i.e. Zone 3 to 6) is listening to USB Audio shared by the Driver with the rear audio zone passenger(s).

Scenario

1. Vehicle user enable Cabin mode.

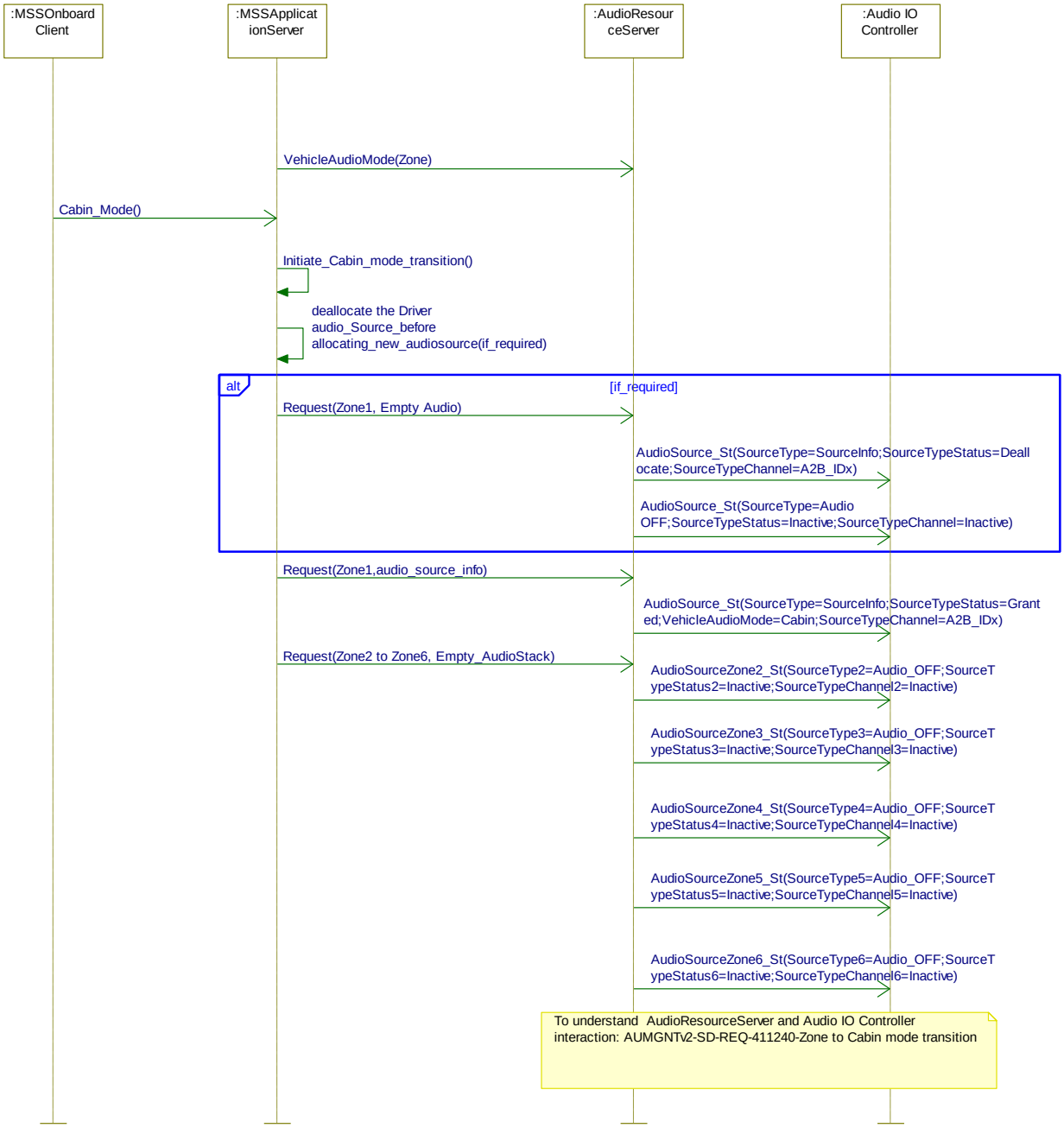
Post-condition

1. Vehicle audio mode shall switch to Cabin mode.

2. The audio source for all the vehicle passengers shall switch to Driver audio source (i.e. FM tuner).

Note: When there is any conflict between the Audio Resource Server and Audio IO Controller interface then the Audio Management spec would take priority.

Sequence Diagram



3.1.3.2.2 MSS-SD-REQ-412375/A-Vehicle Audio mode is switched from Cabin mode to Zone mode

Pre-condition

1. Vehicle Audio is Cabin Mode.
2. Vehicle Front and Rear Media Zone (i.e. Zone 1 to Zone 4) is listening to same audio source. (ex. USB Media).

Scenario

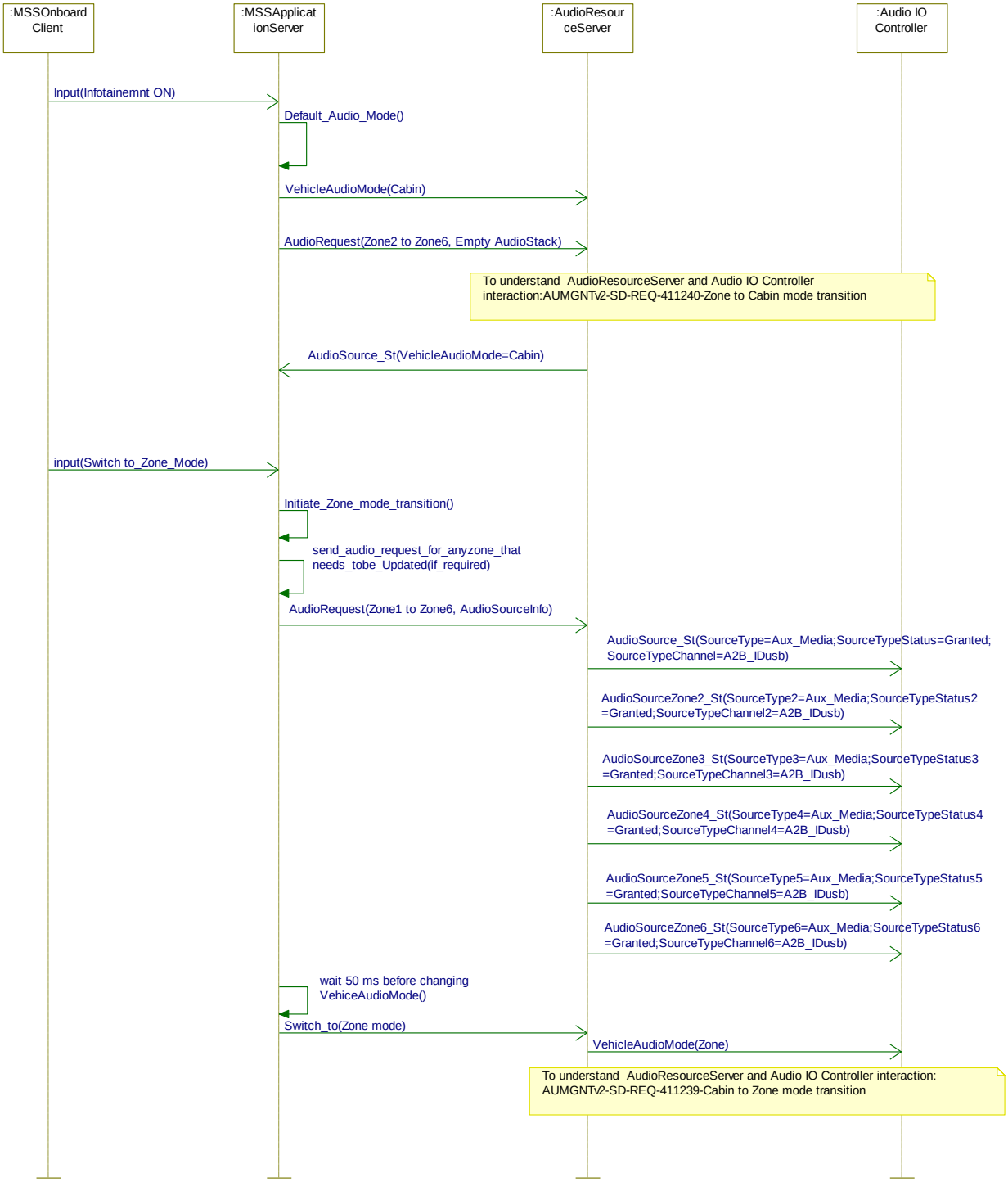
1. Vehicle user enables Zone mode.

