Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Audio Management

APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.5

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
May 31, 2013	**1.0**	**Initial Release**	
June 5, 2014	**1.1**		
	AUMGNT-SR-REQ-014570/B-Audio Request - Allowable Combinations (TcSE ROIN-41055-8)		asimukhi: The requested priority was changed from "PTY/NEWS" to "PTY News" and the according comment was changed from "PTY or PTY NEWS interrupt" to "PTY NEWS interrupt". This change clarifies the DAB-TA behavior in case of DAB PTY NEWS.
	AUMGNT-REQ-031821/A-Releasing a Temporary Priority Audio Source with one Entry in the Audio Stack (TcSE ROIN-305211-1)		<Steve Orris / Jason Myslinski> New requirement for AHU on releasing temporary audio sources when the audio stack is empty
	AUMGNT-REQ-031822/A-Suppressing Announcements with Priority Type TA, Alarm, PTY/News while there is an empty audio stack (TcSE ROIN-305220-1)		<Frank Nowack/Steve Orris/Jason Myslinski> When there is a an empty audio stack TA announcements shall not be activated
	AUMGNT-SD-REQ-014586/A-Release Current Audio Resource, One Entry in Stack, (Switch to Default Source) (TcSE ROIN-41652-4)		<Steve Orris / Jason Myslinski> Updated to show temporary audio sources such as Phone, VR do not go to the default source
	AUMGNT-FUR-REQ-086753/A-Module responsible for ending Manual Audio Mute		<Frank Nowack / Jason Myslinski> Requirement stating what shall end a manual audio mute.
October 23, 2014	**1.2**		
	AUMGNT-TMR-REQ-014549/B-Timer - Taudio_connect_overall (TcSE ROIN-120549-1)		<jmyslin2> Clarification for Audio Resource Server showing De-allocated for release all audio resources since 300 msec is the for the final ResourceUpdate.st message
	AUMGNT-SD-REQ-014588/B-Release All Resources, Front Stack (TcSE ROIN-121246-4)		asimukhi - no content change. Revised to be able to delete the link to the Use Case STMGNT-UC-REQ-051633/A-Activate the Multimedia System reboot.
	AUMGNT-SR-REQ-014614/D-Resource Client - Audio Source Cycling (TcSE ROIN-166931-2)		<jmyslin2> For SYNC Gen 3 and MFD/APIM added DAB to the source order table
	AUMGNT-FUR-REQ-086753/F-Module responsible for ending Manual Audio Mute		<jmyslin2> Updated requirement for module responsible for muting/unmuting that is not covered in the SPSS.
June 5, 2015	**1.3**		
	AUMGNTv2-FUN-REQ-016317/B-Manual Audio Mute (TcSE ROIN-290822-1)		<jmyslin2> updated manual audio mute function to get rid of pausing and unpausing media sources per global Ford decision
	AUMGNT-REQ-014646/B-Manual Audio Mute Stacked Source Operation (TcSE ROIN-287117-1)+		<jmyslin2> clarified requirement for when an audio command happens when a source is stacked under manual audio mute
	AUMGNT-SR-REQ-139114/A-Manual Audio Mute - No Pause of Media+		<jmyslin2> New requirement so Manual Audio Mute no longer causes Media sources to be Paused
	AUMGNT-SD-REQ-014648/B-Activate Manual Audio Mute (TcSE ROIN-173367-3)		<jmyslin2> updated manual audio mute sequence diagram to remove pause
	AUMGNT-SD-REQ-014649/B-Deactivate Manual Audio Mute (client ends when mute event ended) (TcSE ROIN-173373-2)		<jmyslin2> Per Ford decision manual audio mute no longer pauses media. Updating sequence diagram.
October 5, 2016	**1.4**		
	AUMGNT-SR-REQ-014570/G-Audio Request - Allowable Combinations (TcSE ROIN-41055-8)		<jmyslin2> The Connected HMI Radio is sending out in the ResourceUpdate.St (Source = Bluetooth Phone, Priority = Priority Service), so updated the table to add as an allowable combination
	AUMGNT-SR-REQ-014572/B-Audio Request - Resource Client Rq no response (TcSE ROIN-41064-1)		<jmyslin2> updated requirement to allow for a retry at start-up if need be
	AUMGNT-SR-REQ-014614/F-Resource Client - Audio Source Cycling (TcSE ROIN-166931-2)		<jmyslin2> Confirmed with HMI team (Ken Williams and Karl Vandivier) for audio source cycling reference the HMI specifications.
	AUMGNT-SR-REQ-237868/A-Media source Stacked under Phone/VR		<Rob Paquette / jmyslin2> New requirement for Media sources stacked underneath Phone or VR
May 30, 2019	**1.5**		
	MD-REQ-274886/A-AudioRequest		<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update

	MD-REQ-274906/A-AudioRequestRsp+	<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	MD-REQ-274906/B-AudioRequestRsp	<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	MD-REQ-274910/A-ResourceUpdateStatus	<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	AUMGNT-SR-REQ-014551/B-Audio Request_Audio Priority Description (TcSE ROIN-40936-1)	<jmyslin2> Clarificagtion of requirement for pausing for manual audio mute
	AUMGNT-SR-REQ-014552/D-Audio Request_Properties of Priorities_Overview (TcSE ROIN-40963-2)	<jmyslin2> added note about a VR request during a phone call. No content change
	AUMGNT-SR-REQ-014557/B-Audio Request_Properties of Priorities_Overview_Collapses Stack (TcSE ROIN-40942-3)	<jmyslin2> Updated requirement
	AUMGNT-SR-REQ-014560/B-Default Audio Source (TcSE ROIN-111331-2)	<jmyslin2> Updated requirement so SYNC requirement regarding Apple CarPlay can be followed. At time of this requirement release Apple required SYNC to go to Audio Off when released CarPlay disconnected (iPhone removed).
	AUMGNT-TMR-REQ-014564/C-Timer - TallocRU (TcSE ROIN-119126-1)	<jmyslin2> updated requirement
	AUMGNT-REQ-014578/B-Muting and Unmuting between Source changes (TcSE ROIN-286981-1)+	<jmyslin2> no content update
	AUMGNT-REQ-014578/C-Muting and Unmuting between Source changes (TcSE ROIN-286981-1)	<jmyslin2> no change
	AUMGNT-SR-REQ-014614/G-Resource Client - Audio Source Cycling (TcSE ROIN-166931-2)	<jmyslin2> no change

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1 Architectural Design

1.1 Overview

Audio resource management in a distributed infotainment system architecture requires detailed definition of the coordination amongst the "objects" which play a role in audio resource management. Within this architecture the audio management tasks have been divided into several objects:

- Resource_Client
- Resource_Server
- Audio Resource Server
- Audio Prioritiser
- Audio Switch
- Audio Settings
- Audio I/O Controller

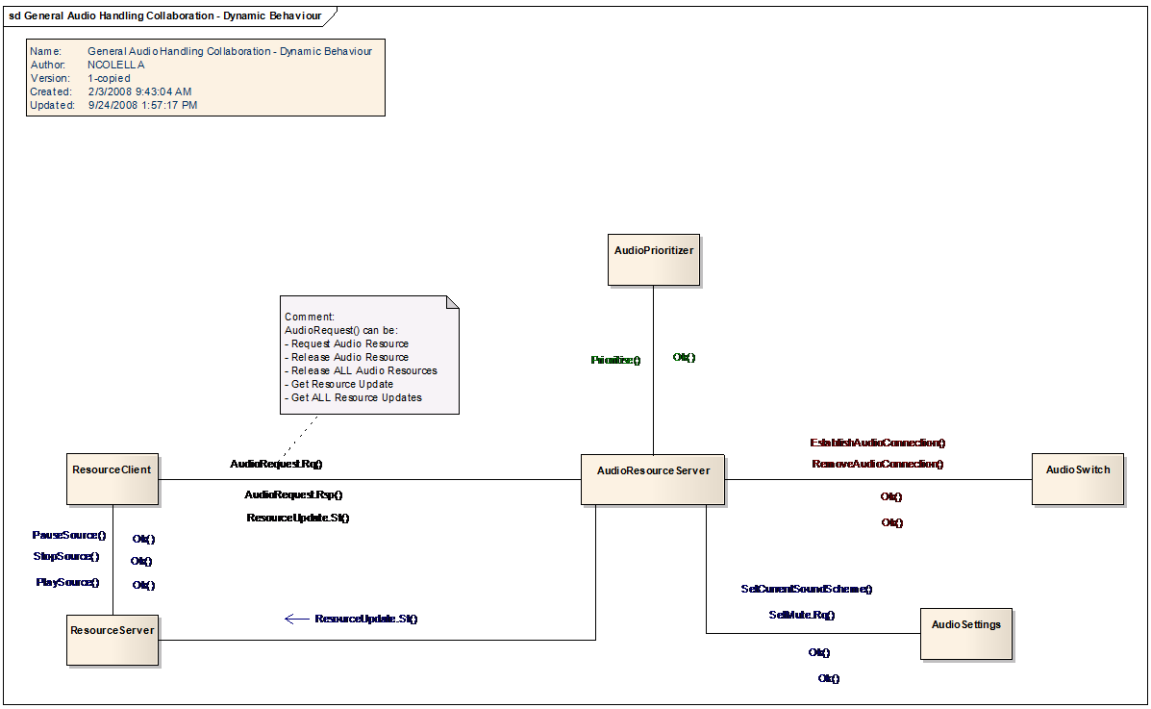
Resource Client	The Resource Client object is the interface of the source function. It reacts with other system parts that control the source or need data from it. It also requests audio resources if they are needed.
Resource Server	The Resource Server object is responsible for controlling the component when incoming service requests are received. The Resource Server also transmits related status information to the Client(s).
Audio Resource Server	The Audio Resource Server object acts as the overall manager which is responsible for the interface between the requesters for the audio system (a.k.a. Resource Client), the audio management objects, and audio sources (i.e. Resource Server). It is also responsible for: Providing status of requests/resources to the Resource Clients based upon other information received from the Audio Prioritizer, Audio Switch, and Audio Settings objects. Indicating sounds schemes and sending mute/unmute requests to the Audio Settings object. Issuing audio port connections/disconnections to the Audio Switch object. Issuing start/stop commands to the sources and arbitration of source control between the rear and front requester systems.
Audio Prioritizer	The Audio Prioritizer object is responsible for analyzing the priority of incoming requests from the Audio Resource Server and then providing a response back to the Audio Resource Server.
Audio Switch	The Audio Switch object is responsible for managing the connection/disconnection of the appropriate input audio ports to the appropriate output audio ports of respective Audio I/O Controller objects. This Audio Switch object is also responsible for mixing audio sources when required
Audio Settings	The audio settings object is responsible for muting/unmuting of audio signals, configuring acoustic parameters based upon sound schemes, and control of acoustical properties. (e.g. volume, BTMBF, etc.)

Audio I/O Controller	The Audio I/O Controller object is responsible for the source specific connection/disconnection of input/output audio ports

1.1.1 Audio Management Collaboration

The objects described each represent a class of objects in the infotainment system which participate in the audio management collaboration process. Each class in this collaboration is a base class of which more specific classes within the system can be created and inherit from their base class.

Some objects can execute operations or services which are invoked with a "method()" call. These "methods()" are typically used for requesting/commanding information/action upon another object. Other "methods()" can be used to respond to requests or provide status information from one object to another. The following is a collaboration diagram depicting the interaction amongst the classes participating in the audio management process:



1.1.2 Audio Request/Source Tracking

Audio sources are typically activated/deactivated due to event which causes an audio source to be either requested for playback or released from playback. Since multiple clients may request access to the audio system for playback, mixing, etc. the Audio Resource Server must have a method in place to track the requests for sources and track the current sources.

The Audio Resource Server utilizes a tabular "stack" approach for tracking the states of all source requests and for currently active sources. Within the "stack" sources are logged with their current status and in order of their priority level. Highest priority sources/requests are placed higher in the stack. The active audio source is placed at the "top" of the "stack". Lower priority requests are placed at the bottom of the stack.

For an audio request, when the request is received, the Audio Resource Server forwards the request to the Audio Priotizer for inspection. Based upon the priority of the request and current source allocation a result is passed back to the Audio Resource Server. The Audio Resource Server may, based upon the response and priority, shuffle the stack and provide a formal response back to the requester.

For every request/source that is in the "stack", the Audio Resource Server will, on a periodic basis, broadcast the status of all request/sources that are in the "stack".

The following is a description of the states of which a request/source can be assigned in the "stack":

State	Description
De-Allocated	The source/request is no longer required and has been removed from the stack.
Allocated	The source has been allocated to the requester but the system is not ready. (e.g. audio connections not ready) No control (e.g. FF, Rew, etc.) of the source is allowed.
Stacked	The incoming request has been placed into the stack due to another event (e.g. a higher priority request is the current active audio source) or a higher priority request pushes the current active source down in the stack. The stacked request will be granted as soon as the audio system is available.
Granted	The source is allocated and granted access to the audio system. This is typically the request with the highest priority. Control of the source is allowed by the requester.
Granted (no control of source)	The requester may listen to the source (and show the HMI), but not control the source. The source is controlled by a different requester with higher priority. Example: The rear seat user listens to FM Tuner and the front seat user listens to CD. The front seat user switches to FM Tuner as well. Since the front system always has higher priority (for the same source/priority), the rear seat FM Tuner client will receive this message and then lose control of the FM Tuner to the front seat user.

1.2 Interface Requirements

1.2.1 MD-REQ-274886/A-AudioRequest

Message Type: Request

This method is used by a client to request/release audio resources from the Audio Resource Server. It is also used to poll the current status of a request (Resource Update).

Logical Signal Name	Literals	Value	Description
OperationType	RequestAudioResource	0x1	Request an audio source
	ReleaseAudioResource	0x2	Release a request (granted or stacked)
	ReleaseALLAudioResources	0x3	Stack will be emptied, default audio source will NOT be allocated
	GetResourceUpdate	0x4	Polls the status of a specific stack entry (specified by Requester System, Requested Source, and Requester Priority)
	GetALLResourceUpdate	0x5	Used to poll the entire audio stack
RequesterSystem	Front Requester	0x0	
	Rear Requester	0x1	
RequestedAudioSource	AM/FM Radio	0x0	
	Frond Disc	0x1	
	SDARS / DAB	0x2	
	In Dash CD Changer	0x3	
	Voice Recogniser	0x4	
	Telematic Unit	0x5	
	Bluetooth Phone	0x6	
	Rear Disc	0x7	
	APIM	0x8	

	Front Aux Input	0x9	
	Navigation	0xA	
	Rear Aux	0xB	
	Not Requested	0xC	
	BTAudio	0xD	
	USB	0xE	
	iPod	0xF	
RequesterPriority	Priority Service	0x0	
	Telephony Service	0x1	
	Auto Answer	0x2	
	TA	0x3	
	PTT Mute & Voice	0x4	
	Nav. User Voice Cmd	0x5	
	Nav. System Voice Cmd	0x6	
	Radio	0x7	
	Disc	0x8	
	Alarm	0x9	
	PTY/NEWS	0xA	
	Aux_ExtSource	0xB	
	Mobile Nav/Tel Mute	0xC	
	Manual Audio Mute	0xD	
	Not Requested	0xE	

1.2.2 MD-REQ-274906/B-AudioRequestRsp

Message Type: Response

This method is the response to the AudioResource.Rq message.

Logical Signal Name	Literals	Value	Description
Response	RequestAccepted	0x1	
	RequestAccepted (no control of audio source)	0x2	
	RequestDenied	0x3	
	ResourceUpdateStatus	0x4	
OperationType	RequestAudioResource	0x1	
	ReleaseAudioResource	0x2	
	ReleaseALLAudioResource	0x3	
	GetResourceUpdate	0x4	
	GetALLResourceUpdates	0x5	
RequesterSystem	FrontRequester	0x1	
	RearRequester	0x2	
RequestedAudioSource	AM/FM Radio	0x0	
	Front Disc	0x1	
	SDARS/DAB	0x2	
	In Dash CD Changer	0x3	
	Voice Recogniser	0x4	
	Telematic Unit	0x5	
	Bluetooth Phone	0x6	
	Rear Disc	0x7	

	APIM	0x8	
	Front Aux Input	0x9	
	Navigation	0xA	
	Rear Aux	0xB	
	Not Requested	0xC	
	BT Audio	0xD	
	USB	0xE	
	iPod	0xF	
RequesterPriority	Priority Service	0x0	
	Telephony Service	0x1	
	Auto Answer	0x2	
	TA	0x3	
	PTT Mute & Voice	0x4	
	Nav User Voice Cmd	0x5	
	Nav System Voice Cmd	0x6	
	Radio	0x7	
	Disc	0x8	
	Alarm	0x9	
	PTY/NEWS	0xA	
	Aux_ExtSource	0xB	
	Mobile Nav/Tel Mute	0xC	
	Manual Audio Mute	0xD	
	Not Requested	0xE	

1.2.3 MD-REQ-274910/A-ResourceUpdateStatus

Message Type: Status

This method is used to inform clients/requesters what the current status is of a request and/or status of the audio stack.

This method is application event-periodic driven.

When there are no resources allocated, the audio source and priority parameters shall be set to 'Not Requested'.

- ResourceUpdate(Front system, Not Requested, Not requested, De-allocated)

Logical Signal Name	Literals	Value	Description
RequesterSystem	FrontRequester	0x0	
	RearRequester	0x1	
RequestedAudioSource	AM/FM Radio	0x0	Indicates the respective audio source
	Front Disc	0x1	
	SDARS/DAB	0x2	
	In Dash CD Changer	0x3	
	Voice Recogniser	0x4	
	Telematic Unit	0x5	
	Bluetooth Phone	0x6	
	Rear Disc	0x7	
	APIM	0x8	
	Front Aux Input	0x9	
	Navigation	0xA	
	Rear Aux	0xB	
	Not Requested	0xC	

	BT Audio	0xD	
	USB	0xE	
	iPod	0xF	
RequesterPriority	Emergency Service	0x0	This parameter indicates the priority associated with the respective audio source
	Telephony Service	0x1	
	Auto Answer	0x2	
	TA	0x3	
	PTT Mute & Voice	0x4	
	Nav User Voice Cmd	0x5	
	Nav System Voice Cmd	0x6	
	Radio	0x7	
	Disc	0x8	
	Alarm	0x9	
	PTY/NEWS	0xA	
	Aux_ExtSource	0xB	
	Mobile Nav/Tel Mute	0xC	
	Manual Audio Mute	0xD	
	Not Requested	0xE	
ResourceRequestStatus	No Resource Update	0x0	The Status of the respective audio source
	Deallocated	0x1	
	Allocated	0x2	
	Stacked	0x3	
	Granted	0x4	
	Granted (no control of audio source)	0x5	

2 Functional Definition

2.1 AUMGNT-FUN-REQ-014534/A-Resource Update (TcSE ROIN-119203-1)

2.1.1 Requirements

2.1.1.1 AUMGNT-SR-REQ-014535/A-Resource Update (TcSE ROIN-40951-1)

The Audio Resource Server shall inform Resource Clients/Slaves about the current status of a request via the ResourceUpdate.St() method. The Audio Resource Server shall issue the ResourceUpdate.St() immediately upon any change in the stack. Resource Clients/Slaves shall monitor the ResourceUpdate.St() method to determine when their respective source has been updated (Deallocated, Allocated, Stacked, Granted, Granted w/o control) and to react upon the update.

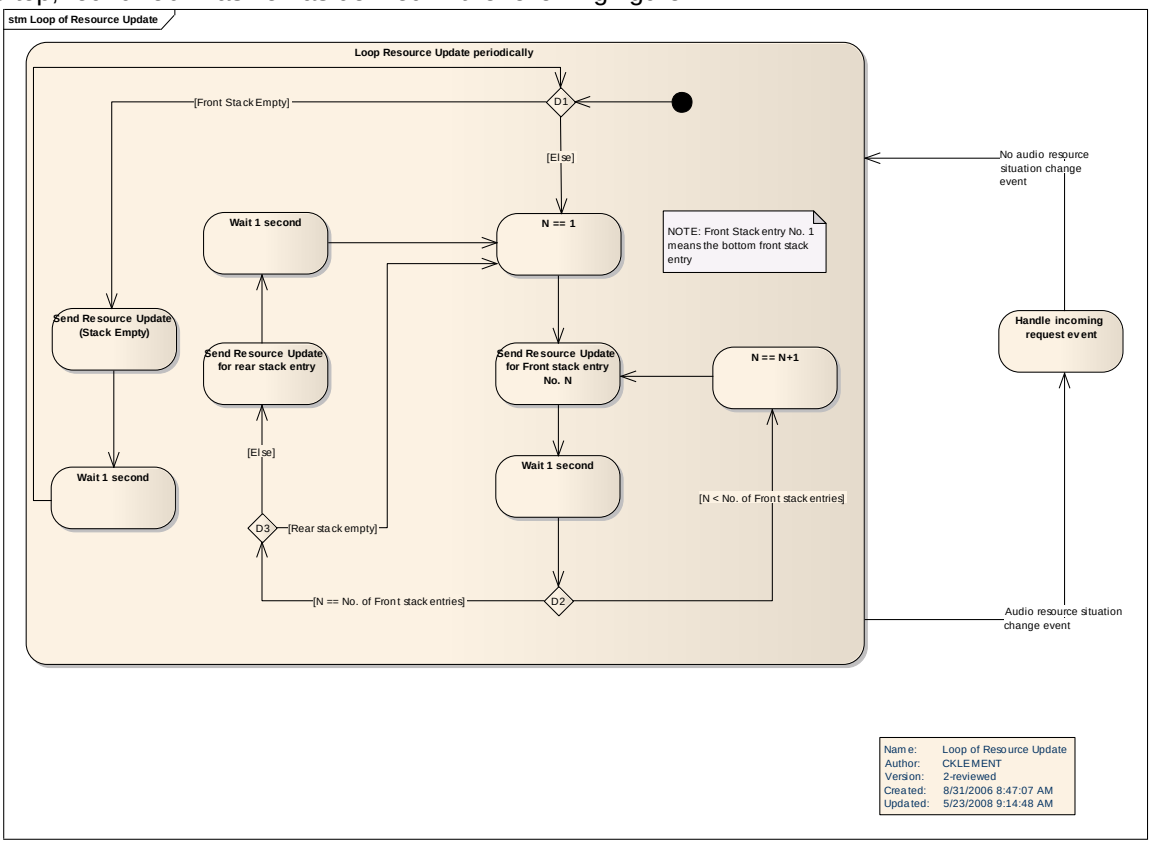
Example:
The user switches between radio and CD. The Audio Resource Server must then send out Resource Update several times; “allocated” for the CD, “Deallocated” for the radio and then “granted” for the CD. These messages are sent out on event.

When there are no resources allocated, there is no specified audio source or priority, the ResourceUpdate.St() parameters shall be configured as follows:

ResourceUpdate(Front system, Not Requested, Not requested, De-allocated)

2.1.1.2 AUMGNT-SR-REQ-014536/A-Resource Update_Loop of Resource Update (TcSE ROIN-40953-1)

To ensure that all Resource Clients in the system have the correct information about the current audio resource system state, the Audio Resource Server shall execute the ResourceUpdate() loop on a periodic basis and step through the audio stack from bottom to top, round robin fashion as defined in the following figure:



Example:
The front user listened to the CD and then there is an ongoing phone call.
The rear user is listening to the radio.
In the Front stack the CD request is stacked and the phone call ditto is granted.
In the rear stack the Radio request is granted.

The Audio Resource Server must go through the stack (from bottom to top, round robin fashion) and send out Resource Updates for each stack entry periodically.

In the example above, the Audio Resource Server would then send Resource Update (Front, CD, Stacked) and then after 1 sec. it would send Resource Update (Front, Phone, Granted). After one second send out a Resource Update for the rear system, Resource Update (Rear Radio, Granted). This procedure then repeats until there is an event that requires change to the audio stack.

2.1.1.3 AUMGNT-SR-REQ-014537/A-ResourceUpdate_AudioRequest Parameters (TcSE ROIN-41059-2)

Due to nature of the ResourceUpdate.St() parameters being physically packaged in the same CAN message with the AudioRequest.Rsp() method, when the ResourceUpdate periodic loop is executing the AudioRequest.Rsp() and ResourceUpdate.St() parameters shall be set to the following values:

AudioRequest.Rsp(ResourceUpdateStatus, Inactive, Front Requester, Not Requested, Not Requested)

ResourceUpdate(Requester System(x), Requested Audio Source(x), Requester Priority(x), Resource Request Status(x))

Note: x = value for current index item in the loop

2.1.1.4 AUMGNT-SR-REQ-014538/A-Resource Update Status - Resource Server (TcSE ROIN-147237-1)

Upon reception of a ResourceUpdate(Requester System, Requested Audio Source, Requester Priority, Resource Request Status) the "Requested Audio Source" shall take the following actions based upon the "Resource Request Status" signal:

Deallocated - The audio resource shall produce a stable, muted, audio output with no transients (audio pops, etc.) and shall return their respective source to its default state.

Allocated - The audio resource shall produce a stable, muted, audio output with no transients (audio pops, etc.) and the audio resource shall ready (pause, if applicable) their respective source for playback.

Stacked - The audio resource shall produce a stable, muted, audio output with no transients (audio pops, etc.) and the audio resource shall ready (pause, if applicable) their respective source for playback.

Granted - The audio resource shall begin playback, if not already in a playback state, of their respective source and produce a stable, un-muted, audio output with no transients (audio pops, etc.).

Granted w/o control – The audio resource shall begin playback, if not already in a playback state, of their respective source and produce a stable, un-muted, audio output with no transients (audio pops, etc.). Control requests from the indicated "Requester System" shall be ignored.

2.2 Audio Request

2.2.1 General Requirements - Audio Request

2.2.1.1 AUMGNT-SR-REQ-014539/A-Audio Request_Allowed Audio Requests_Crank (TcSE ROIN-40944-1)

The Audio Resource Server shall be able to receive and process Audio Release Requests during Crank.

2.2.1.2 AUMGNT-SR-REQ-014540/B-Audio Request_Allowed Audio Requests_Overview (TcSE ROIN-40943-2)

Note: This requirement is for CGEA 1.2 and C1MCA only. Only those architectures use the PowerMode signal.

Audio Requests (RequestAudioResource) shall only be issued during PowerMode=OFF & Extended Play = Active or PowerMode=ACC or PowerMode=RUN.

Note: This in order to prevent from unexpected behavior during crank.

If the above conditions are not met, the Resource Client shall (locally) set its request as pending, and then it shall be cued and issued when the above conditions are met.

If additional request for the same source and priority has occurred during the pending state, the previous Audio Request shall be deleted and not sent out.

When the pending state is over the last request shall be sent out.

Audio Requests (ReleaseAudioResource) can be issued during PowerMode=OFF or PowerMode=ACC or PowerMode=RUN or PowerMode=Crank.

2.2.1.3 AUMGNTv2-SR-REQ-014541/A-Audio Request_Allowed Audio Requests_Overview (TcSE ROIN-279692-1)

Audio Requests (RequestAudioResource) shall only be issued when the following is true:

Ignition_Status = Off & Delay_Accy = Off & Extended Play = Active,
Or
Ignition_Status = Accessory or Run
Or
Delay_Accy = On.

Note: This in order to prevent from unexpected behavior during crank.

If the above conditions are not met, the Resource Client shall (locally) set its request as pending, and then it shall be cued and issued when the above conditions are met.

If additional request for the same source and priority has occurred during the pending state, the previous Audio Request shall be deleted and not sent out.

When the pending state is over the last request shall be sent out.

Audio Requests (ReleaseAudioResource) can be issued when the following is true:

Ignition_Status = Off & Delay_Accy = Off
Or
Ignition_Status = Accessory or Delay_Accy = On
Or
Ignition_Status = Run
Or
Ignition_Status = Start

2.2.1.4 AUMGNT-SR-REQ-014542/A-Audio Request - REQUEST (TcSE ROIN-40959-1)

The Resource Client shall utilize the AudioRequest.Rq() method to request/release audio resources from the Audio Resource Server and to request the status of resources. The method AudioRequest.Rq() must provide the following information (parameters/signals):

Operation Type
Indicates if the method call is a request for resource, release of resource, or request for resource update.

The Operation Type parameter must provide one of the following values:

Request Audio Resource – request an audio source
Release Audio Resource – release a request (granted or stacked)
Release ALL Audio Resources – release all requests. Stack will be emptied, default audio source will NOT be allocated
Get Resource Update – polls the status of a specific stack entry (specified by Requester System, Requested Source, and Requester Priority).
Get ALL Resource Updates – used to poll the entire audio stack. All entries will be transmitted using the ResourceUpdate.St attribute

Requester System
Indicates where a request is sent from. This parameter is to determine which entertainment zone (front or rear) the requested source should be connected, it is also used for arbitrating between requests with same audio source and priority but from different zones. Front requests shall always have higher priority than rear requests.

Example:
FSE sends request for the Am Fm Radio with Radio as priority. A while later, the rear seat user requests to listen to the radio as well (with headphones unplugged, i.e. with the main loudspeakers). The Audio Resource Server then receives two identical requests except for the requester system, and can thus distinguish between the requests.

Requested Audio Source
Indicates the audio source the requester wants to activate.

Requester Priority
Indicates the priority of the requested source. Also, a single audio source may have many types of audio information (e.g. the radio has TA, PTY, Radio, Alarm) and therefore an additional need for different priority types. This parameter must provide one of the values defined in the Priority Table.

An entry in the audio request stack is determined by the parameters:
Operation Type
Requester System
Requested Audio Source
Requester Priority
Request Status

2.2.1.5 AUMGNT-SR-REQ-014543/A-Audio Request - RESPONSE (TcSE ROIN-40960-1)

The Audio Resource Server method AudioRequest.Rsp() shall be used for responding to AudioRequest.Rq() method. The response shall be provided within Taudio_request msec of the request The following information (parameters/signals) shall be provided:

Response
This parameter shall indicate either a positive or negative acknowledgment to a request for resources or indicate a status update.

RequestAccepted
RequestAccepted (no control of audio source)
RequestDenied
ResourceUpdateStatus

Operation Type
This parameter must indicate one of the following values:

Request Audio Resource – request an audio source
Release Audio Resource – release a request (granted or stacked)
Release ALL Audio Resources – release all requests. Stack will be emptied, default audio source will NOT be allocated
Get Resource Update – polls the status of a specific stack entry (specified by Requester System, Requested Source, and Requester Priority).
Get ALL Resource Updates – used to poll the entire audio stack. All entries will be transmitted using the ResourceUpdate.St attribute

Requester System
Indicates where a request is sent from. This parameter is to determine which entertainment zone (front or rear) the requested source should be connected, it is also used for arbitrating between requests with same audio source and priority but from different zones. Front requests shall always have higher priority than rear requests.

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Requested Audio Source
Indicates the audio source the requester wants to activate.

Requester Priority
Indicates the priority of the requested source. Also, a single audio source may have many types of audio information (e.g. the radio has TA, PTY, Radio, Alarm) and therefore an additional need for different priority types. This parameter must provide one of the values defined in the Audio Priority Table.

2.2.1.6 AUMGNT-SR-REQ-014544/A-Audio Resource Update - STATUS (TcSE ROIN-40961-2)

The Audio Resource Server method ResourceUpdate.St() shall be used to inform clients/requesters about the current status of a request. The Audio Resource Server must provide the following information (parameters/signals):

Requester System
Indicates which entertainment zone (front or rear) the respective information pertains.

Requested Audio Source
Indicates respective audio source.

The Audio Resource Server must transmit the value "Not Requested" if there are no resources allocated.

Requester Priority
Indicates respective priority.

The Audio Resource Server must transmit the value "Not Requested" if there are no resources allocated.

Resource Request Status
Indicates respective stack status.

Deallocated - The Audio Resource Server shall transmit the value "Deallocated" if there are no resources allocated.

Example: For the front system when a Release All request has been completed the resource update will indicate:
ResourceUpdate(Front system, Not Requested, Not requested, De-allocated)

The Audio Resource Server shall transmit the value "Deallocated" for a resource that has been released and is no longer in the stack.

No Resource Update - The Audio Resource Server shall transmit the value "No Resource Update" during a response to an AudioRequest.RSP(RequestAudioResource or ReleaseAudioResource or ReleaseAllAudioResources or GetResourceUpdate or GetALL ResourceUpdates).

Allocated - The Audio Resource Server shall transmit the value "Allocated" if the resource is allocated but not ready for use (audio connections not ready), which means that no control of the source is allowed.

Stacked - The Audio Resource Server shall transmit the value "Stacked" if the request does not have access to the resource, but it is in the stack and will be granted the resource as soon as it is available.

Granted - The Audio Resource Server shall transmit the value "Granted" if the request is allocated and granted and can be controlled by the requester.

Granted w/o control – The Audio Resource Server shall transmit the value "Granted w/o control" if the requester may listen to the source (and show the view), but not control the source. The source is controlled by a different requester with higher priority.

Example:
The rear seat user listens to radio and the front seat user listens to CD. The front seat user switches to radio as well. Since the front system always has higher priority (for the same source/priority type), the rear seat radio client will receive this message and then loses control of the radio to the front seat user.

2.2.1.7 AUMGNT-SR-REQ-014545/A-Audio Request_ResourceUpdate Parameters (TcSE ROIN-41060-1)

Due to nature of the ResourceUpdate.St() parameters being physically packaged in the same CAN message with the AudioRequest.Rsp() method, when a AudioRequest.Rsp() message is transmitted in response to an AudioRequest.Rq(RequestAudioResource or ReleaseAudioResource or ReleaseALLAudioResources) request the ResourceUpdate.St() parameters shall be set to the following values:

ResourceUpdate(Front Requester, Not Requested, Not Requested, No Resource Update)

2.2.1.8 AUMGNT-SR-REQ-014546/A-Internal/External Source Definition (TcSE ROIN-119784-1)

Within the sequence diagrams there is usage of "Internal Audio Resources" and "External Audio Resources". This nomenclature is used to delineate those audio resources which may be present on the same physical node as the Audio Resource Server.

In configurations in which an audio resource (e.g. AM_FM server or AM_FM client) is located on the same physical node as the Audio Resource Server, the "Internal Audio Resource" interfaces shall be used. For audio resources (e.g. USB Server) which do not exist on the same physical node as the audio resource server, the "External Audio Resource" interfaces shall be used.

The determination of which resources are located with the Audio Resource Server can be extracted from the deployment table for the specific node.

2.2.1.9 IFS-MMCAN-FUR-REQ-014547/A-Logical/Physical Communication Channels (TcSE ROIN-121393-1)

Within all sequence diagrams, the communication interfaces for objects deployed to the same component shall utilize "logical" communication channels. Objects which are deployed on separate modules and must communicate shall use "physical" communication channels (e.g. InfoCAN).

The determination of physical partitioning of objects can be extracted from the deployment table for the specific node.

2.2.1.10 AUMGNT-TMR-REQ-014548/B-Timer - Taudio_request (TcSE ROIN-41506-2)

Name	Description	Units	Range	Resolution	Default
Timer - Taudio_request	Max. time for Resource Server to respond to request. Note: always use the default value for implementation	msec	25-1000	25	125

2.2.1.11 AUMGNT-TMR-REQ-014549/C-Timer - Taudio_connect_overall (TcSE ROIN-120549-1)

Name	Description	Units	Range	Resolution	Default
Timer - Taudio_connect_overall	The time between an AudioRequest.Rq(RequestAudioResource) and ResourceUpdate.St(Granted)/ResourceUpdate.St (deallocated – ex ReleaseAllAudioResources) shall not be more than Taudio_connect_overall. Valid for all sequence diagrams in this specification. Note: use the default value	msec	100-350	10	300

2.2.2 AUMGNT-FUN-REQ-014550/A-Audio Request - Priority Levels (TcSE ROIN-119268-2)

2.2.2.1 Requirements

2.2.2.1.1 AUMGNT-SR-REQ-014551/B-Audio Request_Audio Priority Description (TcSE ROIN-40936-1)

The following table defines the Priorities which must be supported by the Resource Clients, Audio Resource Server and Audio Prioritizer. A priority level shall be specified in the AudioRequest.Rq() method for an audio source by the Resource Client.

The following table defines the audio priorities which shall be used as part of the AudioRequest.Rq() method:

Priority Name	Priority Level	Description/Usage
Priority Service	9	Priority Calls
Auto Answer	9	Telematic service
Telephony Service	8	Normal phone calls (incoming, dialing, outgoing, active voice calls, etc.)
Mobile NAV and TEL Mute	7	Mobile NAV use or mute during a Telephony service
PTT Mute & Voice	6	PTT audio mute and voice feedback
Alarm	5	e.g. PTY31 Alarm
TA	4	Traffic announcement
PTY/NEWS	3	PTY or PTY NEWS interrupt
Manual Audio Mute	2	Mute of the audio system (~~pauses active source, if applicable~~)
Radio	1	Normal AM/FM/SAT/DAB Radio listening
Disc	1	Disc player (e.g. single CD, multi-CD, DVD, etc.)
AUX_ExtSource	1	External audio source (e.g. line-in, USB, etc.)
Nav. User Voice Cmd	N/A	Navigation voice command requested by user (e.g. user presses repeat button) Used for Non-APIM configurations.
Nav. System Voice Cmd	N/A	Navigation voice command requested by system (e.g. guidance prompt) Used for Non-APIM configurations.
Not Requested	N/A	Used only in combination with Release ALL Resources / Get ALL Resource Updates

2.2.2.1.2 AUMGNT-SR-REQ-014552/D-Audio Request_Properties of Priorities_Overview (TcSE ROIN-40963-2)

The following table shows the properties for different Priorities which must be supported by the Resource Clients, Audio Resource Server and Audio Prioritizer. The requester system and requested source are not shown, since the priority properties of a request are the same regardless of requester systems and source.

Priority Type	Priority Level	May Interrupt up to Level No.	May enter stack below granted entry	Stackable	Collapses Stack
Priority Service	9	8	No	No	No[6]
Auto Answer[1]	9	8	No	No	No
Telephony Service	8	7	No	Yes	No
Mobile NAV and Tel Mute	7	6	No	Yes	No
PTT Mute & Voice	6	8	No	No	No
Alarm	5	4	Yes	No	No
TA	4	3	Yes	No	No
PTY/NEWS	3	2	Yes	No	No
Manual Audio Mute	2	4	No	Yes	No
Radio	1	7	No	Yes	Yes
Disc	1	7	No	Yes	Yes
Aux_ExtSource	1	7	No	Yes	Yes
Nav. User Voice Cmd[2]	N/A	9 (mix)[3]	N/A	N/A	N/A
Nav. System Voice Cmd[2]	N/A	7 (mix)[4]	N/A	N/A	N/A
Not Requested[5]	N/A	N/A	N/A	N/A	N/A

Notes:
1) Same priority as emergency service -> same behavior

2) Will be mixed with the current audio source (if accepted/granted):
- Nav _x_ Voice Cmd does not have a specific priority level, since it is treated separately due to mixing.
- Incoming Resource Client requests are not evaluated against Nav _x_ Voice Cmd requests.
- Nav _x_ Voice Cmd priority types do not have properties like “stackable” or “collapses stack” since they do not enter the normal audio stack.

- Incoming Nav _x_ Voice Cmd requests do not influence the “normal” stack, except for “Nav. User Voice Cmd” during a PTT & Voice session.
- If there is an incoming “Nav. User Voice Cmd” during an active “Nav. System Voice Cmd”, the Audio Resource Server shall replace the “Nav. System Voice Cmd”with the “Nav. User Voice Cmd” in the “mixing” stack. No other action will be taken.