Post-condition

1. Vehicle audio mode shall switch to Zone mode.
2. The audio source for Front Media Zone (i.e. Zone1 to Zone2) and the Rear Media Zone (i.e. Zone3 to Zone 4) shall be switched to Driver audio source (i.e. USB).

Note: When there is any conflict between the Audio Resource Server and Audio IO Controller interface then the Audio Management spec would take priority.

Sequence Diagram



3.1.3.2.3 MSS-SD-REQ-416644/A-Different audio source is selected for the same Media Zone

Pre-condition

1. Vehicle audio mode is in Zone mode.
2. Front Media Zone active with FM active (i.e. Zone 1 and Zone 2 have AudioSource.St & AudioSourceZone2.St (SourceType = FM)).

3. Rear Media zone active with USB Media. i.e. Zone 3 & zone 4 have AudioSourceZone3.St to AudioSourceZone4.St (SourceType = USB)).

Scenario

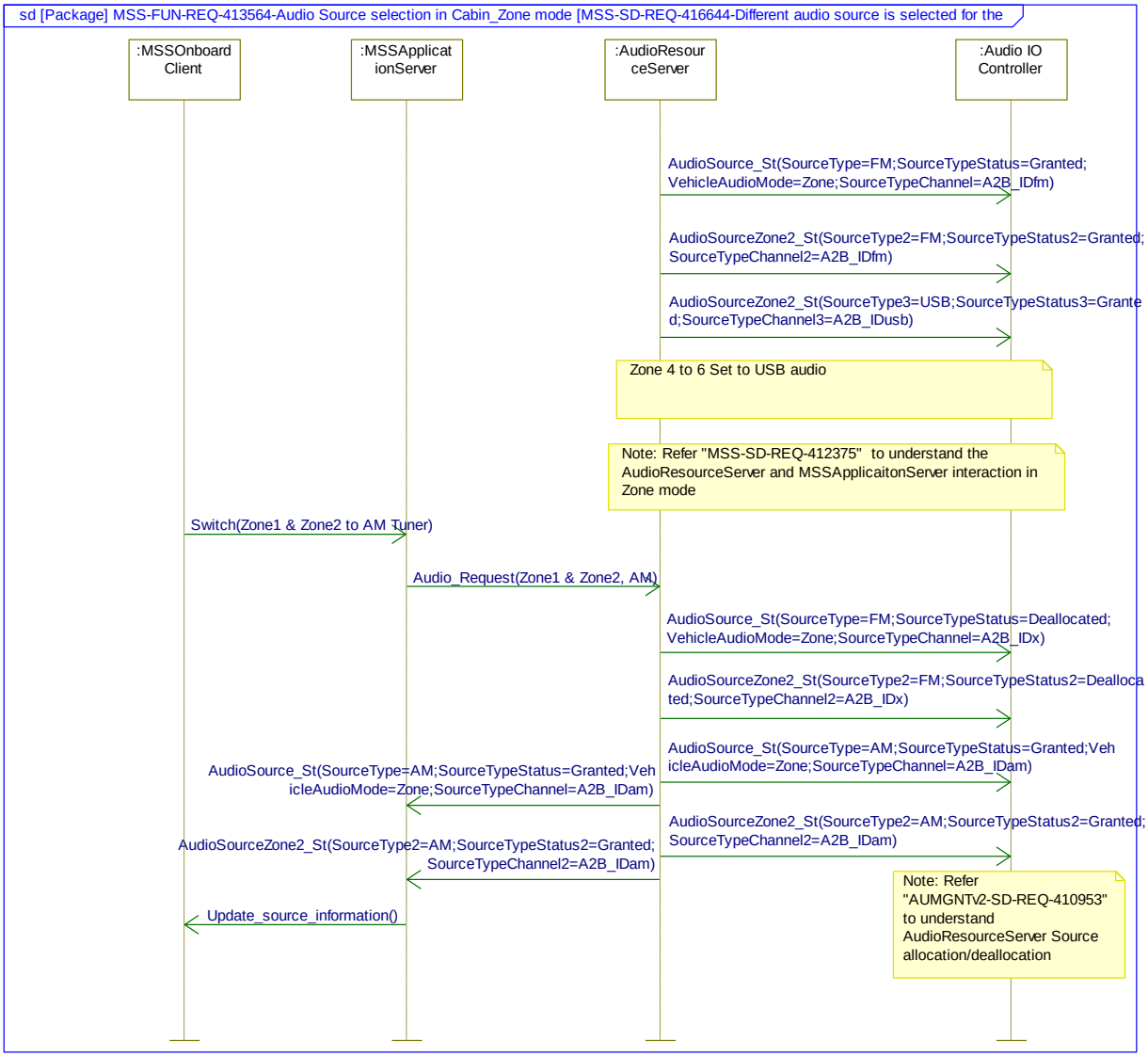
1. Different audio source is selected (ex. AM Tuner) is selected for the Front Media zone from the infotainment screen.

Post-condition

1. Front Media zone source is switched from FM tuner to AM tuner.
   (i.e. Zone 1 and Zone 2 have AudioSource.St & AudioSourceZone2.St (SourceType = AM)).
2. The infotainment system shall continue to play USB media for the rear media zone and the audio shall not be interrupted by the source change in Front Media zone.

Note: When there is any conflict between the Audio Resource Server and Audio IO Controller interface then the Audio Management spec would take priority.

Sequence Diagram



3.1.3.2.4 MSS-SD-REQ-421465/A-Driver shares audio source with rear passenger Triggers Cabin to Zone mode transition

Pre-condition

1. Vehicle audio mode is in Cabin Mode.
2. Vehicle audio mode transition between cabin and Zone mode is allowed.

3. No Phone call is active in the vehicle.
4. Vehicle Passengers are listening to the AM Tuner audio played through entire Cabin.
5. Driver Phone is connected and mapped to the Zone1. (Available in the Infotainment system screen for selection).