3) If the current/granted request is “PTT Mute & Voice” then a request for “Nav. User Voice Cmd” will deallocate the “PTT Mute & Voice” request (the one below will remain stacked) and only navigation guidance will be audible in the loudspeakers.

4) System initiated navigation voice guidance will not interrupt PTT MUTE & Voice recognition feedback. Otherwise it is accepted up to the level defined in the column “May interrupt up to level No.”

5) This “Priority Type” is different from others, since it is used for Release ALL (highest priority) and Get ALL Resource Updates (no need for priority, no action taken on stack).

6) If it is called out in the applicable feature specification (ex emergency call SPSS) on what to do when ending a priority service call with Priority Type = Priority Service for collapse stack and if it contradicts what is in this requirement then the feature specifications calling this out take precedent.

7) Above shows a PTT Mute & Voice can interrupt a Telephony Service priority type. This is only from the Audio Resource Server side of things. If for example the source client (ex APIM with phone and VR functionality) doing the audio request does not allow VR session to interrupt a Phone call then the source client should not make the audio request for VR during a phone call

2.2.2.1.3 AUMGNT-SR-REQ-014553/A-Audio Request_Properties of Priorities_Overview_Priority Level (TcSE ROIN-40938-2)

The priority level shall be used in the Audio Prioritizer to determine if an incoming request should be granted, stacked,or denied.

The Audio Prioritizer must evaluate the following parameters of the incoming request:
- Priority Level
- May interrupt up to level No.
- May enter stack below granted entry
- Collapse stack

The Audio Resource Server shall also evaluate the "Stackable" attribute of the "Granted" resource upon an incoming resource request.

2.2.2.1.4 AUMGNT-SR-REQ-014554/A-Audio Request_Properties of Priorities_Overview_Interrupt (TcSE ROIN-40939-1)

The “May interrupt up to level No.” value of the incoming request shall be compared with priority level of the granted (current) request. The incoming request shall be accepted if the "May interrupt up to level No." is equal or greater than the currently active Priority Level regardless of the priority of the incoming request.

Example:
PTT Mute & Voice (level 6) will be accepted during a phone call (level 8) since it is allowed to interrupt up to level 8.

EXCEPTION:
When resources are granted to the PTT&Voice and there is an incoming request, it shall be accepted only if it may interrupt the stacked item below PTT&Voice.

Example:
When there is an ongoing phone call, the user presses the PTT button. Phone resources are stacked and resources are granted to PTT & Voice. The user issues a voice command to activate the Radio, which results in an incoming Radio resources request. The request shall be denied since the Radio is not allowed to interrupt the stacked resource, Telephony service.

2.2.2.1.5 AUMGNT-SR-REQ-014555/A-Audio Request_Properties of Priorities_Overview_Stack below granted (TcSE ROIN-40940-2)

An incoming request with lower priority than needed to interrupt the current/granted request, will be placed (in order of priority) in the stack underneath the current/granted entry if the "May enter stack below granted entry?" parameter is marked as "Yes".

For example, if Telephony Service is granted and a incoming request for TA is received, the TA request will be stacked until the Telephony Service is deallocated.

When the currently granted request is released, the next highest priority request (which is stacked) shall be allocated and granted assuming that a new incoming request with higher priority has not been received.

An incoming request with lower priority than needed to interrupt the current/granted request, will be denied if "May enter stack below granted entry?" is marked as "No".

2.2.2.1.6 AUMGNT-SR-REQ-014556/A-Audio Request_Properties of Priorities_Overview_Stackable (TcSE ROIN-40941-2)

The "Stackable" attribute is only applied to resources that are currently "Granted" it is not associated with an incoming request. A "Granted" Resource Client must be released (deallocated) if it is not stackable (Stackable = NO), and a request with greater or equal priority is placed on top.

Example:
There is an active TA and a request for “Telephony Service” is received.

A "Granted" Resource Client request must be stacked if it is marked as stackable (Stackable = YES), and a request with greater or equal priority is placed on top.

2.2.2.1.7 AUMGNT-SR-REQ-014557/B-Audio Request_Properties of Priorities_Overview_Collapses Stack (TcSE ROIN-40942-3)

If an incoming request is accepted with the attribute "Collapse Stack" equal to "Yes", all Resource Client requests in the stack must be released (deallocated) with the following exceptions:

- When the requested source is currently a stacked source, that source shall not be deallocated prior to being granted

The Audio Resource Server shall individually deallocate all respective sources in the stack for the "Requester System" to inform the respective Resource Clients that the audio request has been released.

~~For multiple entries in the stack, each individual allocation/deallocation shall be separated by TallocRU msec.~~

If an incoming request is accepted with the attribute "Collapse Stack" equal to "No", the current/granted request shall be stacked if its attribute "Stackable" is equal to "Yes" else it shall be released (deallocated).

Example:
There is an active TA interrupt (radio is stacked) and a disc request is received. Both the TA and Radio requests are then released. Upon acceptance of the incoming request, the Audio Resource Server must send the following sequence:

ResourceUpdate.St(FrontReq, CD, Disc, Allocated)
ResourceUpdate.St(FrontReq, Am/FM Radio, TA, Deallocated)
ResourceUpdate.St(FrontReq, Am/FM Radio, Radio, Deallocated)

2.2.3 AUMGNT-FUN-REQ-014558/A-Audio Request - System Startup (TcSE ROIN-119270-1)

2.2.3.1 Requirements

2.2.3.1.1 AUMGNT-SR-REQ-014559/A-Audio Request_Last Used Source (TcSE ROIN-40958-2)

For the system start-up, the System Master (FSE) shall activate the last used source on start-up of the system.

Note: The last used source shall be the last source (Granted/Stacked) with the Radio, Disc, or AUX_ExtSource priority type. For example, VR and Phone would not be activated on system startup. If the last used source is no longer available the default source shall be activated by the System Master.

2.2.3.1.2 AUMGNT-SR-REQ-014560/B-Default Audio Source (TcSE ROIN-111331-2)

The default source shall be defined as the last active Audio source with priority Radio and source either AM/FM or DAB/SAT.

Note: Throughout the audio management spec it defines when to go to the default source. In other feature specifications this shall be followed unless explicitly called out otherwise for a particular source.

- Some Audio Management requirements that might be impacted if there was an exception in a feature specification:
  - AUMGNT-SD-REQ-014586/A-Release Current Audio Resource, One Entry in Stack, (Switch to Default Source)
  - AUMGNT-SR-REQ-014559/A-Audio Request_Last Used Source
- Example: At the time this requirement revision was released Apple required CarPlay to go to Audio Off when CarPlay is the active audio source and the iPhone is disconnected. So SYNC (ie system master) in this case can just send a ReleaseAll Audio Request (audio off) instead of a Release Audio Request which would go to the default source. Also if the iPhone was removed after shutdown then at start-up SYNC wouldn't request the default source if CarPlay was the last source but would instead go to audio off. Check CarPlay spec for latest requirement as it may have changed from this example.

2.2.4 AUMGNT-FUN-REQ-014561/A-Audio Request - System Shutdown (TcSE ROIN-119188-1)

2.2.4.1 Requirements

2.2.4.1.1 AUMGNT-SR-REQ-014562/A-Audio Request_System Shutdown (TcSE ROIN-40945-2)

When the system (front, rear, or both) is shutdown, the System Master or RSE Controller shall issue the AudioRequest(ReleaseALLAudioResources, Front or Rear Requester, Not Requested, Not Requested) to the Audio Resource Server. This will trigger the Audio Resource Server to release all requests for the "Requester System" given in the message.

When the System Master needs to release both systems (Front and Rear) the System Master shall only need to send a request to release the Front System, the Audio Resource Server shall manage releasing both Front and Rear systems.

IMPORTANT:
No default source should be started when " ReleaseALLAudioResources" has been received.

2.2.4.1.2 AUMGNT-SR-REQ-014563/B-Audio Request_System Shutdown_Resource Update (TcSE ROIN-40946-2)

Upon reception of the "ReleaseALLAudioResources" request, the Audio Resource Server shall respond with:

AudioRequest.Rsp(RequestAccepted, ReleaseALLAudioResources, "Requester System", Not Requested, Not Requested)

The Audio Resource Server shall then individually deallocate all sources in the stack for the "Requester System" and issue the ResourceUpdate.St("Requester System", Not Req, Not Req, Deallocated) to inform the Resource Clients that the audio stack is empty for the "Requester System".

For multiple entries in the stack, each individual deallocation shall be separated by TallocRU msec.

Example:
The front requester audio stack consists of AM/FM Radio, Radio; AM/FM Radio, TA. Upon reception of Release ALL, the Audio Resource Server must send the following sequence:

AudioRequest.Rsp(RequestAccepted, ReleaseALLAudioResources, Front Requester, Not Requested, Not Requested)
ResourceUpdate.St(FrontReq, Am/FM Radio, TA, Deallocated)
ResourceUpdate.St(FrontReq, Am/FM Radio, Radio, Deallocated)
ResourceUpdate.St(FrontReq, Not Req, Not Req, Deallocated)

IMPORTANT:
No default source should be started when "ReleaseALLAudioResources" has been received.

Note: When the infotainment system is powered ON (HMIAudioMode = ON) but no audio source is active and audio is OFF (ex. user pressed power button to turn Audio OFF while in Run) this is indicated by an empty audio stack with the ResourceUpdate.St(Requester System, Not Req, Not Req, Deallocated).

2.2.4.1.3 AUMGNT-TMR-REQ-014564/C-Timer - TallocRU (TcSE ROIN-119126-1)

Name	Description	Units	Range	Resolution	Default
Timer - TallocRU	Nominal separation time between allocation/deallocation events as called out in Audio Management individual requirements. Tolerance = (+/- 10 msec) Note: use the default value	msec	20-250	10	100

2.2.5 AUMGNT-FUN-REQ-014569/A-Audio Request - Requesting an Audio Resource (TcSE ROIN-119205-1)

2.2.5.1 Requirements

2.2.5.1.1 AUMGNT-SR-REQ-014570/G-Audio Request - Allowable Combinations (TcSE ROIN-41055-8)

The following are the allowable combinations of the audio request parameters to support the issuance of and AudioRequest.Rq() method. These combinations shall be adhered to by Resource Clients/ Servers classes.

The class deployment table/diagram shall define which physical nodes must implement the required Resource Clients/Servers classes.

Note: The actual usage of the specific audio requests is dependant upon whether the Clients/Servers support the feature of the audio requests. For example, if the AMFM Client/Server does not support the TA feature then the audio request AudioRequest.Rq(RequestAudioResource, Front Requester, AM/FM Radio, TA) would not be utilized.

The Audio Resource Server shall also support the processing of all possible configurations defined in the table.

Resource Class	Requester System	Requested Source	Requested Priority	Comment	Volume Settings	Can be saved as Last Used Source(3)
AMFM Client AMFM Server	Front Requester	AM/FM Radio	Radio	Normal Radio Listening	Media	Yes
AMFM Client AMFM Server	Front Requester	AM/FM Radio	PTY/News	PTY or PTY NEWS interrupt	TA	No
AMFM Client AMFM Server	Front Requester	AM/FM Radio	TA	Traffic Announcement interrupt.	TA	No
AMFM Client AMFM Server	Front Requester	AM/FM Radio	Alarm	PTY31 Alarm.	TA	No
SDARS Client SDARS Server	Front Requester	SDARS	Radio	Normal Radio Listening	Media	Yes
DAB Client DAB Server	Front Requester	DAB	Radio	Normal Radio Listening	Media	Yes
DAB Client DAB Server	Front Requester	DAB	PTY News	PTY NEWS interrupt	TA	No
DAB Client DAB Server	Front Requester	DAB	TA	Traffic Announcement interrupt.	TA	No
DAB Client DAB Server	Front Requester	DAB	Alarm	PTY31 Alarm.	TA	No
SingleCD Client SingleCD Server	Front Requester	Front Disc	Disc	Front disc player	Media	Yes
RearCD Client RearCD Server	Front Requester	Rear Disc	Disc	Rear disc player	Media	Yes
InDashCD Client InDashCD Server	Front Requester	In-Dash CD Changer	Disc	In-dash CD changer	Media	Yes
AUX Client AUX3 Server	Front Requester	Front Aux Input	AUX_ExtSource	BVC Aux Input	Media	Yes
AUX Client AUX2 Server	Front Requester	Front Aux Input	AUX_ExtSource	APIM Aux Input	Media	Yes
AUX Client AUX1 Server	Front Requester	Front Aux Input	AUX_ExtSource	AHU Aux Input	Media	Yes

Rear AUX Client Rear AUX Server	Front Requester	Rear Aux Input	AUX_ExtSource	Rear Aux Input	Media	Yes
iPod Client iPod Server	Front Requester	iPod	AUX_ExtSource	Other external sources	Media	Yes
USB Client USB Server	Front Requester	USB	AUX_ExtSource	Other external sources	Media	Yes
BT_Stereo Client BT_Stereo Server	Front Requester	BT_Stereo	AUX_ExtSource	Other external sources	Media	Yes
APIM Client APIM Server	Front Requester	APIM	Priority Service		Phone	No
APIM Client APIM Server	Front Requester	APIM	Auto Answer		Phone	No
APIM Client APIM Server	Front Requester	APIM	Telephony Service		Phone	No
APIM Client APIM Server	Front Requester	APIM	Mobile NAV and Tel Mute	Mobile Navigation	Prompt (Not Mixed)	No
APIM Client APIM Server	Front Requester	APIM	Alarm		TA	No
APIM Client APIM Server	Front Requester	APIM	TA		TA	No
APIM Client APIM Server	Front Requester	APIM	PTY/NEWS		TA	No
APIM Client APIM Server	Front Requester	APIM	Aux_ExtSource		Media	Yes
VR Client VR Server	Front Requester	Voice Recognizer	PTT Mute & Voice	PTT audio mute + voice feedback	VR	No
Telematic Client Telematic Server	Front Requester	Telematic Unit	Mobile NAV and TEL Mute	Mute speakers for TEL telephony system	N/A	No
Telematic Client Telematic Server	Front Requester	Telematic Unit	Priority Service	SOS calls, etc.	Phone	No
Telematic Client Telematic Server	Front Requester	Telematic Unit	Auto Answer		Phone	No
BTPhone Client BTPhone Server	Front Requester	Bluetooth Phone	Telephony Service	Normal Phone Calls	Phone	No
BTPhone Client BTPhone Server	Front Requester	Bluetooth Phone	Mobile NAV and TEL Mute	Mute speakers for BT telephony system	N/A	No
BTPhone Client BTPhone Server	Front Requester	Bluetooth Phone	Priority Service		Phone	No
Navigation Client Navigation Server (Non-APIM)	Front Requester	Navigation	Nav. User Voice Cmd	Mixing request. Navigation voice command requested by user.	Prompt	No
Navigation Client Navigation Server (Non-APIM)	Front Requester	Navigation	Nav. System Voice Cmd	Mixing Request. Navigation voice command requested by system.	Prompt	No
Navigation Client Navigation Server (Non—APIM)	Front Requester	Navigation	Mobile NAV and TEL Mute	Mobile Navigation	Prompt (Not Mixed)	No

System Master	Front Requester	Not Requested	Manual Audio Mute(1)	Mute of the audio system	N/A	No
System Master	Front Requester	Not Requested	Not Requested	Used for "Release All Resources" & "Get ALL resource updates"(2)	N/A	Yes(5)
AMFM Client AMFM Server	Rear Requester	AM/FM Radio	Radio	Normal Radio Listening		
SDARS Client SDARS Server	Rear Requester	DAB/SDARS	Radio	Normal Radio Listening		
SingleCD Client SingleCD Server	Rear Requester	Front Disc	Disc	Front disc player		
InDashCD Client InDashCD Server	Rear Requester	In-Dash CD Changer (not part of the rear system)	Disc	In-dash CD changer		
RearCD Client RearCD Server	Rear Requester	Rear Disc	Disc	Rear disc player		
AUX Client AUX3 Server	Rear Requester	Front Aux Input	AUX_ExtSource	BVC Aux Input		
AUX Client AUX2 Server	Rear Requester	Front Aux Input	AUX_ExtSource	APIM Aux Input		
AUX Client AUX1 Server	Rear Requester	Front Aux Input	AUX_ExtSource	AHU Aux Input		
Rear AUX Client Rear AUX Server	Rear Requester	Rear Aux Input	AUX_ExtSource	Rear Aux Input		
iPod Client iPode Server	Rear Requester	Front iPod	AUX_ExtSource	Other external sources		
USB Client USB Server	Rear Requester	Front USB	AUX_ExtSource	Other external sources		
BT_Stereo Client BT_Stereo Server	Rear Requester	Front BT_Stereo	AUX_ExtSource	Other external sources		

Note:
1) "Manual Audio Mute" is used by the front system to mute the audio system. The current source shall be ~~paused (if applicable) and~~ stacked.
2) When the requester wants to release all resources or get resource update for all requests in the stack, there is no specified audio source or priority, so Not Requested will be used in this case.
3) Indicates whether the System Master is allowed to save the combination as the "Last Used Source" during power mode transitions. These source are saveable when either stacked or granted.
4) Volume Settings column Indicates what the volume settings will be once granted in the ResourceUpdate.St
5) The ResourceUpdate.st of (Front Req, Not Req, Not Req, Deallocated) is saved as no audio source (ex Power button turned audio OFF while in Run with HMIAudioMode = ON) but for the system master (ex MFD/APIM..) when starting up and shutting down if there was an active source before the shutdown sequence is started than the system master shall remember that source. See Station Management for details of start-up and shutdown.

2.2.5.1.2 AUMGNT-SR-REQ-014571/A-Audio Request - Resource Client Rq (TcSE ROIN-41063-1)

The Resource Client shall follow the "Properties of Priorities" table and "Allowed Audio Requests" tables for constructing the AudioRequest.Rq() method.

2.2.5.1.3 AUMGNT-SR-REQ-014572/B-Audio Request - Resource Client Rq no response (TcSE ROIN-41064-1)

Unless noted otherwise if the Resource Client does not receive the AudioRequest.Rsp (Accepted) command within Taudio_request, the Resource Client shall wait for a new request event to occur before attempting another request.

Note: at start-up the System Master Resource Client is allowed to do a retry event 500 msec later if did not receive an AudioRequest.Rsp.

2.2.5.1.4 AUMGNT-SR-REQ-014573/A-Audio Request - Resource Client Rq denied (TcSE ROIN-41065-2)

If a request is denied, AudioRequest.Rsp (Denied), the Resource Client shall wait a minimum of Taudio_req_retry before retrying a new request. All subsequent retries shall be separated by a minimum of Taudio_req_retry. If the request continues to be denied after a total time of Taudio_req_retry_total, then the retry shall be cancelled and the Resource Client shall wait for a new request event to occur before attempting another request. The total time shall begin at the initial resource request.

2.2.5.1.5 AUMGNT-SR-REQ-014574/A-Resource Client - Granted w/o Control (TcSE ROIN-41068-1)

Resource Clients which have been "Granted w/o Control" for the "Rear Requester" shall not issue control commands (FF/REV, etc.) to the Resource Slave.

2.2.5.1.6 AUMGNT-SR-REQ-014575/A-Resource Client - Update View (TcSE ROIN-41066-1)

Upon the subsequent reception of the respective ResourceUpdate.St(Allocated), the Resource Client shall update their respective HMI view.

2.2.5.1.7 AUMGNT-SR-REQ-014576/A-Audio Request - Muliple Clients (TcSE ROIN-129288-1)

Based on the deployment table, a component may have several Resource Clients (e.g. AM_FM Client, CD Client, etc.) associated to it. When a component has several Resource Clients and needs to switch from one client to another, the component shall follow the standard audio request process for activating its audio clients. The Audio Resource Server will be responsible for managing the connection/disconnection process.

For example, a component has both USB and iPod deployed to it. If USB is currently the granted audio source and the component needs to switch to iPod, the component shall only issue a request for iPod and the Audio Resource Server shall management the activation process. The component must not issue a release for USB prior to requesting iPod.

2.2.5.1.8 AUMGNT-REQ-014577/A-Audio Request_Audio Priority Description_Exceptions (TcSE ROIN-284386-1)

The audio shall not be muted when the current source is set to AM/FM or DAB Radio with media volume active and there is a priority change resulting in a TA volume setting source becoming active (i.e. priority changes from Radio to TA, Alarm, PTY/News or vice versa). Reference "AUMGNT-GREQ-41055-7-Audio Request - Allowable Combinations".

2.2.5.1.9 AUMGNT-REQ-014578/C-Muting and Unmuting between Source changes (TcSE ROIN-286981-1)

Unless noted otherwise* when changing audio sources the Audio Resource Server shall mute when SetMute.Rq = ON as indicated in the Audio Management Sequence Diagrams.

- Note: for the Audio Resource Server SetMute.Rq = ON begins the start of the mute ramp times as called out in requirement "VOL-REQ-088208-Audio Attenuation / Mute Ramps". While the audio is ramping down this shall not affect the CAN exchange in the audio management process. SetMute.Rq = OFF is only after the previous source is muted and the audio has been switched to the new audio source.

When changing audio sources the Audio Resource Server shall unmute (SetMute.Rq = OFF) in 200 msec or less of Granting the new audio source as indicated in the ResourceUpdate signal. This is applicable when there is an AHU with no DSP AMP. When DSP AMP is present reference requirement "AUMGNT-GREQ-220856-1-Muting and Unmuting of Audio Resource Server Line Level signal to the external DSP AMP for source changes".

* Example: A requirement that notes otherwise is "AUMGNT-GREQ-284386-1-Audio Request_Audio Priority Description_Exceptions".

2.2.5.2 Sequence Diagrams

2.2.5.2.1 AUMGNT-SD-REQ-014579/A-Request Internal Audio Resource, No Entry in Stack (TcSE ROIN-41616-2)

Constraints

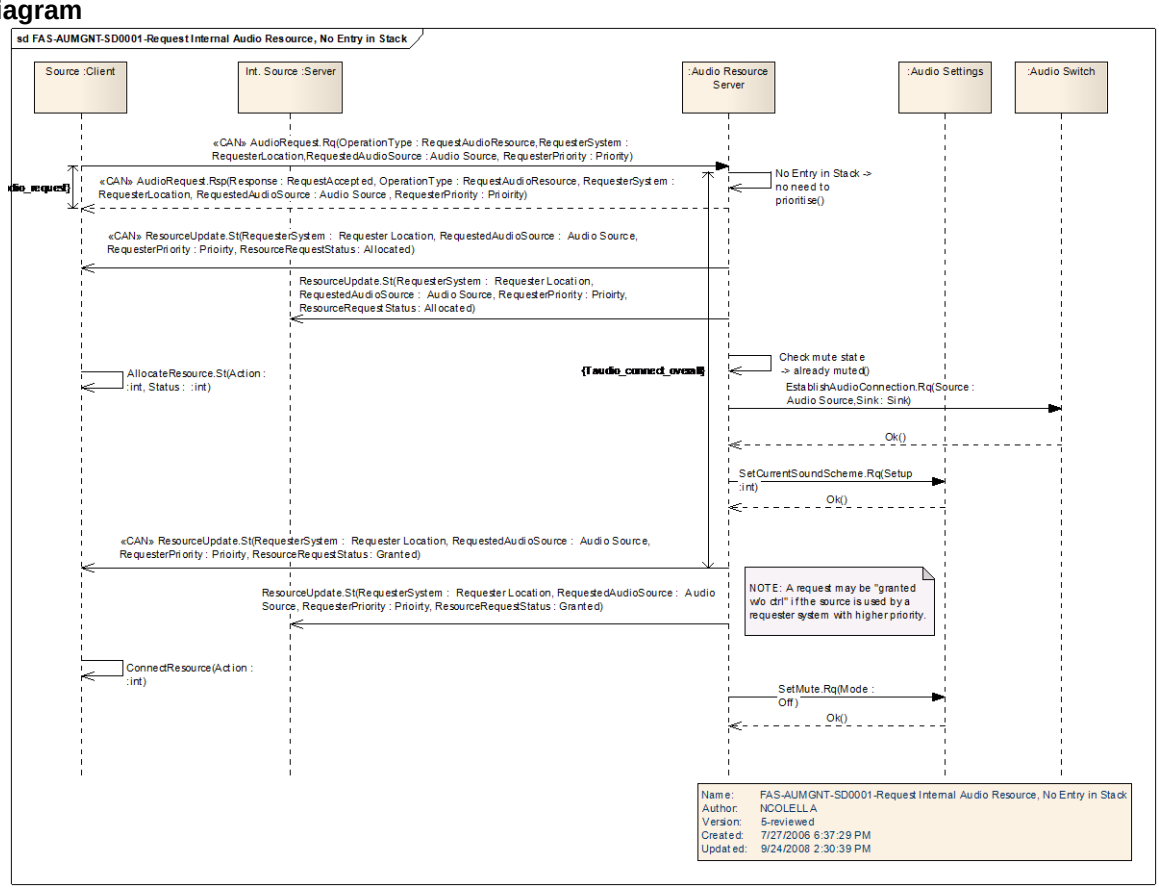
Pre-condition

The Audio Stack is empty (no currently active audio source)

Post-condition

The requested audio source is active

Sequence Diagram



2.2.5.2.2 AUMGNT-SD-REQ-014580/A-Request External Audio Resource, No Entry in Stack (TcSE ROIN-41621-2)

Constraints

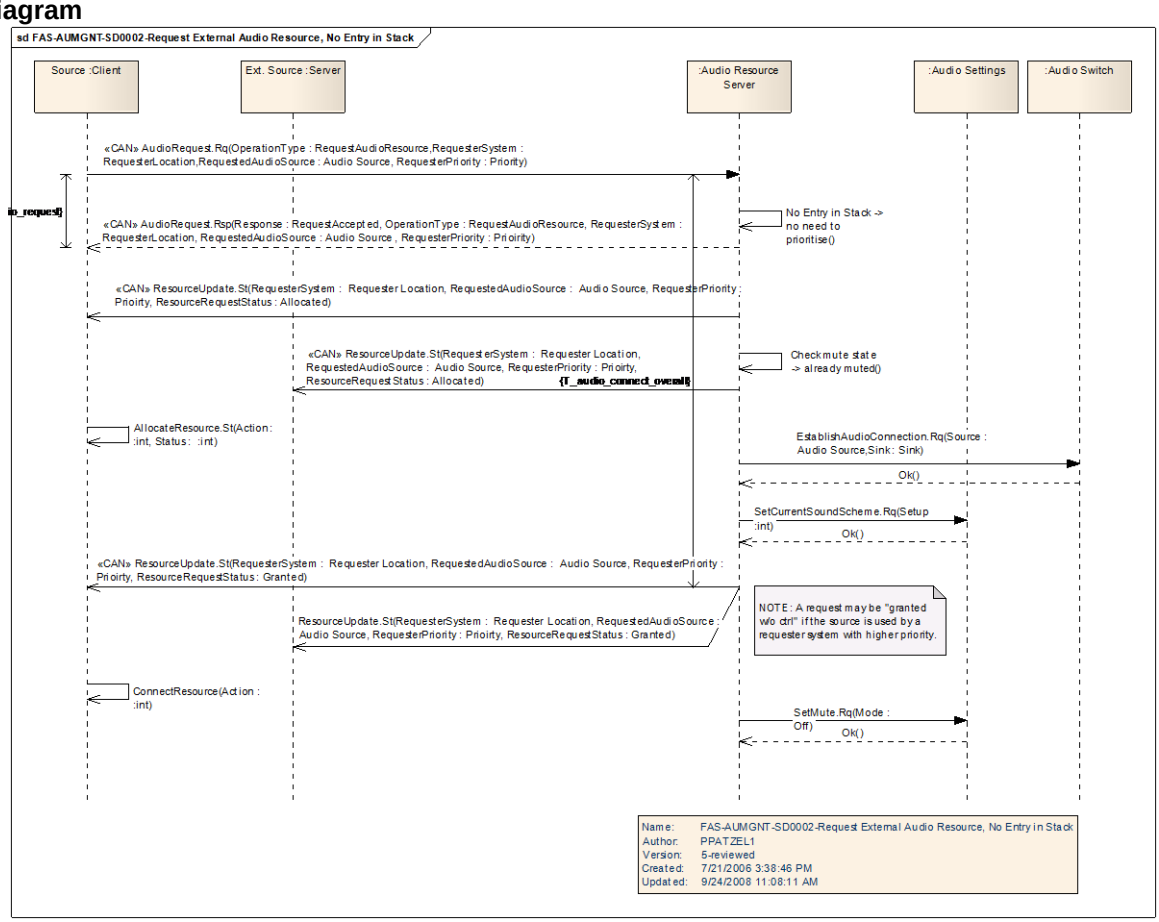
Pre-condition

The Audio Stack is empty (no currently active audio source)

Post-condition

The requested audio source is active

Sequence Diagram



2.2.5.2.3 AUMGNT-SD-REQ-014581/A-Request Internal Audio Source, At Least one Entry in Stack (TcSE ROIN-41626-3)

Constraints

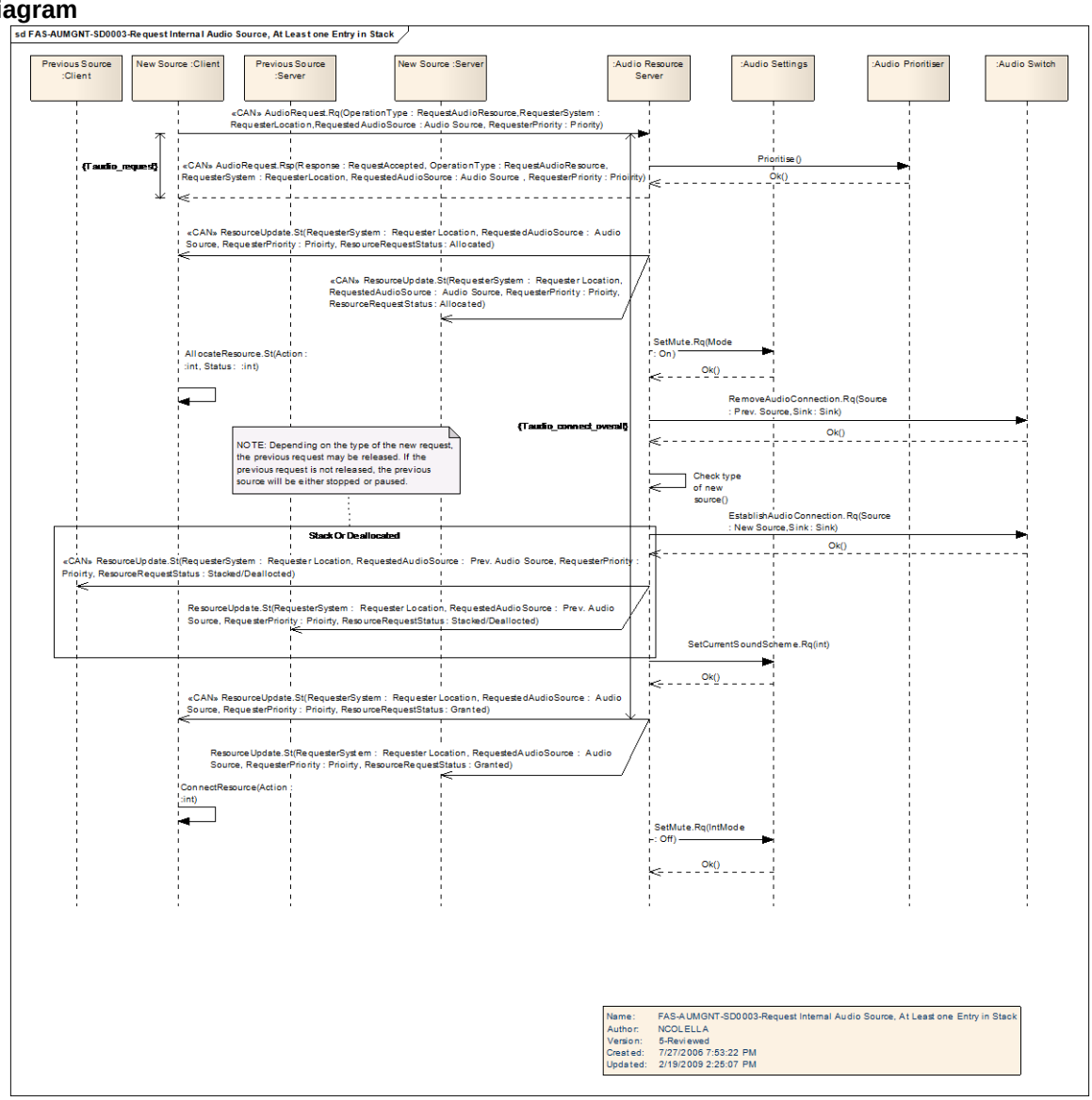
Pre-condition

The Audio Stack consists of at least one entry

Post-condition

The requested audio source is active

Sequence Diagram



2.2.5.2.4 AUMGNT-SD-REQ-014582/A-Request External Audio Source, At Least one Entry in Stack (TcSE ROIN-41631-3)

Constraints

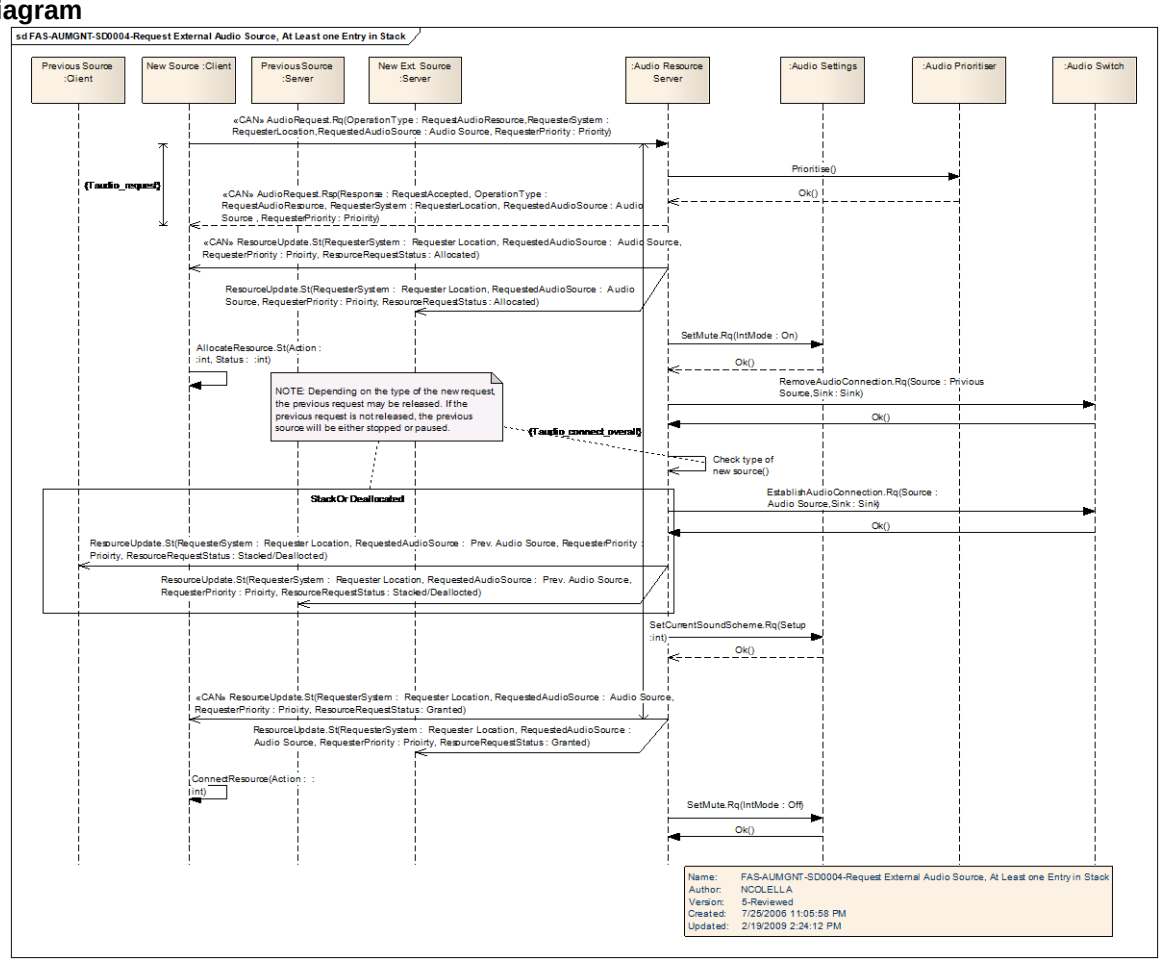
Pre-condition

The Audio Stack consists of at least one entry

Post-condition

The requested audio source is active

Sequence Diagram



2.2.5.2.5 AUMGNT-SD-REQ-014583/B-Exception - Audio Request Denied (TcSE ROIN-41642-1)

Constraints

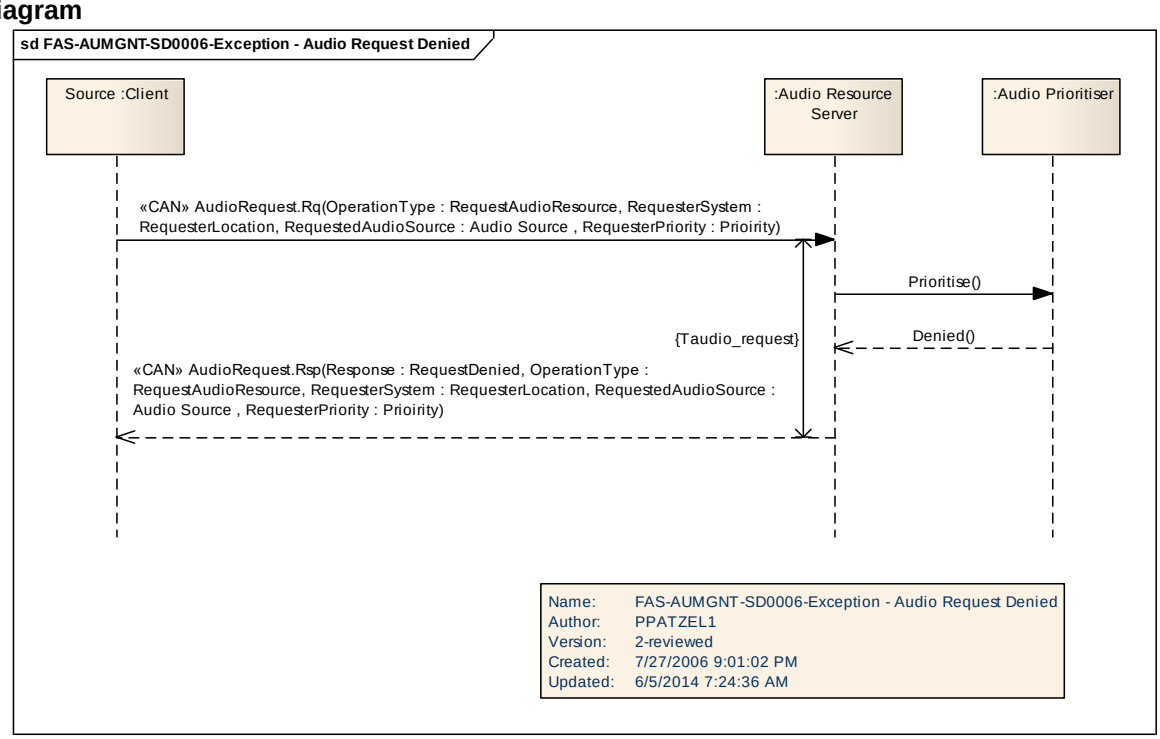
Pre-condition

The Audio Stack consists of at least one entry

Post-condition

Same situation as before the sequence, audio request denied

Sequence Diagram



2.2.6 AUMGNT-FUN-REQ-014584/A-Audio Request - Releasing an Audio Resource (TcSE ROIN-121275-1)

2.2.6.1 Requirements

2.2.6.1.1 AUMGNT-REQ-031821/A-Releasing a Temporary Priority Audio Source with one Entry in the Audio Stack (TcSE ROIN-305211-1)

All priorities with the attribute "Collapses Stack" equal to "No" as defined in AUMGNT-GREQ-40963-Audio Request_Properties of Priorities_Overview (System) are considered temporary audio priorities.