Scenario

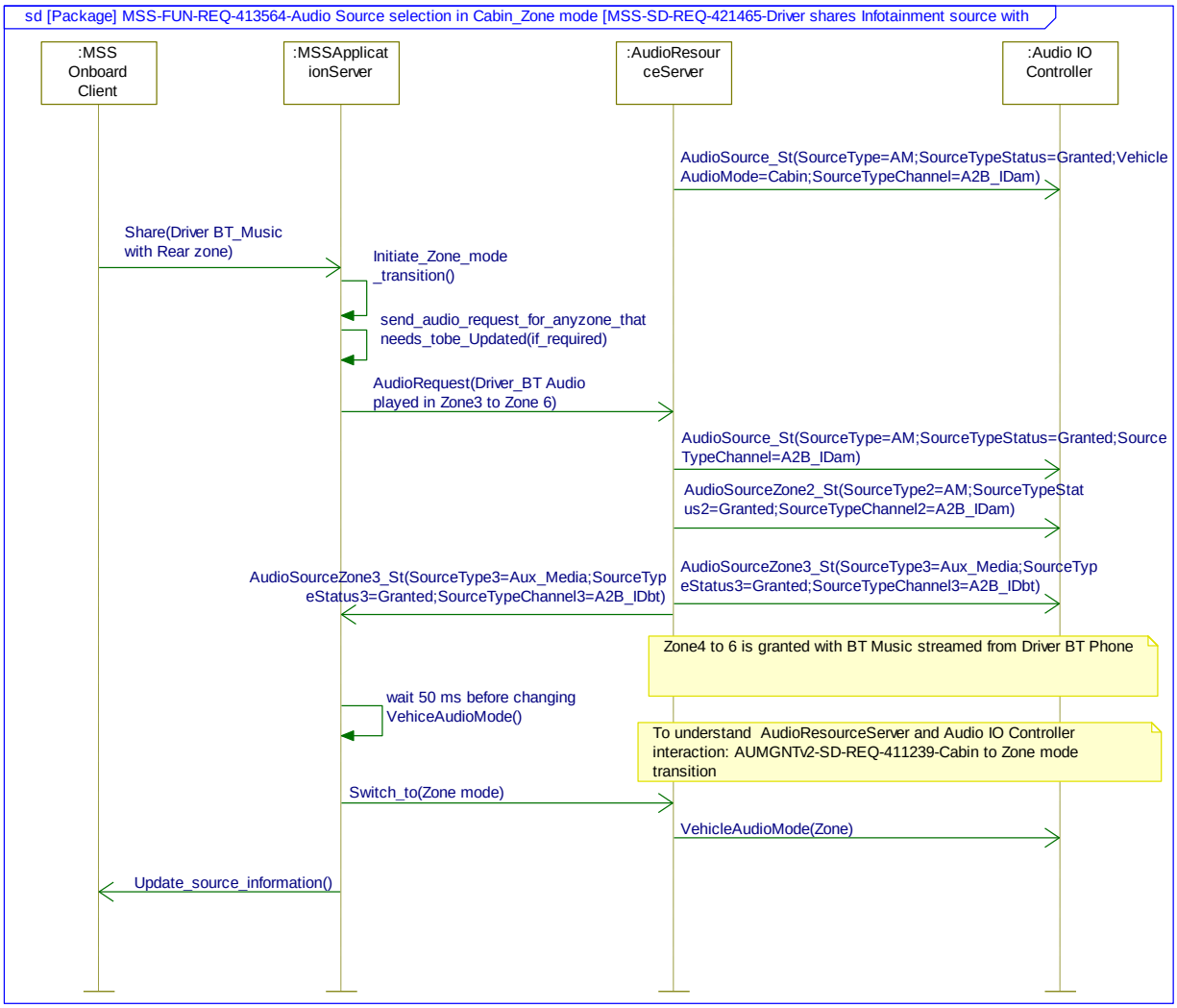
1. Driver intends to share the BT Media only with the rear Media zone passenger and still wants to continue listening to AM audio for the Front Media zone.

Post-condition

1. Vehicle audio mode shall switch to zone mode.
2. Vehicle audio source for the Front Media zone shall continue to play the AM Tuner audio (i.e. Zone1 & Zone2).
3. Vehicle audio source for the Rear Media zone shall play BT Media streamed from the Zone 3 passenger (i.e. Zone3 & Zone4).

Note: When there is any conflict between the Audio Resource Server and Audio IO Controller interface then the Audio Management spec would take priority.

Sequence Diagram



3.1.3.2.5 MSS-SD-REQ-421469/A-Driver shares audio source with rear passenger while the passenger in zone mode listening to different source

Pre-condition

1. Vehicle audio mode is in Zone Mode.
2. Vehicle audio mode transition between cabin and Zone mode is allowed.

3. Zone 2 Phone call is active in the vehicle.
4. Zone 1 passenger is listening to Drive phone media.
5. Zone 3 passengers are listening to USB media
6. Zone 4 passengers are listening to BT Media streamed by Zone 4 passenger phone.

Scenario

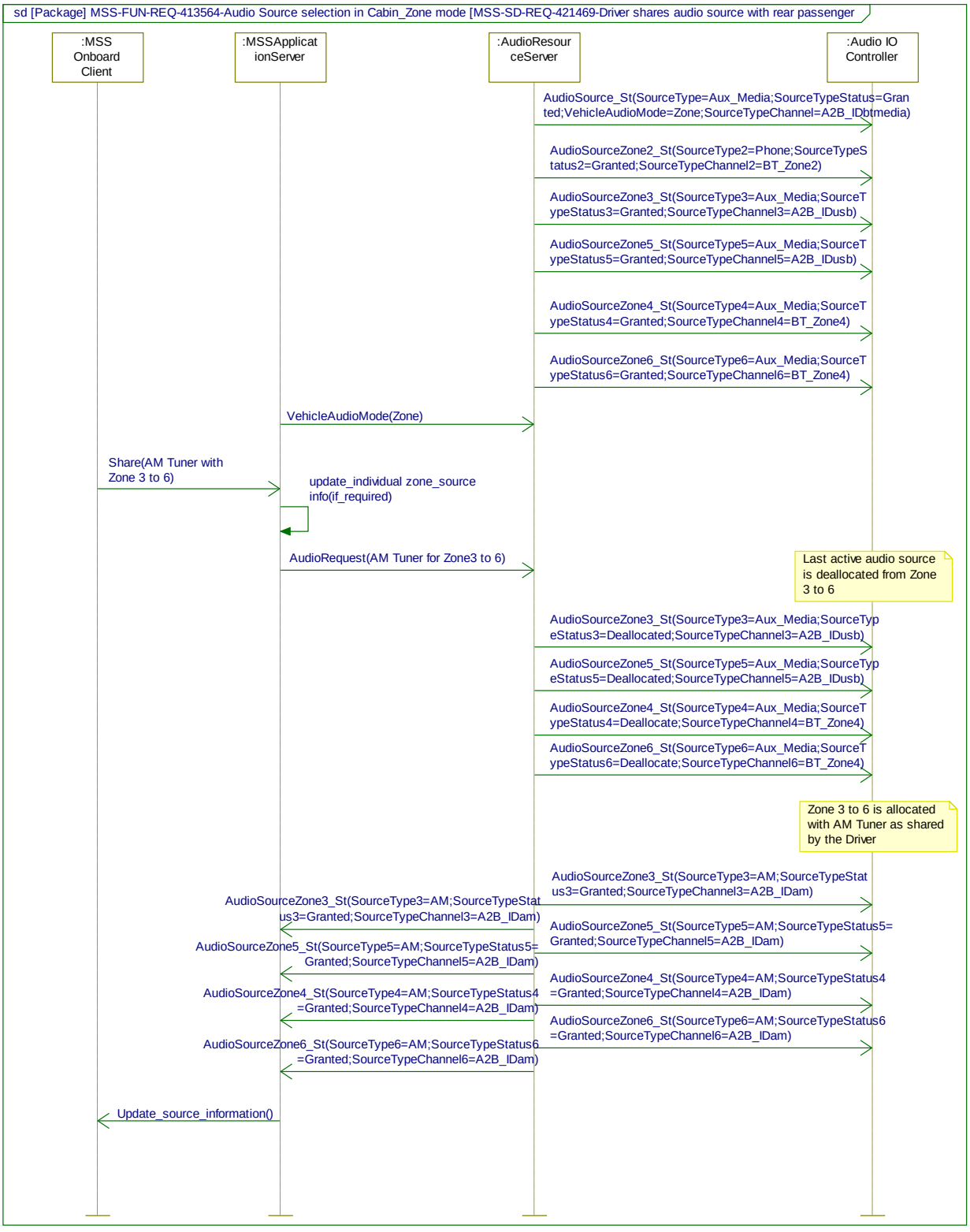
1. Driver intends to share AM tuner audio source with all the rear zone passenger (i.e. Zone 3 to Zone 4).