While the Audio Stack is empty and a temporary priority source becomes active as defined above, then upon release of the audio source with a temporary priority, the Audio Resource Server shall not allocate / grant the default source and the audio stack shall become empty.

Example:
The ResourceUpdate.St has an empty audio stack. A temporary audio source then becomes active (ex. Phone, VR, Prompts…). When the temporary audio source is released, the Audio Resource Server returns to an empty audio stack.

Notes:
The audio stack is empty when the ResourceUpdate.St = “RequesterSystem:FrontRequester; RequestedAudioSource:Not Requested; RequestedPriority:Not Requested; ResourceRequestedStatus:Deallocated”.

Temporary audio priorities can be released internally by the Audio Server or externally via an Audio Request (ReleaseAudioResource/ReleaseAllAudioResources) from the Audio Source Client (ex. VR, Phone).

2.2.6.1.2 AUMGNT-REQ-031822/A-Suppressing Announcements with Priority Type TA, Alarm, PTY/News while there is an empty audio stack (TcSE ROIN-305220-1)

While the Audio Stack is empty the Audio Resource Server shall not source announcements with the priority type Alarm, PTY/News, TA.

Notes:
The audio stack is empty when the ResourceUpdate.St = “RequesterSystem:FrontRequester; RequestedAudioSource:Not Requested; RequestedPriority:Not Requested; ResourceRequestedStatus:Deallocated”.

2.2.6.2 Sequence Diagrams

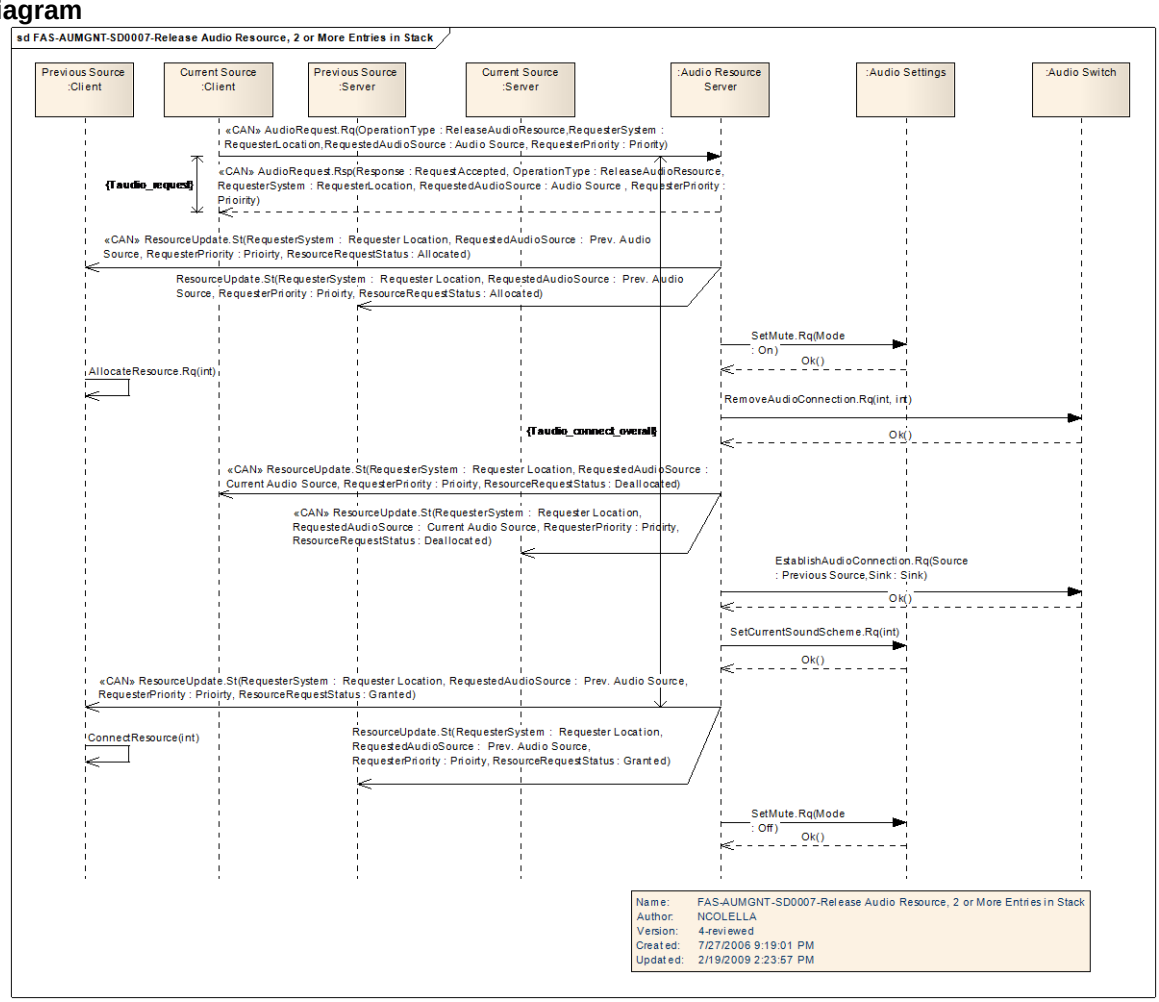
2.2.6.2.1 AUMGNT-SD-REQ-014585/A-Release Audio Resource, 2 or More Entries in Stack (TcSE ROIN-41647-3)

Constraints

Pre-condition
The Audio Stack has two or more entries

Post-condition
The previous used source is active

Sequence Diagram



2.2.6.2.2 AUMGNT-SD-REQ-014586/A-Release Current Audio Resource, One Entry in Stack, (Switch to Default Source) (TcSE ROIN-41652-4)

Constraints

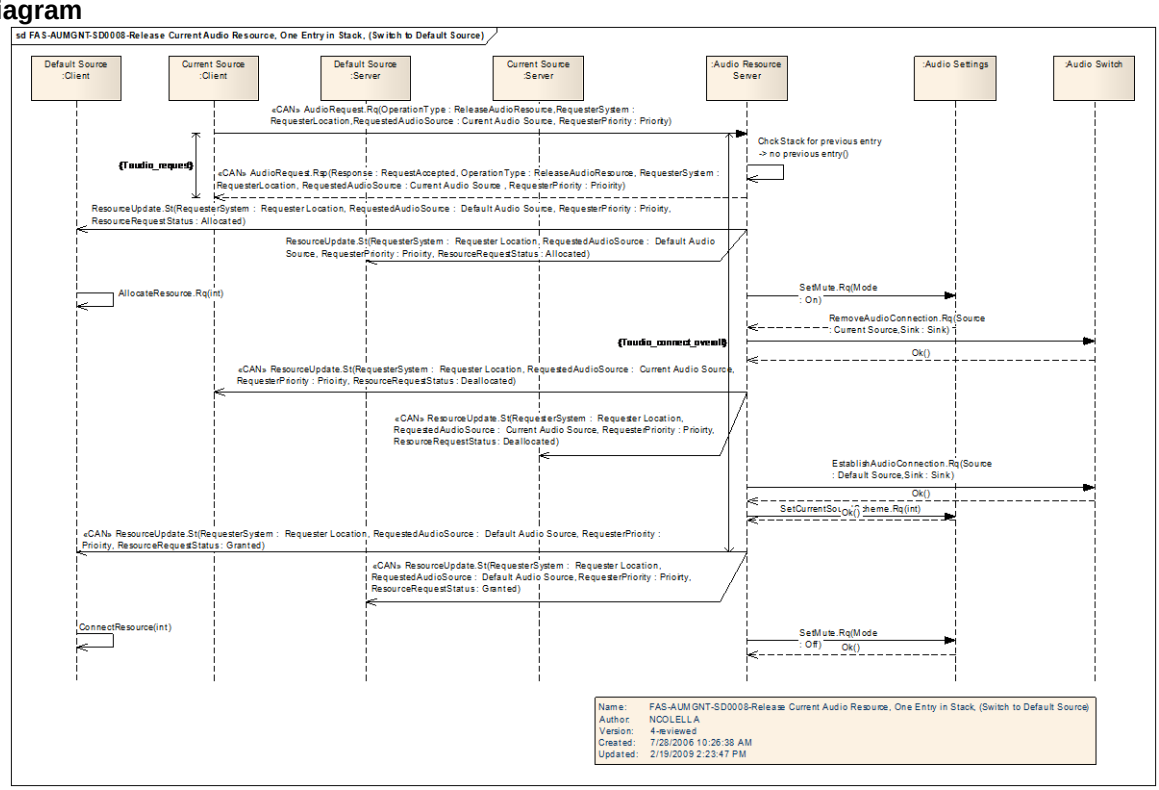
Pre-condition

The Audio Stack consists of one entry and the Audio Stack entry is not a temporary audio source (ex Phone, VR – as defined in AUMGNT-GREQ-031821-Releasing a Temporary Priority Audio Source with one Entry in the Audio Stack).

Post-condition

The default source is active

Sequence Diagram



2.2.6.2.3 AUMGNT-SD-REQ-014587/A-Release Stacked Request (TcSE ROIN-41657-2)

Constraints

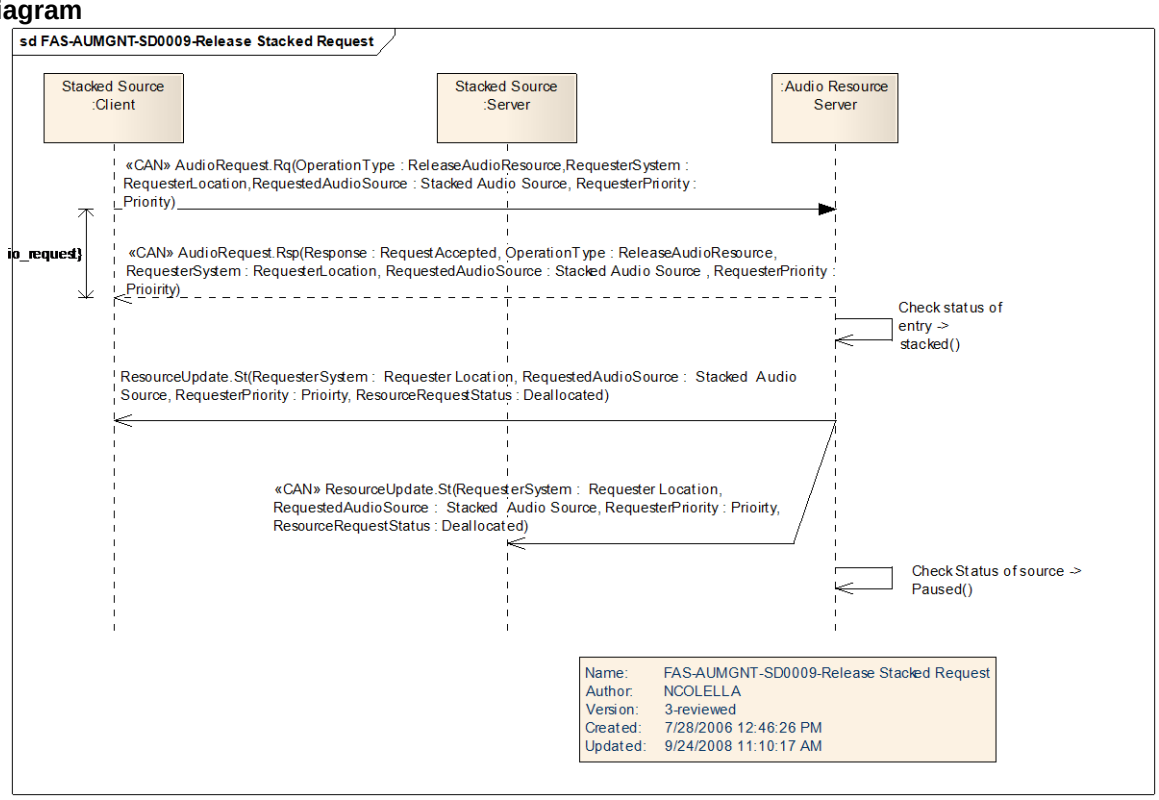
Pre-condition

The Audio Stack consists of at least two entries, one of them is stacked (the one to be released)

Post-condition

The currently used source is active as before

Sequence Diagram



2.2.6.2.4 AUMGNT-SD-REQ-014588/B-Release All Resources, Front Stack (TcSE ROIN-121246-4)

Constraints

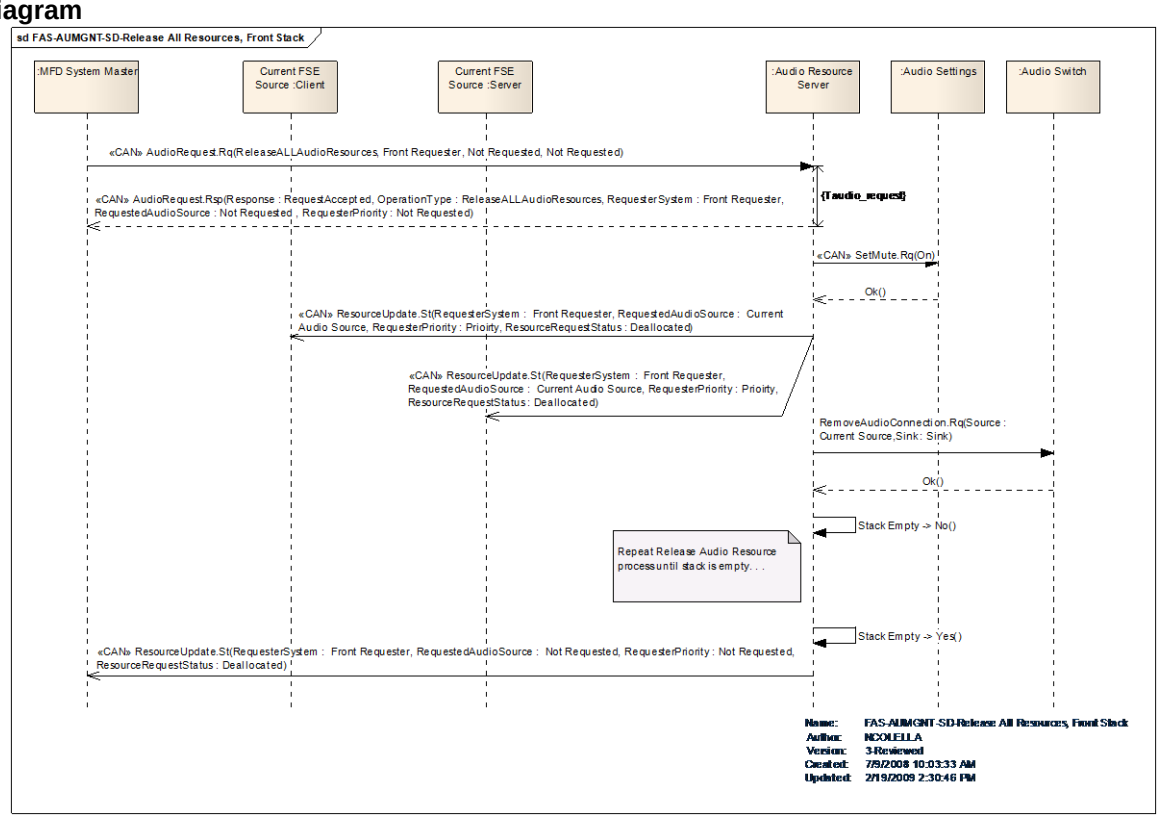
Pre-condition

The Front Audio Stack consists of one or more entries.

Post-condition

No sources are active.

Sequence Diagram



2.2.6.2.5 AUMGNT-SD-REQ-014589/A-Release All Resources, Front Stack and Rear Stack (TcSE ROIN-121264-3)

Constraints

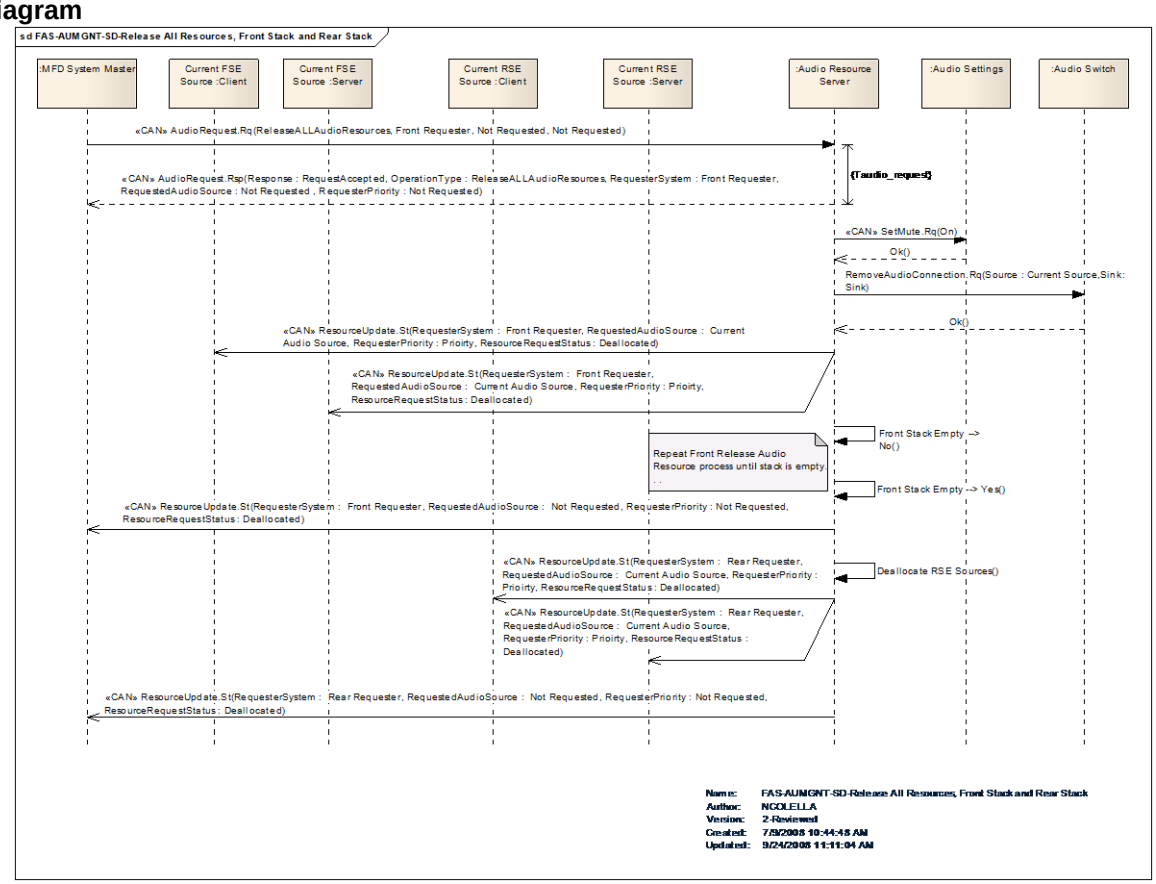
Pre-condition

The Front Audio Stack consists of one or more entries.

Post-condition

No sources are active.

Sequence Diagram



2.2.7 AUMGNT-FUN-REQ-014590/A-Audio Request - GetResourceUpdate (TcSE ROIN-119229-1)

2.2.7.1 Requirements

2.2.7.1.1 AUMGNT-SR-REQ-014591/A-Audio Request_GetResourceUpdate Request (TcSE ROIN-41061-1)

To obtain the current status of a specific request/source from the Audio Resource Server, the Resource Client shall utilize the AudioRequest.Rq() method with the AudioRequest.Rq() parameters set to the following:

AudioRequest.Rq(GetResourceUpdate, Requester System, Requested Audio Source, Requester Priority)

2.2.7.1.2 AUMGNT-SR-REQ-014592/A-Audio Request_GetResourceUpdate RSP (TcSE ROIN-41058-1)

The Audio Resource Server shall respond to AudioRequest.Rq(GetResourceUpdate) method via the AudioRequest.Rsp() and the ResourceUpdate.St() methods. The response shall be provided within TgetRU msec of the request.

Due to nature of the ResourceUpdate() parameters being physically packaged in the same CAN message with the AudioRequest.Rsp() method, when a "GetResourceUpdate" is received the AudioRequest.Rsp() and ResourceUpdate.St() parameters shall be set to the following values:

AudioRequest.Rsp(RequestAccepted, GetResourceUpdate, Requester System, Requested Audio Source, Requester Priority)

ResourceUpdate(Requester System, Requested Audio Source, Requester Priority, Resource Request Status)

2.2.7.1.3 AUMGNT-SR-REQ-014593/A-AudioClient-Polling-SingleEntryDenyFaultyReqMethodSetup (TcSE ROIN-128916-2)

A "GetResourceUpdate" request shall be denied if the requested combination is not valid per AUMGNT-GREQ-41055-3-Audio Request - Allowable Combinations. The response shall be provided within TgetRU msec of the request.

Due to nature of the ResourceUpdate.St() parameters being physically packaged in the same CAN message with the AudioRequest.Rsp() method, when a "GetResourceUpdate" request is denied the AudioRequest.Rsp() and ResourceUpdate.St() parameters shall be set to the following values:

AudioRequest.Rsp(RequestDenied, GetResourceUpdate, Requester System, Requested Audio Source, Requested Priority)

ResourceUpdate(FrontRequester, Not Requested, Not Requested, No Resource Update)

2.2.7.1.4 AUMGNT-SR-REQ-014594/A-AudioClient-Polling-SingleEntryAllowedRequests (TcSE ROIN-128915-2)

The Audio Resource Server shall support the "GetResourceUpdate" request with all allowable request combinations regardless if the requested combination is active or inactive in the audio stack. Allowed combinations as listed in AUMGNT-GREQ-41055-3-Audio Request - Allowable Combinations.

2.2.7.1.5 AUMGNT-SR-REQ-014595/A-AudioClient-Polling-AcceptAudioStackPollingRequest (TcSE ROIN-128902-2)

A "GetALLResourceUpdate" or "GetResourceUpdate" polling request shall be accepted if the Audio Resource Server is active and the audio stack is ready to accept. A requester will be able to poll the audio stack prior to receiving the ResourceUpdate() periodic loop. For example, upon system startup a requester can issue a request prior receiving the RU loop.

2.2.7.1.6 AUMGNT-SR-REQ-014596/A-AudioClient-Polling-DenyAudioStackPollingRequest (TcSE ROIN-128904-2)

The audio resource server shall deny any "GetALLResourceUpdate" or "GetResourceUpdate" polling request if the audio stack is not ready and the Resource Update Loop is currently not in activated.

2.2.7.1.7 AUMGNT-SR-REQ-014597/A-AudioClient-Polling-ParallelPollingRequests (TcSE ROIN-128906-2)

Parallel polling requests ("GetALLResourceUpdate" and/or "GetResourceUpdate") from more than one requester is inhibited. If there is a new polling request during a currently active polling session the audio resource server shall deny the new

request. Other requesters can use the same polling information from a current polling session. Each requester does not need to have a separate polling session. For example, during start-up, if a requester needs to receive the updated audio stack data but receives an accepted polling response from the audio resource server prior to issuing it polling request, then the requesters shall cancel its pending polling request.

2.2.7.1.8 AUMGNT-SR-REQ-014598/A-Audioclient-Polling-RetryMechanism (TcSE ROIN-128907-2)

"GetALLResourceUpdate" and "GetResourceUpdate" polling requests are to re-transmitted if the previous request was denied. Retry requests shall be separated by TPollReqRetry = 300ms. The re-try mechanism is stopped if the polling request gets accepted from the audio resource server.

2.2.7.1.9 AUMGNT-SR-REQ-014599/A-AudioClient-Polling-InitAudioStackPolling (TcSE ROIN-128908-2)

"GetALLResourceUpdate" and "GetResourceUpdate" polling requests shall only be issued when a requester is missing this information and requires the information for further processing. For example, an event which caused the requester to become unstable and unsure of the audio stack. If a new source is requested or released according to the defined audio management requirements, the requester unit must not re-request the status of a valid and legal released audio source.

2.2.7.1.10 AUMGNT-TMR-REQ-014600/B-Timer - TgetRU (TcSE ROIN-41510-1)

Name	Description	Units	Range	Resolution	Default
Timer - TgetRU	Max. response time for GetALLResourceUpdate or GetResourceUpdate requests. Note: use the default value	msec	25-1000	25	125

2.2.7.2 Sequence Diagrams

2.2.7.2.1 AUMGNT-SD-REQ-014601/A-Get Resource Update (TcSE ROIN-119795-1)

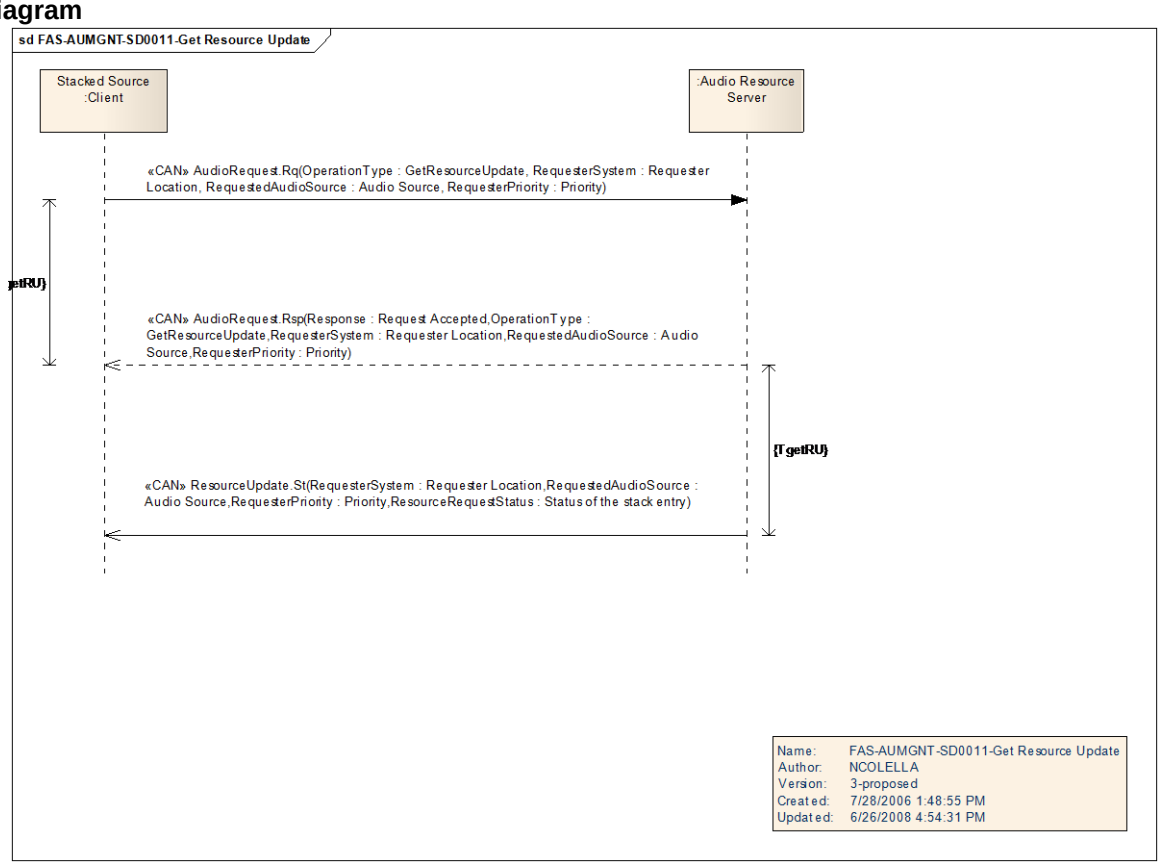
Linked Elements
FRD-REQ-028574/A-Audio Management (TcSE ROIN-28902-2)

Constraints

Pre-condition
The system is activated

Post-condition
The system continues as before

Sequence Diagram



2.2.8 AUMGNT-FUN-REQ-014602/A-Audio Request - GetALLResourceUpdate (TcSE ROIN-119230-1)

2.2.8.1 Requirements

2.2.8.1.1 AUMGNT-SR-REQ-014603/A-Audio Request_GetALLResourceUpdate Request (TcSE ROIN-41062-1)

To obtain the current status of all requests/sources from the Audio Resource Server, the Resource Client shall utilize the AudioRequest.Rq() method with the AudioRequest.Rq() parameters set to the following:

AudioRequest.Rq(GetALLResourceUpdate, Requester System, Not Requested, Not Requested)

2.2.8.1.2 AUMGNT-SR-REQ-014604/A-Audio Request_GetALLResourceUpdate RSP (TcSE ROIN-41057-1)

The Audio Resource Server shall respond to AudioRequest.Rq(GetALLResourceUpdate) method via the AudioRequest.Rsp() and the ResourceUpdate.St() methods. The response shall be provided within TgetRU msec of the request. For multiple entries in the stack, each response shall be separated by TgetallRU msec.

Due to nature of the ResourceUpdate.St() parameters being physically packaged in the same CAN message with the AudioRequest.Rsp() method, when a "GetALLResourceUpdate" is received the AudioRequest.Rsp() and ResourceUpdate.St() parameters shall be set to the following values:

AudioRequest.Rsp(RequestAccepted, GetALLResourceUpdate, Requester System, Not Requested, Not Requested)

ResourceUpdate(Requester System, Requested Audio Source, Requester Priority, Resource Request Status)

2.2.8.1.3 AUMGNT-SR-REQ-014605/A-AudioClient-Polling-StartingEntryForPolling (TcSE ROIN-128909-2)

In response to the "GetALLResourceUpdate" request, the Audio Resource Server shall transmit the stack entries starting with the currently scheduled and not yet transmitted entry in the audio stack.

2.2.8.1.4 AUMGNT-SR-REQ-014606/A-AudioClient-Polling-ContentPollingLoop (TcSE ROIN-128910-2)

In response to the "GetALLResourceUpdate" request, only audio resources which are "Granted", Stacked", or "Allocated" shall be included in the ResourceUpdate() polling loop. Not active or not stacked sources shall not be included as part of the polling loop. For example, if two items are in the stack, these two stack entries will be transmitted within the ResourceUpdate() polling loop.

2.2.8.1.5 AUMGNT-SR-REQ-014607/A-AudioClient-Polling-LastEntryForPolling (TcSE ROIN-128911-2)

In response to the "GetALLResourceUpdate" request, each entry within the audio stack shall be transmitted one time.

2.2.8.1.6 AUMGNT-SR-REQ-014608/A-AudioClient-Polling-RULoopAfterPollingFinalized (TcSE ROIN-128912-2)

After completion of the polling of the audio stack, the Audio Resource server shall resume the normal resource update loop process.

2.2.8.1.7 AUMGNT-SR-REQ-014609/A-AudioClient-Polling-DenyFaultyReqMethodSetup (TcSE ROIN-128913-2)

A "GetALLResourceUpdate" request shall be denied if the requested combination is not valid per AUMGNT-GREQ-41055-3-Audio Request - Allowable Combinations. The response shall be provided within TgetallRU msec of the request.

Due to nature of the ResourceUpdate.St() parameters being physically packaged in the same CAN message with the AudioRequest.Rsp() method, when a "GetResourceUpdate" request is denied the AudioRequest.Rsp() and ResourceUpdate.St() parameters shall be set to the following values:

AudioRequest.Rsp(RequestDenied, GetALLResourceUpdate, Requester System, Requested Audio Source, Requested Priority)

ResourceUpdate(FrontRequester, Not Requested, Not Requested, No Resource Update)

2.2.8.1.8 AUMGNT-SR-REQ-014610/A-AudioClient-Polling-RULoopAfterSingleEntryPollingFinalized (TcSE ROIN-128914-2)

After completion of the polling of the audio stack, the Audio Resource server shall resume the resource update loop process.

2.2.8.1.9 AUMGNT-TMR-REQ-014611/B-Timer - TgetallRU (TcSE ROIN-41509-2)

Name	Description	Units	Range	Resolution	Default
Timer - TgetallRU	Nominal separation time between ResourceUpdate.St() responses for multiple stacked entries. Note: use the default volume	msec	25-1000	10	20

2.2.8.2 Sequence Diagrams

2.2.8.2.1 AUMGNT-SD-REQ-014612/A-GetALLResourceUpdate (TcSE ROIN-120421-1)

Scenarios

Scenario

Constraints

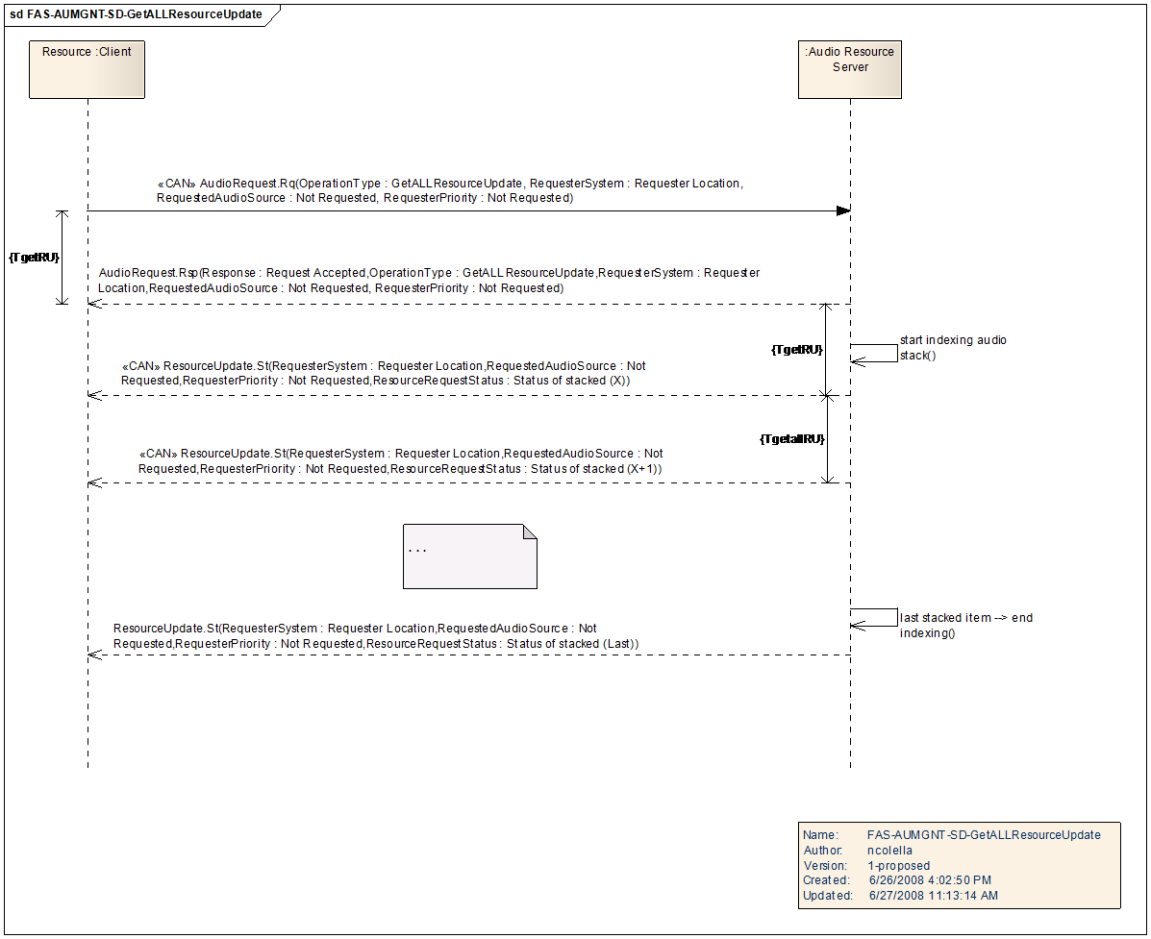
Pre-condition

The system is activated

Post-condition

The system continues as before

Sequence Diagram



2.2.9 AUMGNT-FUN-REQ-014613/A-Resource Client - Audio Source Cycling Order (TcSE ROIN-166933-1)

2.2.9.1 Requirements

2.2.9.1.1 AUMGNT-SR-REQ-014614/G-Resource Client - Audio Source Cycling (TcSE ROIN-166931-2)

Reference the HMI specifications for audio source ordering.

~~The following table outlines the audio source selection order in applications which allow the user a simple method for cycling through audio sources (i.e. steering wheel "Media" button). The table only outlines the order but the actual methodology for each source selection is defined in the respective sources functional area.~~

~~If the HMI specification for the "Media" source order button is different from what is listed in this requirement then follow the HMI specification.~~

~~Requests for audio sources shall not be issued any faster than Taudio_cycle_request when using the source order button.~~

~~Order~~	~~Source Name~~	~~Requester System~~	~~Requested Source~~	~~Requested Priority~~	~~Comment~~
~~1~~	~~AM (1)~~	~~Front Requester~~	~~AM/FM Radio~~	~~Radio~~	~~Normal Radio Listening~~
~~2~~	~~AM AST (1)~~	~~Front Requester~~	~~AM/FM Radio~~	~~Radio~~	~~Normal Radio Listening~~
~~3~~	~~FM1 (1)~~	~~Front Requester~~	~~AM/FM Radio~~	~~Radio~~	~~Normal Radio Listening~~
~~4~~	~~FM2 (1)~~	~~Front Requester~~	~~AM/FM Radio~~	~~Radio~~	~~Normal Radio Listening~~
~~5~~	~~FM AST (1)~~	~~Front Requester~~	~~AM/FM Radio~~	~~Radio~~	~~Normal Radio Listening~~
~~6~~	~~SAT 1 / DAB1 (1)~~	~~Front Requester~~	~~SDARS~~	~~Radio~~	~~Normal Radio Listening~~
~~7~~	~~SAT 2 / DAB2 (1)~~	~~Front Requester~~	~~SDARS~~	~~Radio~~	~~Normal Radio Listening~~
~~8~~	~~SAT 3 / DAB3 (1)~~	~~Front Requester~~	~~SDARS~~	~~Radio~~	~~Normal Radio Listening~~
~~9~~	~~CD (2)~~	~~Front Requester~~	~~Front Disc~~	~~Disc~~	~~Front disc player~~
~~10a (without APIM - Ex. USB internal to AHU)~~	~~Aux USB (4)~~	~~Front Requester~~	~~USB~~	~~Aux_ExtSource~~	~~AHU Aux Input~~
	~~Aux iPod (4)~~	~~Front Requester~~	~~iPod~~	~~Aux_ExtSource~~	~~AHU Aux Input~~
	~~Line – In (3)~~	~~Front Requester~~	~~Front Aux Input~~	~~AUX_ExtSource~~	~~AHU Aux Input~~
~~10b (with APIM)~~	~~AUX~~	~~Front Requester~~	~~APIM~~	~~AUX_ExtSource~~	~~APIM Aux Input~~

~~1) Consult appropriate use case/sequence diagram for band selection. SAT and DAB are mutually exclusive. DAB3 applicable if supported by Audio Client (ex. DAB3 HMI) and Audio Server.~~
~~2) Only requested if CD is loaded.~~
~~3) Line-in (Front Aux Input) is not always available for the customer. The Audio Client should have a config parameter to decide if the Line-In source should be requested or skipped within the source sequence.~~
~~4) The FunctionStatus of USB and iPOD is populated by AHU for what source is available for the Audio Client. If source is not available the Audio Client shall not request the source.~~