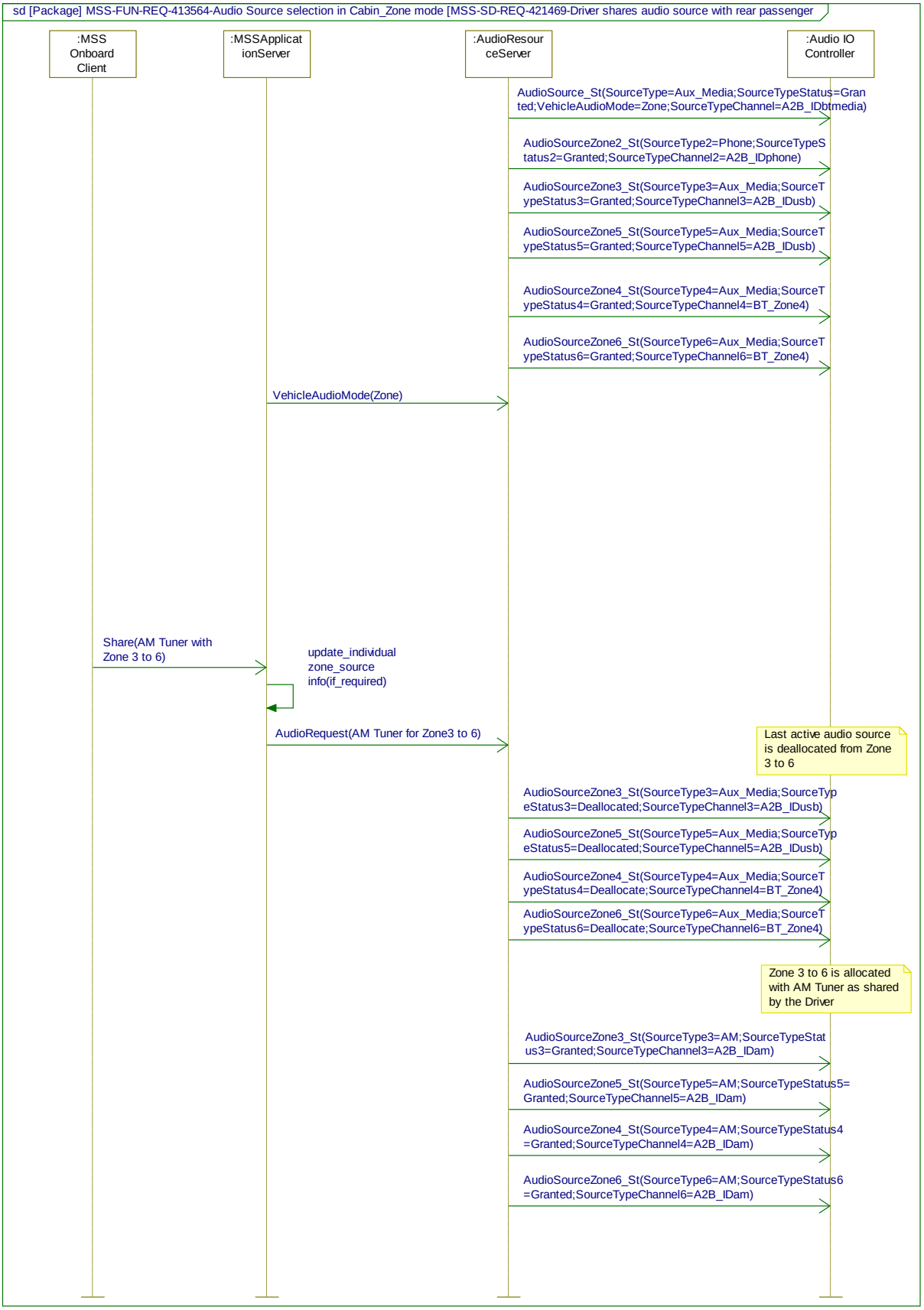
Post-condition

1. Vehicle audio mode shall remain in zone mode.
2. Zone 2 Phone call shall be continued in the vehicle.
3. Zone 1 shall continue listening in Driver phone media.
4. Zone 3 & 4 passengers shall switch to AM tuner audio source.

Note: When there is any conflict between the Audio Resource Server and Audio IO Controller interface then the Audio Management spec would take priority.

Sequence Diagram




sd [Package] MSS-FUN-REQ-413564-Audio Source selection in Cabin_Zone mode [MSS-SD-REQ-421469-Driver shares audio source with rear passenger
:MSS Onboard Client
:MSSApplicationServer
:AudioResourceServer
:Audio IO Controller
AudioSource_St(SourceType=Aux_Media;SourceTypeStatus=Granted;VehicleAudioMode=Zone;SourceTypeChannel=A2B_IDbtmedia)
AudioSourceZone2_St(SourceType2=Phone;SourceTypeStatus2=Granted;SourceTypeChannel2=A2B_IDphone)
AudioSourceZone3_St(SourceType3=Aux_Media;SourceTypeStatus3=Granted;SourceTypeChannel3=A2B_IDusb)
AudioSourceZone5_St(SourceType5=Aux_Media;SourceTypeStatus5=Granted;SourceTypeChannel5=A2B_IDusb)
AudioSourceZone4_St(SourceType4=Aux_Media;SourceTypeStatus4=Granted;SourceTypeChannel4=BT_Zone4)
AudioSourceZone6_St(SourceType6=Aux_Media;SourceTypeStatus6=Granted;SourceTypeChannel6=BT_Zone4)
VehicleAudioMode(Zone)
Share(AM Tuner with Zone 3 to 6)
update_individual zone_source info(if_required)
AudioRequest(AM Tuner for Zone3 to 6)
Last active audio source is deallocated from Zone 3 to 6
AudioSourceZone3_St(SourceType3=Aux_Media;SourceTypeStatus3=Deallocated;SourceTypeChannel3=A2B_IDusb)
AudioSourceZone5_St(SourceType5=Aux_Media;SourceTypeStatus5=Deallocated;SourceTypeChannel5=A2B_IDusb)
AudioSourceZone4_St(SourceType4=Aux_Media;SourceTypeStatus4=Deallocate;SourceTypeChannel4=BT_Zone4)
AudioSourceZone6_St(SourceType6=Aux_Media;SourceTypeStatus6=Deallocate;SourceTypeChannel6=BT_Zone4)
Zone 3 to 6 is allocated with AM Tuner as shared by the Driver
AudioSourceZone3_St(SourceType3=AM;SourceTypeStatus3=Granted;SourceTypeChannel3=A2B_IDam)
AudioSourceZone5_St(SourceType5=AM;SourceTypeStatus5=Granted;SourceTypeChannel5=A2B_IDam)
AudioSourceZone4_St(SourceType4=AM;SourceTypeStatus4=Granted;SourceTypeChannel4=A2B_IDam)
AudioSourceZone6_St(SourceType6=AM;SourceTypeStatus6=Granted;SourceTypeChannel6=A2B_IDam)

3.1.3.2.6 MSS-SD-REQ-421097/A-Rear Passenger shares audio to their own media zone that triggers Cabin to Zone mode transition

Pre-condition

1. Vehicle audio mode is in Cabin Mode.
2. Vehicle audio mode transition between cabin and Zone mode is allowed.
3. No Phone call is active in the vehicle.
4. Vehicle Passengers are listening to the AM Tuner audio played through entire Cabin.