2.2.9.1.2 AUMGNT-TMR-REQ-014615/B-Timer - Taudio_cycle_request (TcSE ROIN-166932-1)

Name	Description	Units	Range	Resolution	Default
Timer - Taudio_cycle_request	Minimum separation time between audio source requests. Note: use the default value	msec	25-1000	25	125

2.3 AUMGNT-FUN-REQ-014616/A-Stack of Request (Pause of Ext. Source) (TcSE ROIN-120527-1)

2.3.1 Sequence Diagrams

2.3.1.1 AUMGNT-SD-REQ-014617/A-Stack of Request (Pause of Ext. Source) (TcSE ROIN-119834-2)

Linked Elements
FRD-REQ-028574/A-Audio Management (TcSE ROIN-28902-2)

Constraints

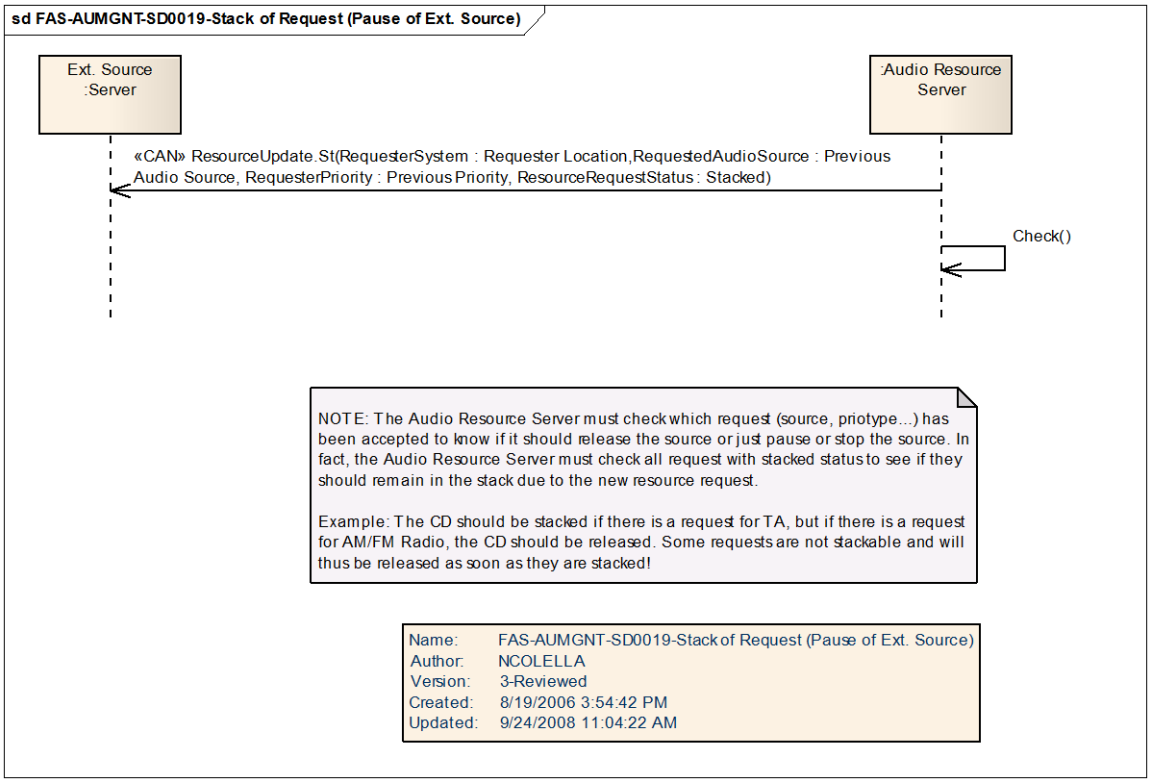
Pre-condition
The system is activated

Pre-condition
The Stacked Behaviour requires the source to be paused when the request is stacked.

- Exception: When Manual Audio Mute is Granted and Audio Source is stacked and the stacked source is not paused.

Post-condition
The source is paused

Sequence Diagram



2.4 AUMGNT-FUN-REQ-014618/A-Stack of Request (Pause of Int. Source) (TcSE ROIN-120532-1)

2.4.1 Sequence Diagrams

2.4.1.1 AUMGNT-SD-REQ-014619/A-Stack of Request (Pause of Int. Source) (TcSE ROIN-119828-2)

Linked Elements
FRD-REQ-028574/A-Audio Management (TcSE ROIN-28902-2)

Constraints

Pre-condition

The system is activated

Pre-condition

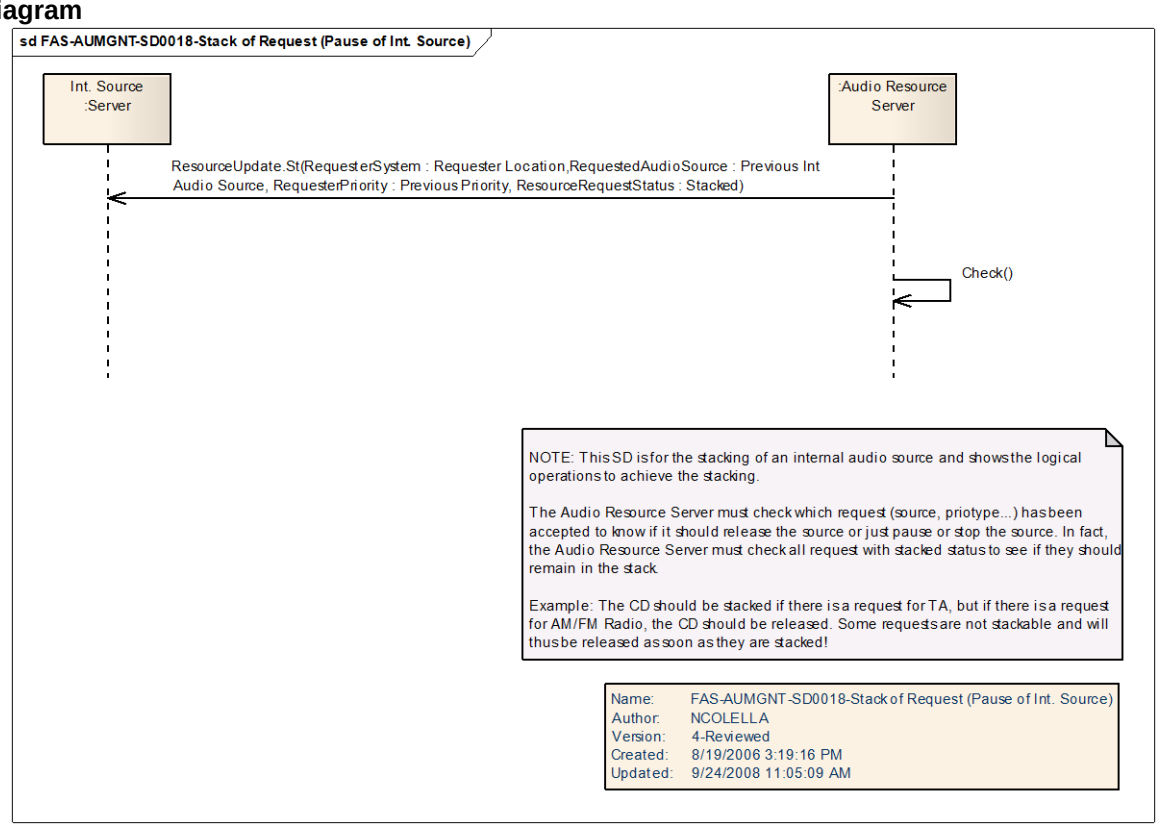
The Stacked Behaviour requires the source to be paused when the request is stacked.

- Exception: When Manual Audio Mute is Granted and Audio Source is stacked and the stacked source is not paused.

Post-condition

The source is paused

Sequence Diagram



2.5 AUMGNT-FUN-REQ-014620/A-Reactivation of External Source (TcSE ROIN-120520-1)

2.5.1 Sequence Diagrams

2.5.1.1 AUMGNT-SD-REQ-014621/A-Reactivation of External Source (TcSE ROIN-119822-2)

Linked Elements

FRD-REQ-028574/A-Audio Management (TcSE ROIN-28902-2)

Constraints

Pre-condition

The system is activated

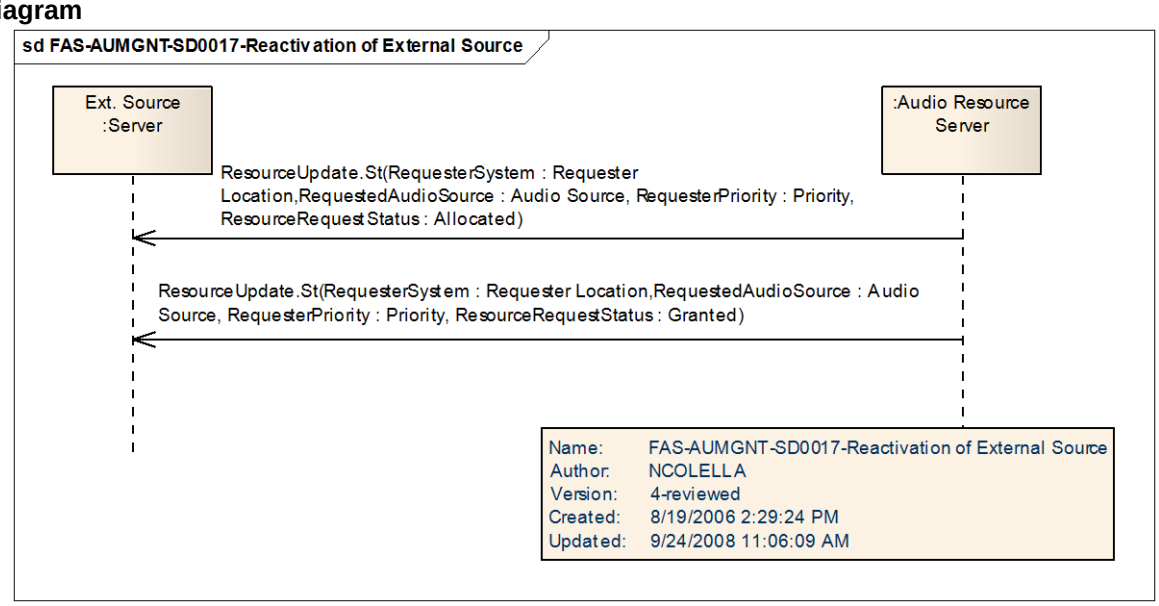
Pre-condition

The source (request) has been stacked previously

Post-condition

The source is playing

Sequence Diagram



2.6 AUMGNT-FUN-REQ-014622/A-Reactivation of Internal Source (TcSE ROIN-120537-1)

2.6.1 Sequence Diagrams

2.6.1.1 AUMGNT-SD-REQ-014623/A-Reactivation of Internal Source (TcSE ROIN-119816-2)

Linked Elements
FRD-REQ-028574/A-Audio Management (TcSE ROIN-28902-2)

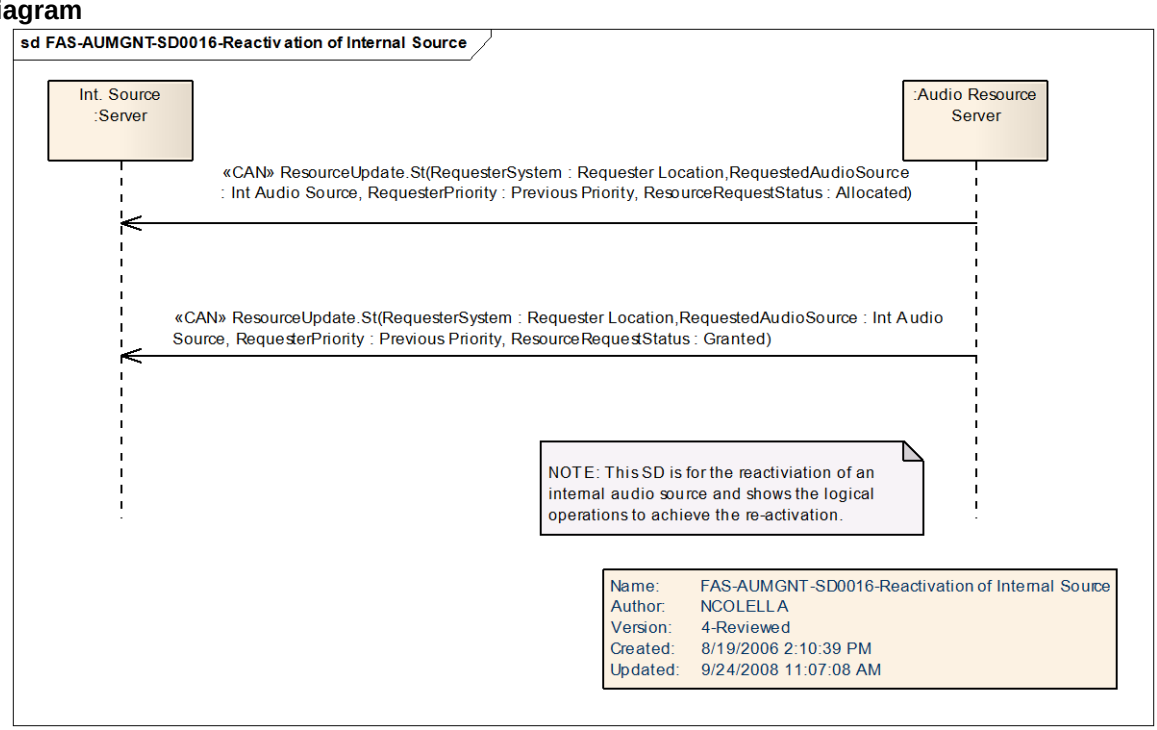
Constraints

Pre-condition
The system is activated

Pre-condition
The source (request) has been stacked previously

Post-condition
The source is playing

Sequence Diagram



2.7 AUMGNTv2-FUN-REQ-016317/B-Manual Audio Mute (TcSE ROIN-290822-1)

Additional Manual Audio Mute requirements to reference:

Volume Manual Audio Mute:
VOL-GREQ-205228-1-Manual Audio Mute

Station Management Manual Audio Mute:
STMGNT-GFUN-280901-1-Manual Audio Mute Deactivation of Infotainment System

2.7.1 Use Cases

2.7.1.1 AUMGNT-UC-REQ-016318/C-Deactivate Manual Audio Mute via the HMI (TcSE ROIN-290817-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System powered ON Audio is muted via manual audio mute
Scenario Description	The user selects <Deactivate Mute> via HMI.
Post-conditions	The infotainment system sets volume to the level, which was selected prior to the mute activation. ~~All controlled Media sources (e.g. CD, iPod, USB, etc.) set to play.~~ HMI Indicates {Mute Deactivated}
List of Exception Use Cases	N/A
Interfaces	CBI, G-HMI, SWC, Audio Out

2.7.1.2 AUMGNT-UC-REQ-016319/A-System Interrupts without cancelling Manual Audio Mute (TcSE ROIN-290819-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is ON Manual Audio Mute is active
Scenario Description	System interrupt occurs like TA, News, Alarm, Phone, Voice according the audio client (AUMGNT-GREQ-40963-2-Audio Request_Properties of Priorities_Overview)
Post-conditions	System interrupts like TA, News, Alarm, Phone, Voice according the audio client (AUMGNT-GREQ-40963-2-Audio Request_Properties of Priorities_Overview) shall interrupt the "Mute" just temporarily and go back to "Mute" on the user source that was previously selected.
List of Exception Use Cases	
Interfaces	System Interrupt interface, Audio Out

2.7.1.3 AUMGNT-UC-REQ-016320/B-Activate Manual Audio Mute (TcSE ROIN-290828-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is ON Infotainment System is not muted
Scenario Description	User selects <Activate Mute> via HMI

Post-conditions	The infotainment System sets volume to mute. ~~All controlled Media sources (e.g. CD, iPod, USB, etc.) set to pause.~~ HMI indicates {Mute Activated}.
List of Exception Use Cases	
Interfaces	CBI, G-HMI, SWC, Audio Out

2.7.1.4 AUMGNT-UC-REQ-016321/A-Manual Audio Mute active, Mediaplayer source stacked, remove/disconnect (TcSE ROIN-290829-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is ON Manual Audio Mute is Active Mediaplayer source (ex CD, USB…) is the stacked audio source
Scenario Description	User removes source device/medium
Post-conditions	Mediaplayer medium/device is removed by User Mute is deactivated Default source is active
List of Exception Use Cases	
Interfaces	User interface with device/medium, Audio Out

2.7.1.5 AUMGNT-UC-REQ-016322/A-Temporary Audio Source active, Manual Audio Mute stacked Mediaplayer source stacked, remove/disconnect media (TcSE ROIN-290830-1)

Actors	Vehicle Occupant
Pre-conditions	The infotainment system is ON. Temporary Audio Source is granted (ex. Phone Call, VR, TA). Manual Audio Mute is stacked. Mediaplayer source (ex. CD, USB…) is stacked beneath Manual Audio Mute
Scenario Description	User removes source device/medium (ex removes CD or USB) while Temporary Audio Source is granted
Post-conditions	1. Mediaplayer medium/device is removed by user (ex CD, USB) but Temporary Audio Source remains active (granted) 2. Once granted Audio Source is ended (ex. Phone, VR, TA) then the default source will become active with no mute of audio
List of Exception Use Cases	
Interfaces	User interface with device/medium, Audio Out

2.7.2 Functional Requirements

2.7.2.1 AUMGNT-REQ-014646/C-Manual Audio Mute Stacked Source Operation (TcSE ROIN-287117-1)

When Manual Audio Mute is Granted, the AHU/DSP AMP shall mute the audio output of the source stacked below Manual Audio Mute, but the AHU shall continue to update all status information on the network bus relative to the source stacked below Manual Audio Mute.

- Ex. If AM/FM tuner is stacked below Manual Audio Mute, and the current song changes, the AHU shall continue to update the radio text, PS Name, HD-Radio Text, etc. All information that normally is updated when listening to the stacked source continues to be updated while the source is stacked below Manual Audio Mute.

When Manual Audio Mute is the Granted source the Audio Source Server shall be able to process audio commands from the Audio Source Clients for the stacked audio source as if the stacked audio source was granted.

- Ex. CD is the stacked source under Manual Audio Mute which is granted. If a seek request is received by the Audio Source Server (ex AHU with internal CD) from the Audio Source Client (ex MFD/APIM) than the Audio Source Server would process the seek command as if CD was the Granted source.

2.7.2.2 AUMGNT-REQ-014647/A-Manual Audio Mute Active, Media source stacked, remove media source (TcSE ROIN-289080-1)

When manual audio mute is Granted with a media source stacked (ex CD, USB) if the Audio Resource Server receives an audio request to release the stacked media source (Phone not a media source but priority Radio, Disc, and AuxSource are) then the Audio Resource server shall be responsible for ending the Manual Audio Mute and sourcing the Default audio source.