Scenario

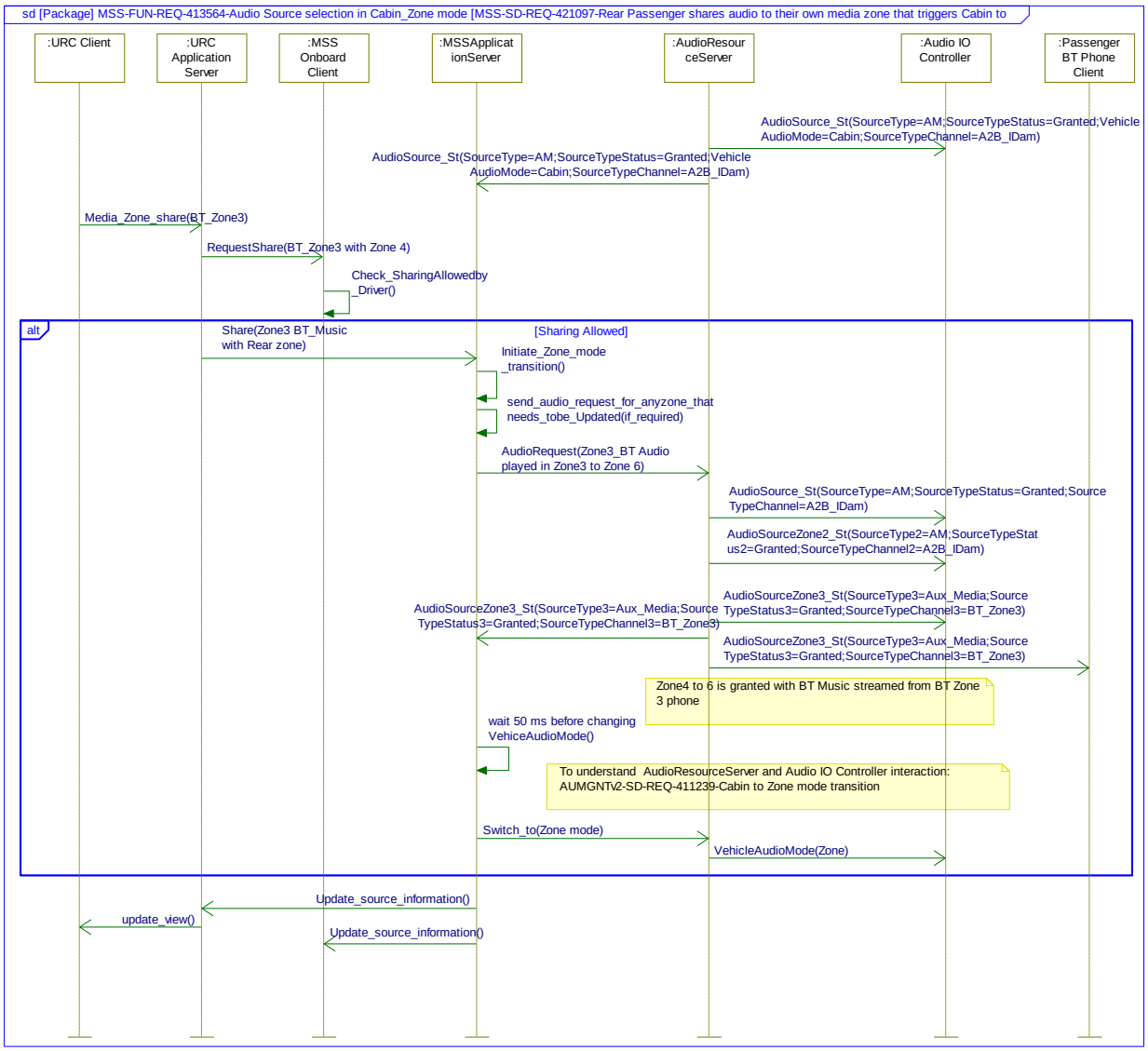
1. From the Phone connected and mapped to the Zone3, the user intends to share the BT Media (via URC APP) with the Rear Media zone passenger.
1. Driver allows the sharing request from the Zone 3 passenger and allows the vehicle to transition from Full cabin to zone mode.

Post-condition

1. Once the sharing is accepted, Vehicle audio mode shall switch to zone mode.
2. Vehicle audio source for the Front Media zone shall continue to play the AM Tuner audio (i.e. Zone1 & Zone2).
3. Vehicle audio source for the Rear Media zone shall play BT Media streamed from the Zone 3 passenger (i.e. Zone3 to Zone 4).

Note: When there is any conflict between this spec for Audio Resource Server and Audio IO Controller then the Audio Management spec would take priority.

Sequence Diagram



3.1.3.2.7 MSS-SD-REQ-421098/A-Passenger shares audio with entire Cabin that triggers Zone to Cabin mode transition

Pre-condition

1. Vehicle audio mode is in Zone Mode.
2. Vehicle audio mode transition between cabin and Zone mode is allowed.
3. No Phone call is active in the vehicle.
4. Front Media Zone passengers is listening to FM tuner audio (i.e. Zone 1 and Zone 2).
5. Rear Media Zone passengers is listening to USB audio (i.e. Zone 3 & 4).

Scenario

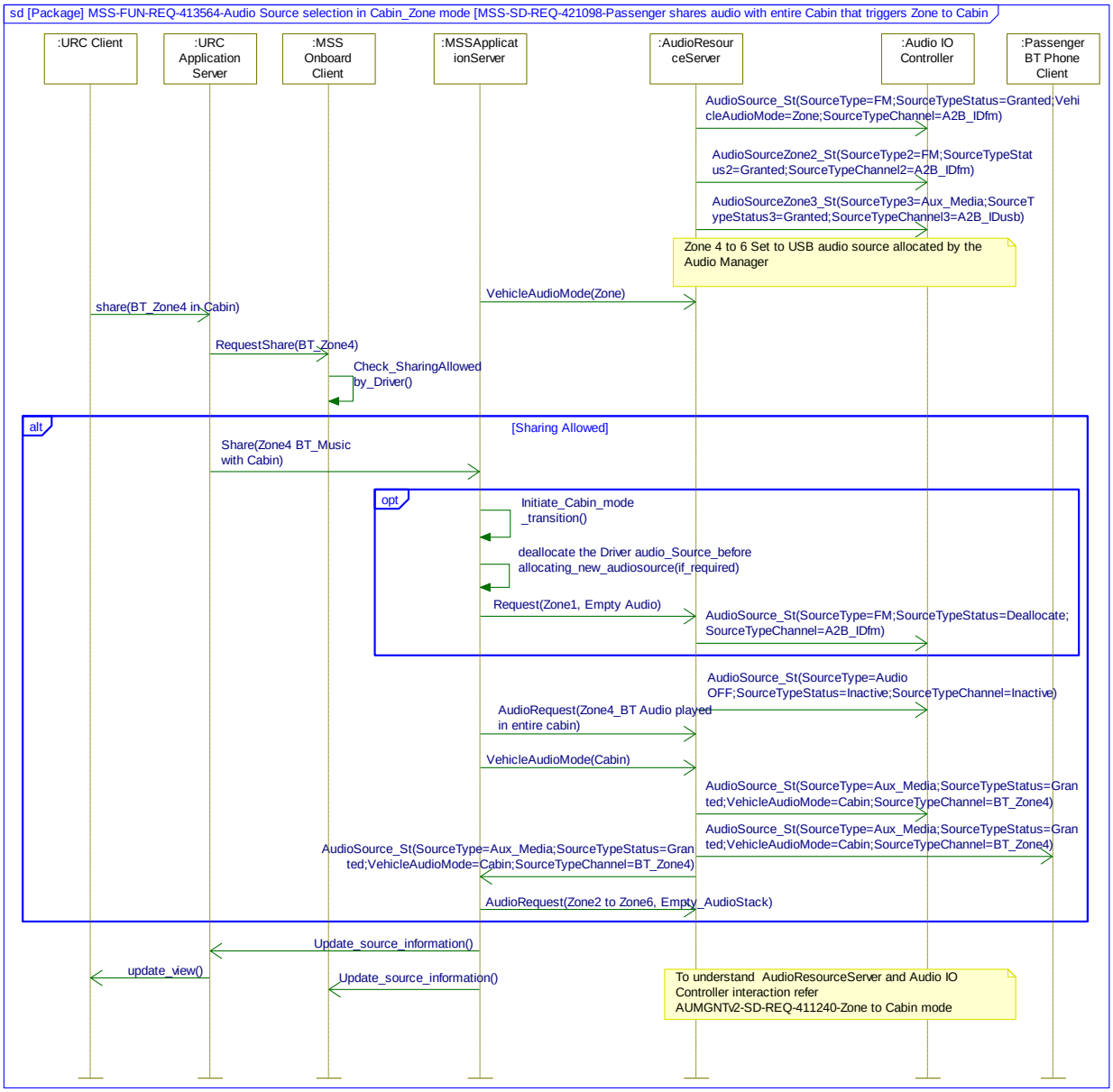
1. From the Phone connected and mapped to the Seat 4, the user intends to share the BT Music (via URC APP) with entire cabin.
2. Driver allows the sharing request from the Zone 4 passenger and allows the vehicle to transition from Zone mode to cabin.