2.7.2.3 AUMGNT-FUR-REQ-086753/J-Module responsible for ending Manual Audio Mute

The following shall end the Manual Audio Mute:

Deactivation event of Manual Audio Mute	Module ending the Manual Audio Mute	Comment
~~Increase Volume~~Volume Adjustment	Audio Resource Server	See Volume SPSS requirement: "VOL-SR-REQ-014857-Manual Audio Mute".
Deactivate Mute HMI button press	Audio Source Client	Ex. While muted pressing the mute HMI button to unmute audio See SPSS Requirement: "AUMGNT-SD-014649-Deactivate Manual Audio Mute".
Source Change	Audio Resource Server	See requirement below for what sources collapse the audio stack "AUMGNT-SR-REQ-014552-Audio Request_Properties of Priorities_Overview"
Preset Selection	Audio Resource Server	Covered with the standard preset selection Management. See for AM/FM incl. HD: AMFM-FUN-REQ-024012-Select AM/FM Preset See for DAB: DAB-FUN-REQ-024473-Select DAB Preset See for SDARS: SDARS-FUN-REQ-024808/A-Select Preset
Station Selection	Audio Resource Server	Covered with the standard station selection Management. See for AM/FM incl. HD: AMFM-FUN-REQ-024000-Seek, AMFM-FUN-REQ-024019-Tuning AM/FM Radio, AMFM-FUN-REQ-024025-Direct Station Selection See for DAB: DAB-FUN-REQ-024478-Seek, DAB-FUN-REQ-024485-Tune DAB Radio, DAB-FUN-REQ-024495-Browse DAB Station List See for SDARS: SDARS-FUN-REQ-024809-Tune, SDARS-FUN-

		REQ-024812-Seek, SDARS-FUN-REQ-024817-Browse Channel Guide
Track / File selection on CD, USB and iPod	Module that is the Server for Media such as USB / iPod shall cancel the manual audio mute. CD is ended by the Audio Resource Server	Ex. If USB / iPod is internal to the AHU then the AHU would end the manual audio mute. If USB / iPod is internal to SYNC Gen 1, 2, 3 then the MFD for SYNC Gen 1 or SYNC Gen 2 or 3 module would end the manual audio mute

Note:
If a certain muting / unmuting requirement just goes to the Audio Resource Server or Audio Source Client and is not already covered in this requirement or the SPSS for manual audio mute then the particular module getting the requirement to mute / unmute should be responsible for requesting or releasing the manual audio mute.

- Ex. The Audio Source Client has an HMI spec requirement to end a mute event for a certain button press. Then the Audio Source Client could just send an AudioRequest to release manual audio mute for that button press (regardless if Audio Resource Server does it too or not) to make sure the manual audio mute event is ended as called out in the HMI.

2.7.2.4 AUMGNT-SR-REQ-139114/C-Manual Audio Mute - No Pause of Media

Manual Audio Mute shall only cause a Media source (ex CD, USB, BT Audio…) to be muted/unmuted and shall not pause/unpause the Media source.

- Stacking an audio source (such as CD, USB stacked under a phone call) typically pauses a media source. Manual Audio Mute is an exception where an audio source is stacked because manual audio mute is granted and in this case the audio source shall continue to play muted even though it is stacked.

Note: This requirement supersedes anything in the SPSS showing a Media source being paused because of the manual audio mute.

2.7.3 Sequence Diagrams

2.7.3.1 AUMGNT-SD-REQ-014648/B-Activate Manual Audio Mute (TcSE ROIN-173367-3)

Linked Elements
AUMGNT-UC-REQ-014643/A-Activate Manual Audio Mute (TcSE ROIN-174338-1)

Scenarios

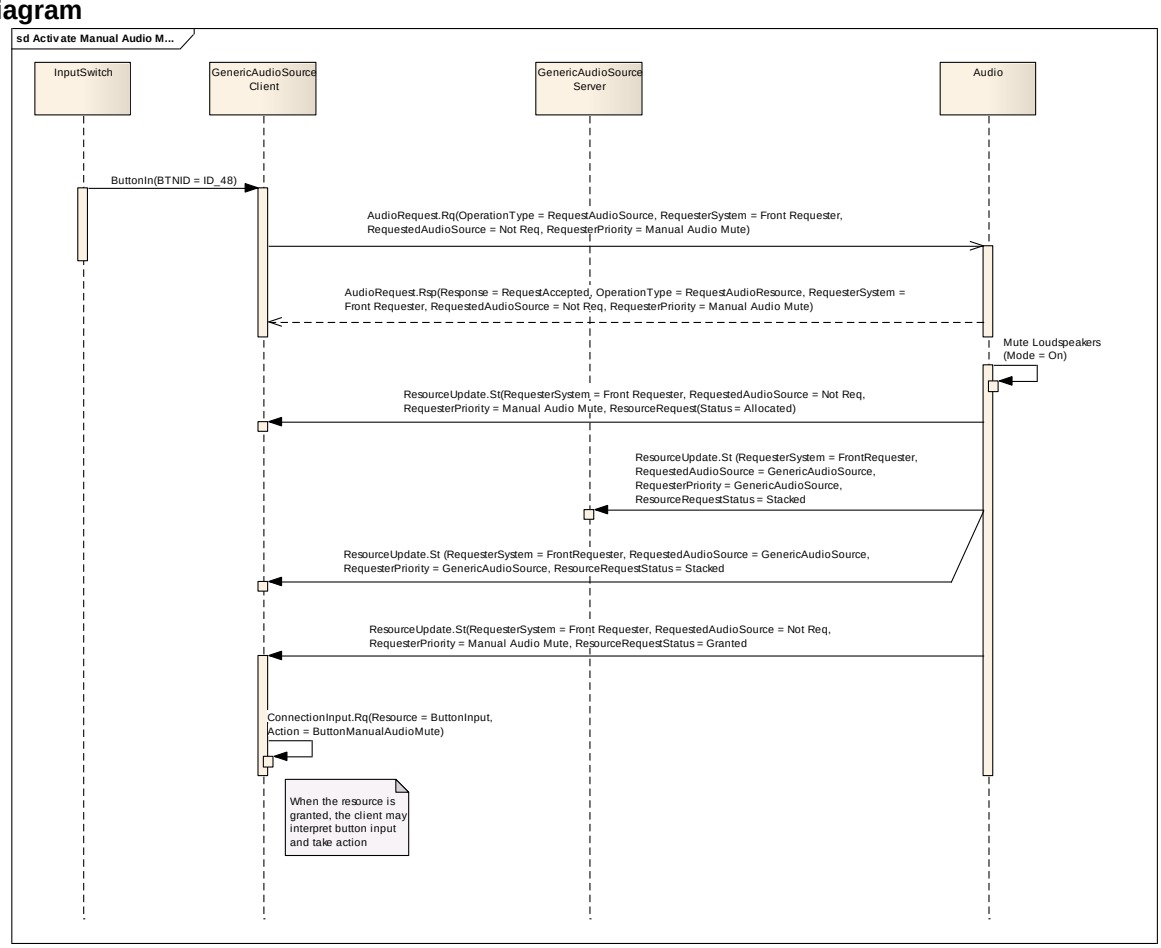
Normal Usage
The Manual Audio Mute is turned ON by the Client (example pressing the Mute button to activate the mute)

Constraints

Pre-condition
Generic Media Sources is active (Example: Tuner, Single CD, iPod, USB, BT Audio, Line In)

Post-condition
Mute is active source
Post-condition
the Generic Media Source is stacked

Sequence Diagram



2.7.3.2 AUMGNT-SD-REQ-014649/B-Deactivate Manual Audio Mute (client ends when mute event ended) (TcSE ROIN-173373-2)

Linked Elements

AUMGNT-UC-REQ-014645/A-Temporary Audio Source active, Manual Audio Mute stacked Mediaplayer source stacked, remove/disconnect media (TcSE ROIN-282983-1)
AUMGNT-UC-REQ-014642/C-Deactivate Manual Audio Mute (TcSE ROIN-174332-2)
AUMGNT-UC-REQ-014644/A-Manual Audio Mute active, Mediaplayer source stacked, remove/disconnect (TcSE ROIN-280974-1)

Scenarios

Normal Usage

The Manual Audio Mute is turned off by the Client (example pressing the Mute button to cancel the mute)

Constraints

Pre-condition

Mute is active source

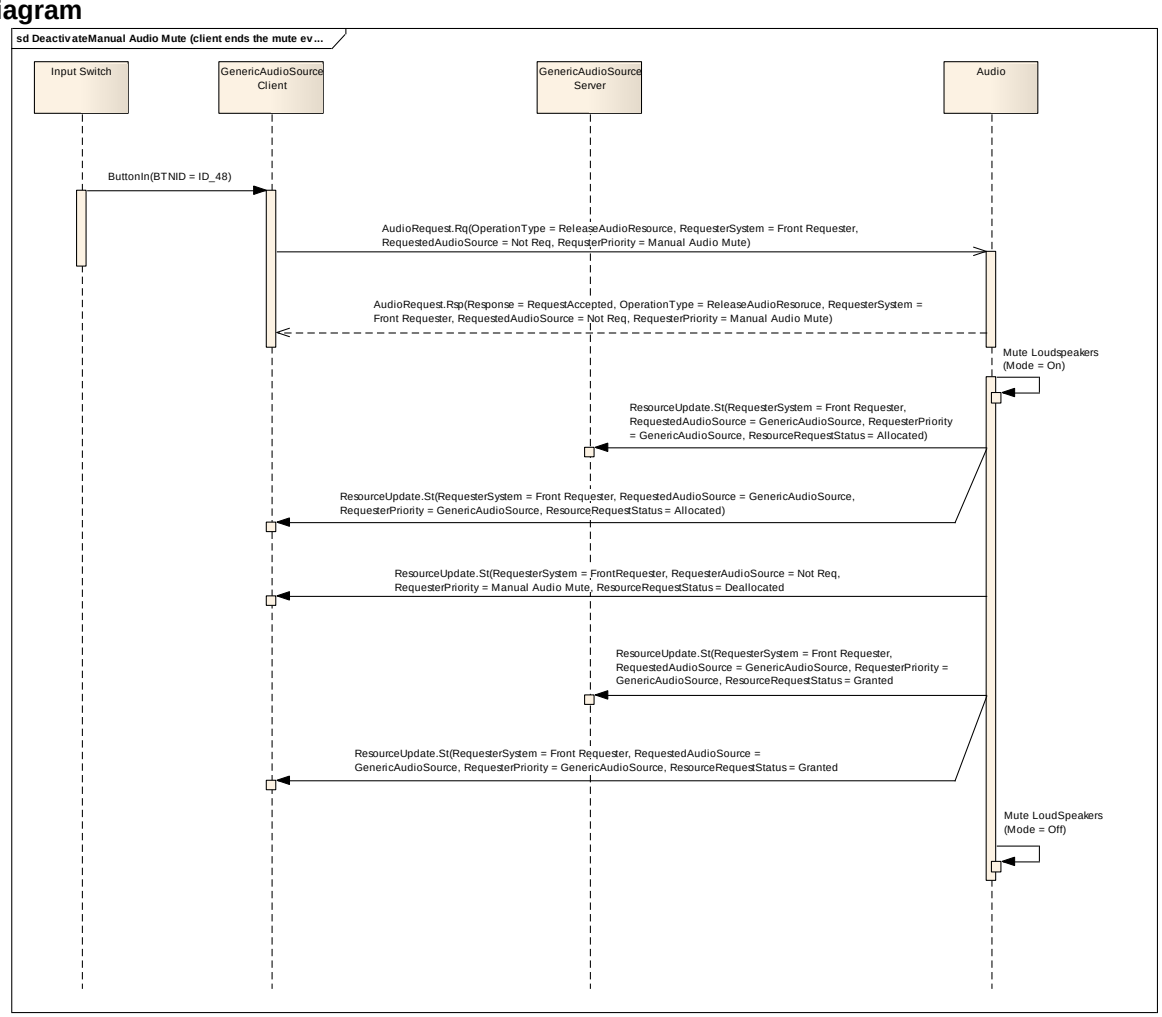
Pre-condition

Generic Media Sources (Example: Tuner, Single CD, iPod, USB, BT Audio, Line In) is stacked

Post-condition

The formerly stacked Media Source is playing through the loud speakers

Sequence Diagram



2.7.3.3 AUMGNT-SD-REQ-014650/B-Manual Audio Mute active, CD Stacked, Eject CD, deactivate Manual Audio Mute (TcSE ROIN-280985-1)

Linked Elements
AUMGNT-UC-REQ-014643/A-Activate Manual Audio Mute (TcSE ROIN-174338-1)

Scenarios

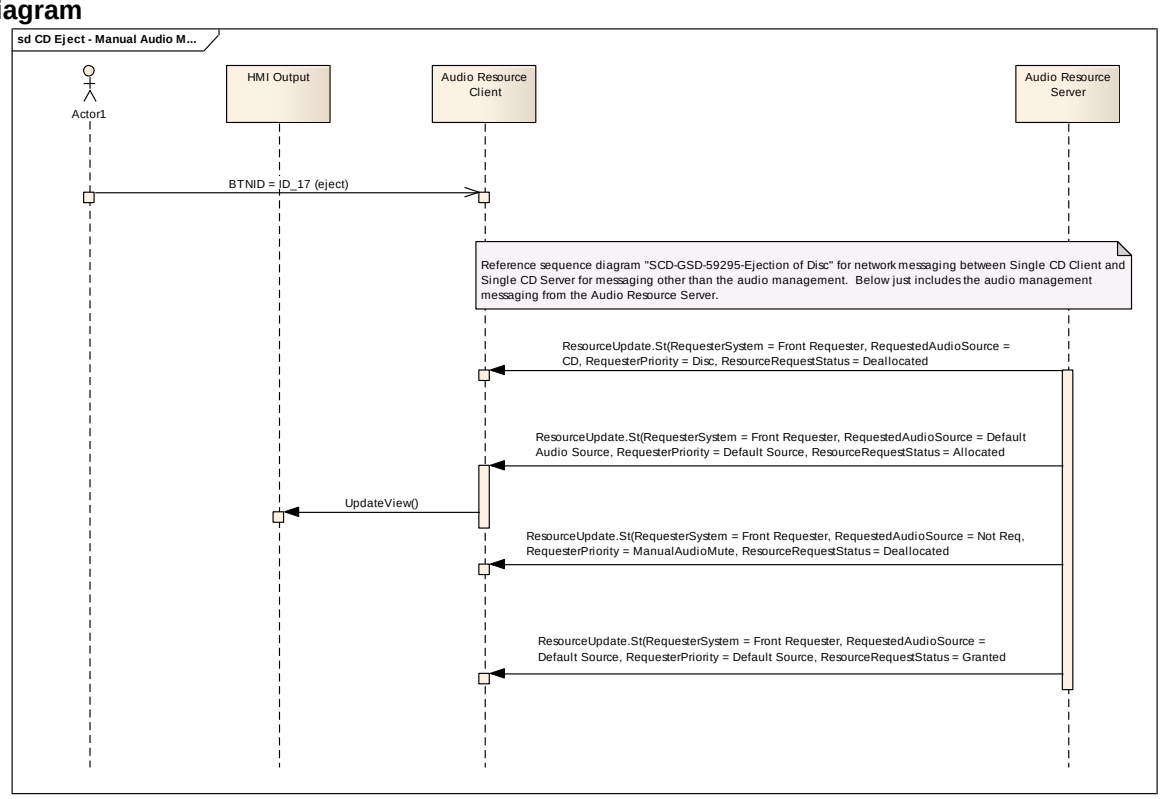
Normal Usage
Single CD disc is ejected

Constraints

Pre-condition
Manual Audio Mute is active source
Pre-condition
Single CD is stacked

Post-condition
Default source is active
Post-condition
Manual Audio Mute is deactivated

Sequence Diagram



2.7.3.4 AUMGNT-SD-REQ-014651/A-Temporary Audio Source active (phone), Manual Audio Mute stacked, Mediaplayer source stacked (USB), remove/disconnect media (TcSE ROIN-284361-1)

Linked Elements

AUMGNT-UC-REQ-014643/A-Activate Manual Audio Mute (TcSE ROIN-174338-1)

Scenarios

Normal Usage

User removes USB

Constraints

Pre-condition

Phone call is Granted

Pre-condition

Manual Audio Mute is stacked

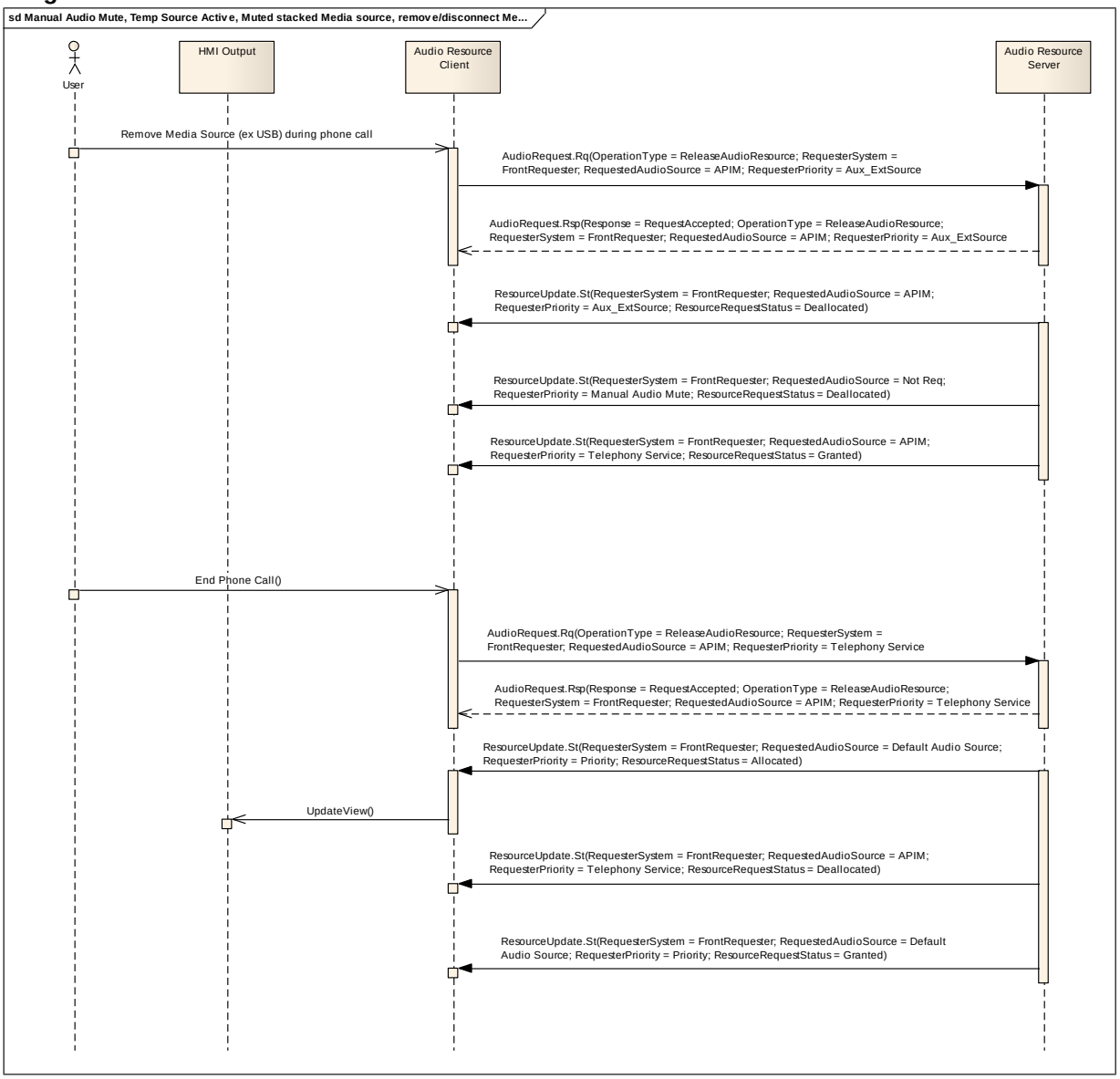
Pre-condition

USB is stacked beneath Manual Audio Mute

Post-condition

1) USB is removed but Phone call remains active
2) Phone call is ended then default source will become active with no mute of audio

Sequence Diagram



2.8 AUMGNT-FUN-REQ-238026/A-Stacked Media Source

2.8.1 AUMGNT-SR-REQ-237868/A-Media source Stacked under Phone/VR

When Phone or VR is Granted the AHU shall continue to update all status information on the network bus relative to the Media source stacked below Phone or VR.

- Ex. If AM/FM tuner is stacked below Phone or VR, and the current song changes, the AHU shall continue to update the radio text, PS Name, HD-Radio Text, etc. All information that normally is updated when listening to the stacked source continues to be updated while the source is stacked below Phone or VR.

3 Appendix: Reference Documents

Reference #	Document Title
1	
2	
3	
4	
5	
6	
7	
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10	
11	
12	
13	
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