Post-condition

1. Once the sharing request is accepted, the Vehicle audio mode shall transition to Cabin mode.
2. Vehicle audio source for entire cabin shall play the audio source streamed by the Zone 4 passenger.

Note: When there is any conflict between this spec for Audio Resource Server and Audio IO Controller then the Audio Management spec would take priority.

Sequence Diagram



3.1.3.2.8 MSS-SD-REQ-421099/A-Passenger shares audio with the other rear zone passenger and when the 4 media zone transitions to 2 Media zone

Pre-condition

1. Vehicle audio mode is in Zone Mode.
2. Vehicle audio mode transition between cabin and Zone mode is allowed.
3. Zone 2 Phone call is active in the vehicle.
4. Zone 1 passenger is listening to FM tuner audio.
5. Zone 3 passengers are listening to USB media
6. Zone 4 passengers are listening to BT Media streamed by Zone 4 passenger phone.

Scenario

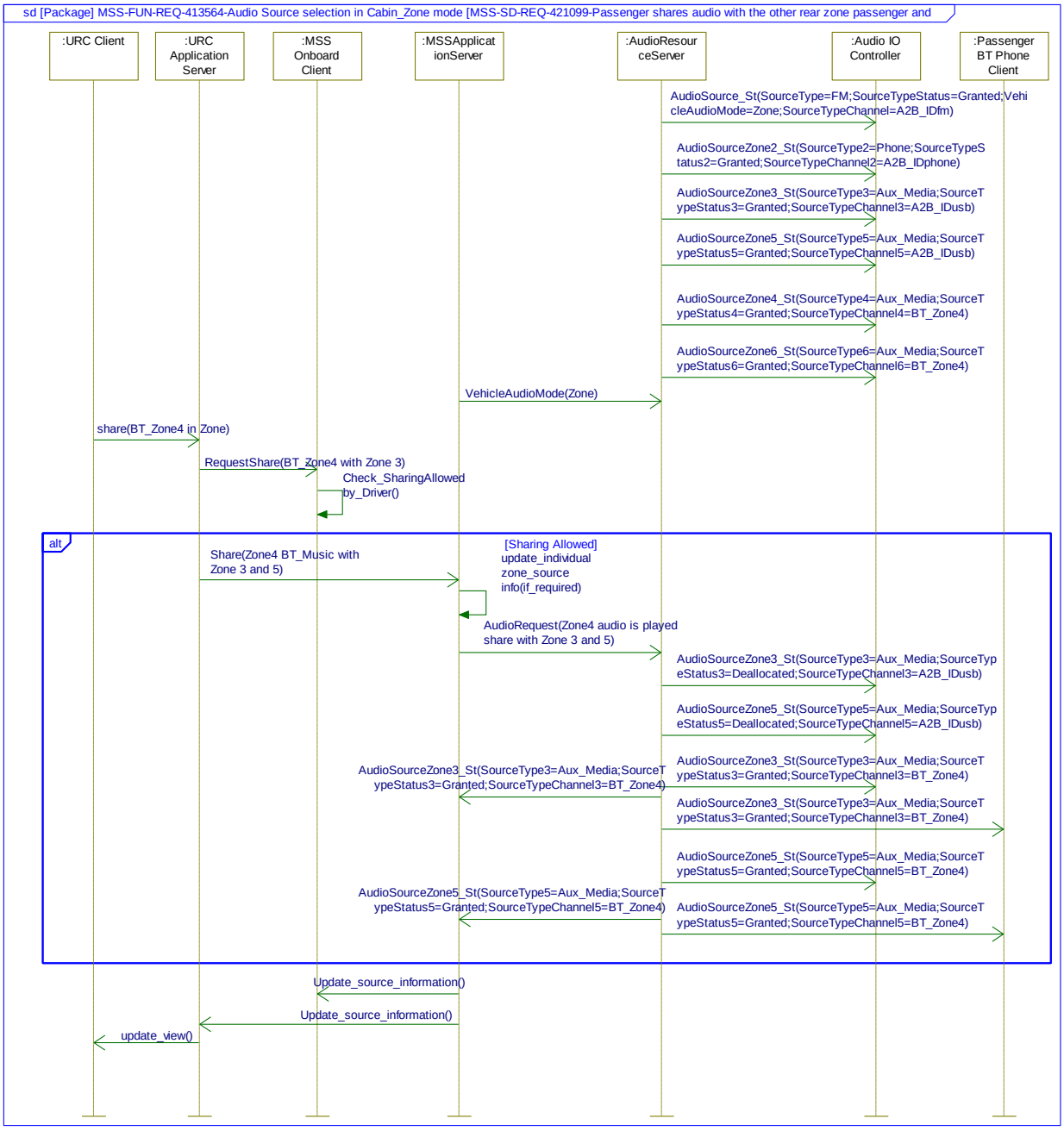
1. From the Phone connected and mapped to the Seat 4, the user intends to share the BT Music (via URC APP) with entire Rear Media zone passenger (i.e. From Zone 3 to Zone 4).
2. Driver allows the sharing request from the Zone 4 passenger.

Post-condition

1. Vehicle audio mode shall remain in zone mode.
2. Zone 2 Phone call shall be continued in the vehicle.
3. Zone 1 shall continue listening in FM tuner audio.
4. Zone 3 & 4 passengers shall listen to BT Media streamed by Zone 4 passenger phone.

Note: When there is any conflict between this spec for Audio Resource Server and Audio IO Controller then the Audio Management spec would take priority.

Sequence Diagram



3.2 MSS-FUN-REQ-410789/A-MSS Mixable Prompt

3.2.1 Requirements

3.2.1.1 MSS-SR-REQ-425397/A-Mixable prompt activation in Zone Mode

When the vehicle audio mode is in zone mode and when any of the voice prompt (i.e. System Prompts, Navigation Prompts) get activated, then 'MSSApplicationServer' shall interface with 'Prompt Generator' to produce voice prompt only out of Driver zone speakers (i.e. seat 1).

These prompts shall be mixed with the current audio source (if applicable) played by the infotainment system.

3.2.1.2 MSS-SR-REQ-415409/A-Driver focused targeted prompt activation rules

When the MSSApplicationServer intends to sound a prompt only for the Driver Zone (i.e. Zone1) then, the MSSApplicationServer shall request the 'Prompt Generator' to produce prompt only for the driver zone speakers. After the MSSApplicationServer requested the 'Prompt Generator' to produce the prompt it shall wait for the ongoing prompt to complete before it places the new request to the 'Prompt Generator'.

Note: Refer Audio Management SPSS for more details on Mixable Audio Prompts 'AUMGNTv2-FUN-REQ-410867-Mixable Prompts'

3.3 MSS-FUN-REQ-422817/A-VR Session activation in Zone Mode

3.3.1 Requirements

3.3.1.1 MSS-SR-REQ-422818/A-VR Session Activation in Zone Mode

When the vehicle audio mode is in zone mode and when the VR session is activated, then

Regardless of 2 media audio or 4 media audio zone is selected

1. The MSSApplicationServer shall allow VR source request to AudioResourceServer for Zone1 only (i.e. Driver zone).
2. When Zone1 audio source is being shared with other zone(s), then the MSSApplicationServer shall request the AudioResourceServer to set the audio source for those zone(s) to Audio OFF (i.e. driver source deallocated) for the duration of VR Session.

When the VR becomes inactive,

1. The MSSApplicationServer shall request the AudioResourceServer to set the audio source for Zone 1 to last active audio source.
2. The MSSApplicationServer shall also interface with AudioResourceServer to resume play back for those passenger zone(s) where the driver audio source was shared prior to VR session.

Note1: Refer Volume SPSS, to understand the Volume adjustment in Zone 1 when the VR session is active.
Note 2: VR Source is not supported for Zone 2 to 6.

3.3.1.2 MSS-SR-REQ-425945/A-Summary of audio source matrix when VR Session activated in zone mode

Audio Source matrix when VR source becomes active in 2 media audio zone system

Scenario	**Pre-Condition:** Current active media source in 2 media audio zone system				**Event:**	**Post-Condition:** New media source in the zones				**Comments**
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**	
case 1	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	X (either PDC Media Source 2 or Z3_BTMedia)	X (Zone3 media shared with Zone4)	VR Activated (for Zone1)	VR	Audio OFF	X (either PDC Media Source 2 or Z3_BTMedia)	X (Zone3 media shared with Zone4)	
case 2	X (PDC Media Source 1)	X (Zone1 media shared with Zone2)	X (Zone1 media shared with Zone3)	X (Zone1 media shared with Zone4)	VR Activated (for Zone1)	VR	Audio OFF	Audio OFF	Audio OFF	
Case 3	X (PDC Media Source 1)	X (Z2_BTPhone)	X (either PDC Media Source 2 or	X (Zone3 media shared with Zone4)	VR Activated (for Zone1)	VR	X (Z2_BTPhone)	X (either PDC Media Source 2 or	X (Zone3 media shared with Zone4)	If the Zone 2 phone call ends when VR is active, the Zone 2 shall remain in Audio OFF

			Z3_BTM edia)					Z3_BTM edia)		if the last active source is Zone1 shared media.

Audio Source matrix when VR source becomes active in 4 media audio zone system

Scenario	**Pre-Condition:** Current active media source in 4 media audio zone system				**Event:**	**Post-Condition:** New media source in the zones				**Comments**
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**	
case 1	X (PDC Media Source 1)	X (PDC Media Source 2)	X (Z3_BT Media)	X (Z4_BTM edia)	VR Activated (for Zone1)	VR	X (PDC Media Source 2)	X (Z3_BT Media)	X (Z4_BTM edia)	
case 2	X (PDC Media Source 1)	X (PDC Media Source 2)	X (Zone1 media shared with Zone3)	X (Zone1 media shared with Zone4)	VR Activated (for Zone1)	VR	X (PDC Media Source 2)	Audio OFF	Audio OFF	
Case 3	X (PDC Media Source 1)	X (Z2_BTM edia)	X (either PDC Media Source 2 or Z3_BTM edia)	X (Z4_BTPh one)	VR Activated (for Zone1)	VR	X (Z2_BTPh one)	X (either PDC Media Source 2 or Z3_BTM edia)	X (Z4_BTPh one)	If the Zone 4 phone call ends when VR is active, the Zone 4 shall remain in Audio OFF if the last active source is Zone1 shared media.

Audio Source matrix when VR source becomes Inactive in 2&4 media audio zone system

Scenario	**Pre-Condition:** VR is active in Driver Zone. In 2 or 4 media audio zone system				**Event:**	**Post-Condition:** New media source in the zones				**Comments**
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**	
case 1	VR (last active Zone1 source is stacked)	X (either PDC Media Source 2 or Z2_BT Media)	X (Z3_BT Media)	X (Z4_BTMedi a)	VR Inactive (for Zone1)	X (Last active Zone 1 media Source)	X (either PDC Media Source 2 or Z2_BTM edia)	X (Z3_BT Media)	X (Z4_BTM edia)	
case 2	VR (last active Zone1 source is stacked)	Audio OFF (last active shared Zone1 source is stacked)	X3 (either Driver or Passenge r media source2)	Audio OFF (last active Zone1 source is stacked)	VR Inactive (for Zone1)	X (Last active Zone 1 media Source)	X (Last active Zone 1 media Source)	X3 (either Driver or Passenge r media source2)	X (Last active Zone 1 media Source)	
Case 3	VR	Audio OFF (last active shared Zone1	Audio OFF (last active shared Zone1	Audio OFF (last active shared Zone1 source is stacked)	VR Inactive (for Zone1)	X (Last active Zone 1 media Source)	X (Last active Zone 1 media Source)	X (Last active Zone 1 media Source)	X (Last active Zone 1 media Source)	If the Zone 4 phone call ends when VR is active, the Zone 4 shall remain

		source is stacked)	source is stacked)							in Audio OFF if the last active source is Zone1 shared media.

3.4 MSS-FUN-REQ-425437/A-Radio Announcement activation in Zone Mode

3.4.1 Requirements

3.4.1.1 MSS-SR-REQ-425438/A-RA session activated when tuner is played only in Driver media zone

In zone mode, when the Radio Announcement (RA) becomes active, while the Zone 1 is listening to 'FM / DAB' audio source the following applies

Regardless of 2 media audio or 4 media audio zone is selected

1. The MSSApplicationServer shall only pass any Radio Announcement (RA) audio request to the AudioResourceServer for Zone 1 only. (i.e. Driver zone). For details on RA audio requests reference the applicable FM or DAB SPSS specification.
2. The MSSApplicationServer shall never pass a RA audio request to the Audio Resource Server for zone 2 – 6.
3. When any of the passenger zone(s) is in 'FM / DAB' audio source already, then the MSSApplicationServer shall never pass RA audio request to the Audio Resource Server for zone 2 – 6. The Audio source for those zone(s) shall remain in 'FM / DAB'.

When the Radio Announcement becomes inactive,

1. The MSSApplicationServer shall send the release request from the DAB/FM Server/Client to the AudioResourceServer for zone 1 and the AudioResourceServer would make the previous shared Stacked source Granted if applicable.

3.4.1.2 MSS-SR-REQ-425637/A-RA session activated when Driver shares the audio source with other zone(s)

In zone mode, when the Zone 1 (i.e. driver zone) is listening to an audio source other than 'FM / DAB' and the same audio source is being shared with other zone(s) and at the same time the Radio Announcement becomes active,

Regardless of 2 media audio or 4 media audio zone is selected

1. The MSSApplicationServer shall only pass any Radio Announcement (RA) audio request to the AudioResourceServer for Zone 1 only. (i.e. Driver zone). While the RA is active.
2. The MSSApplicationServer shall interface with AudioResourceServer to set the audio source for those shared passenger zone(s) to 'Audio OFF' (i.e. "Driver shared source is stacked or deallocated") for the duration of RA.

When DAB or FM Server/Client releases the Radio Announcement

1. The MSSApplicationServer shall send the release request from the DAB/FM Server/Client to the AudioResourceServer for zone 1 and the AudioResourceServer would make the previous shared Stacked source Granted if applicable.
2. For the shared passenger zone(s), the MSSApplicationServer shall interface with AudioResourceServer to request the last active shared driver audio source.

3.4.1.3 MSS-SR-REQ-425638/A-RA session activated when Tuner source is played only in passenger zone(s)

In zone mode, when Zone 1 (i.e. driver zone) is listening to different audio source (other than FM/DAB) and the passenger(s) zone(s) is listening to 'FM/DAB' audio source and at the same time the Radio Announcement becomes active the following applies

Regardless of 2 media audio or 4 media audio zone is selected

1. The MSSApplicationServer shall only pass any Radio Announcement (RA) audio request to the AudioResourceServer for Zone 1 only. (i.e. Driver zone). For details on RA audio requests reference the applicable FM or DAB SPSS specification.
2. When the tuner audio source is the last active audio source in the passenger zone(s), then the MSSApplicationServer shall allow the audio source for those zone to remain in 'FM/DAB'.

When the Radio Announcement becomes inactive,

1. The MSSApplicationServer shall send the release request from the DAB/FM Server/Client to the AudioResourceServer for zone 1 and the AudioResourceServer would make the previous shared Stacked source Granted if applicable.

3.4.1.4 MSS-SR-REQ-425946/A-Summary of audio source matrix when RA Session activated in zone mode

Audio Source matrix when RA source becomes active in 2 media audio zone system

Scenarios	**Pre-Condition:** Current active media source in 2 media audio zone system				**Event**	**Post-Condition:** New media source in the zones			
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**
Case 1	FM / DAB	FM / DAB	X (Driver or Passenger selected media source1)	X (Driver or Passenger selected media source1)	RA active	RA	FM / DAB	X (Driver or Passenger selected media source1)	X (Driver or Passenger selected media source1)
Case 2	X (Driver or Passenger selected media source1)	X (Driver or Passenge r selected media source1)	FM / DAB	FM / DAB	RA active	RA	Audio OFF	FM / DAB	FM / DAB
Case 3	FM/DAB	FM/DAB	FM/DAB	FM/DAB	RA active	RA	FM / DAB	FM / DAB	FM / DAB
Case 4	X (not FM/DAB source)	X (not FM/DAB source)	X (Driver or Passenger different media source, not FM/DAB)	X (Driver or Passenger different media source, not FM/DAB)	RA active	RA	Audio OFF	X (Driver or Passenger different media source, not FM/DAB)	X (Driver or Passenger different media source, not FM/DAB)
Case 5	X (Driver or Passenger different media source, not FM/DAB)	X (Zone1 media shared with Zone2)	AM / SDARS	AM / SDARS	RA active	RA	Audio OFF	Audio OFF	Audio OFF
Case 6	X (Driver or Passenger different media source, not FM/DAB)	X (Zone1 media shared with Zone2)	X (Zone1 media shared with Zone3)	X (Zone1 media shared with Zone4)	RA active	RA	Audio OFF	Audio OFF	Audio OFF

Audio Source matrix when RA source becomes active in 4 media audio zone system

Scenarios	**Pre-Condition:** Current active media source in a 4 media audio zone system				Event	**Post-Condition:** New media source in the zones			
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**
Case 1	FM / DAB	X (PDC Media Source 2)	X (Z3_BTMedia)	X (Z4_BTMedia)	RA active	RA	X (PDC Media Source 2)	X (Z3_BTMedia)	X (Z4_BTMedia)
Case 2	X (PDC Media Source 1)	X (Z2_BTMedia)	FM / DAB	FM / DAB	RA active	RA	X (Z2_BTMedia)	FM / DAB	FM / DAB
Case 3	X (PDC Media Source 1)	FM / DAB	X (Z3_BTMedia)	X (Z4_BTMedia)	RA active	RA	FM / DAB	X (Z3_BTMedia)	X (Z4_BTMedia)
Case 4	FM / DAB	FM / DAB	X (PDC Media Source 2)	X (Z4_BTMedia)	RA active	RA	FM / DAB	X (PDC Media Source 2)	X (Z4_BTMedia)
Case 5	X (PDC Media Source 1)	AM / SDARS	X (Z3_BTMedia)	X (Z4_BTMedia)	RA active	RA	Audio OFF	X (Z3_BTMedia)	X (Z4_BTMedia)
Case 6	X (PDC Media Source 1 not FM/DAB)	X (PDC Media Source 2 not FM/DAB)	X (Zone2 media shared with Zone3)	X (Zone2 media shared with Zone4)	RA active	RA	X (PDC Media Source 2 not FM/DAB)	X (Zone2 media shared with Zone3)	X (Zone2 media shared with Zone4)
Case 7	X (PDC Media Source 1 not FM/DAB)	X (Zone1 media shared with Zone2)	X (Zone1 media shared with Zone3)	X (Zone1 media shared with Zone4)	RA active	RA	Audio OFF	Audio OFF	Audio OFF

Audio Source matrix when RA source becomes Inactive in 2 media audio zone system

Scenarios	**Pre-Condition:** RA is active in Driver Zone. in 2 media audio zone system				Event	**Post-Condition:** New media source in the zones			
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**
Case 1	RA (stacked source is FM/DAB)	FM / DAB	X (PDC Media Source 2 or Z3_BTMedia)	X (Passenger Media or Driver selected different source2)	RA Inactive	FM / DAB	FM / DAB	X (Passenger Media or Driver selected different source2)	X (Passenger Media or Driver selected different source2)
Case 2	RA (stacked source is not Tuner)	Audio OFF (last active shared Zone1 source)	FM / DAB	FM / DAB	RA Inactive	X (last active Zone1 source)	X (Zone1 media shared with Zone2)	FM / DAB	FM / DAB
Case 3	RA	FM / DAB	FM / DAB	FM / DAB	RA Inactive	FM / DAB	FM / DAB	FM / DAB	FM / DAB

	(stacked source is FM/DAB)								
Case 4	RA (stacked source is not Tuner)	Audio OFF (last active shared Zone1 source is stacked)	Audio OFF (last active AM/SDARS source is stacked)	Audio OFF (last active AM/SDARS source stacked)	RA Inactive	X (last active stacked media source not Tuner)	X (Zone1 media shared with Zone2)	AM / SDARS	AM / SDARS
Case 5	RA (stacked source is AM/SDARS)	Audio OFF (last active shared Zone1 source is stacked)	X (PDC Media Source 2 or Z3_BTMedia)	X (Zone3 media is shared with Zone4)	RA Inactive	AM / SDARS	AM / SDARS	X (PDC Media Source 2 or Z3_BTMedia)	X (Zone3 media is shared with Zone4)

Audio Source matrix when RA source becomes Inactive in 4 media audio zone system

Scenarios	**Pre-Condition:** RA is active in Driver Zone. in 2 media audio zone system				Event	**Post-Condition:** New media source in the zones			
	Zone1	**Zone2**	**Zone3**	**Zone4**		**Zone1**	**Zone2**	**Zone3**	**Zone4**
case 1	RA (last active PDC media source 1 not Tuner is stacked)	Z2_BTMedia	FM / DAB	FM / DAB	RA Inactive	X (PDC media source 1)	Z2_BTMedia	FM / DAB	FM / DAB
case 2	RA (last active PDC media source 1 not Tuner is stacked)	Z2_BTMedia	Audio OFF (last active AM/SDARS source is stacked)	Z4_BTMedia	RA Inactive	X (PDC media source 1)	Z2_BTMedia	AM / SDARS	Z4_BTMedia
case 3	RA (last active PDC media source 1 not Tuner is stacked)	Audio OFF (last active shared Zone1 source is stacked)	X (PDC media source 2 not Tuner)	X (Zone 3 media is shared with zone4)	RA Inactive	X (last active Zone1 source not Tuner)	X (Zone 1 media is shared with zone2)	X (PDC media source 2 not Tuner)	X (Zone 3 media is shared with zone4)
case 4	RA (last active PDC media source 1 is stacked)	Audio OFF (last active shared Zone1 source is stacked)	Audio OFF (last active shared Zone1 source is stacked)	Audio OFF (last active shared Zone1 source is stacked)	RA Inactive	X (PDC media source 1)	X (last active Zone1 shared source)	X (last active Zone1 shared source)	X (last active Zone1 shared source)

Note: The above table shall not be considered as the only possible media source combination when RA session interrupts the audio source in the zone mode. This table is meant to aid the understanding of RA intervention in zone mode.

4 Appendix: Reference Documents

Reference #	Document Title
1	MSS Zone Settings Management SPSS
2	MSS Passenger Phone Call SPSS
3	Phoenix Audio Management SPSS
4	URC SPSS
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
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17	