Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Alerts (Chimes/Prompts/Beeps/Audio Attenuation)

APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.0
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Revision History

Date	Version	Notes
May 31st, 2013	1.0	Initial Release

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1.1 Architectural Design

1.1.1 Alert Interface Requirements

1.1.1.1 ALERT-GIF-40348-13-Alert Method Descriptions

Method	Notes	Parameters
IPC_Infotainment	Event-Periodic message from the Chime Client to the Infotainment System	Chime_Source (Signal) 0x0 Invalid 0x1 Infotainment_System 0x2 Cluster Attn_Info_Audio (Signal) – Attenuates the Infotainment Audio 0x0 No Attenuation of Audio 0x1 Attenuation_1 0x2 Attenuation_2 cont. 0x6 Attenuation_6 (higher attenuation number indicates a greater increase in audio attenuation) 0x7 Unknown New_Attn_Event (Signal) 0x0 Inactive 0x1 Active Power_Up_Chime_Modules (Signal) 0x0 Inactive 0x1 Active
IPC_Chime	Event-Periodic message from the Chime Client to the Chime Generator Server and Chime Audio Source Server informing the infotainment system the state of the vehicle Chimes.	Chime (Signal) – Chime Sound ID 0x0 Inactive 0x1 No_Chime (Chime_0) 0x2 Chime_1 0x3 Chime_2 0x4 Chime_3 cont. 0x3F Chime_62 Chime_Vol_Level (signal) 0x0 Inactive (no change to stored chime volume - 100% of stored chime volume) 0x1 99% (of stored chime volume) 0x2 98% (of stored chime volume) 0x3 97% (of stored chime volume) .... 0x62 2% (of stored chime volume) 0x63 1% (of stored chime volume) 0x64 Reserved Chime_Directionality (Signal) 0x0 Inactive / OFF 0x1 All 0x2 Front 0x3 Rear Chime_Time_Criticality (Signal) 0x0 Inactive 0x1 Criticality_High (Immediately end current Chime and play the new chime) 0x2 Criticality_Low (Finish playing current Chime and switch to new chime when

		finished) OFF_Time_Btwn_Chime 0x0 Inactive 0x1 Continuously (repeat continuously) 0x2 5 msec 0x3 10 msec 0x4 15 msec 0x5 20 msec 0x6 40 msec 0x7 60 msec (increment is 20 msec steps until 800 msec) cont.... 0x2C 800 msec 0x2D 850 msec 0x2E 900 msc 0x2F 1 sec 0x30 1.5 sec 0x31 2 sec 0x32 3 sec 0x33 4 sec 0x34 5 sec Chime_Occurence (Signal) – Determines the number of repetitions the chime sound to be played or for the chime to be played continuously 0x0 Inactive 0x1 Play once 0x2 2 Repititions 0x3 3 Repititions 0x4 4 repititions 0x5 5 repetitions … 0xE 14 repetitions 0xF Continuous
IPC_Chime2	Event-Periodic message from the Chime Client to the Chime Generator Server and Chime Audio Source Server informing the infotainment system the state of the vehicle Chimes.	Chime2 (Signal) – Chime Sound ID 0x0 Inactive 0x1 No_Chime (Chime_0) 0x2 Chime_1 0x3 Chime_2 0x4 Chime_3 cont. 0x3F Chime_62 Chime_Vol_Level2 (signal) 0x0 Inactive (no change to stored chime volume - 100% of stored chime volume) 0x1 99% (of stored chime volume) 0x2 98% (of stored chime volume) 0x3 97% (of stored chime volume) .... 0x62 2% (of stored chime volume) 0x63 1% (of stored chime volume) 0x64 Reserved Chime_Directionality2 (Signal) 0x0 Inactive / OFF 0x1 All 0x2 Front 0x3 Rear Chime_Time_Criticality2 (Signal) 0x0 Inactive 0x1 Criticality_High (Immediately end current

		Chime and play the new chime) 0x2 Criticality_Low (Finish playing current Chime and switch to new chime when finished) OFF_Time_Btwn_Chime2 0x0 Inactive 0x1 Continuously (repeat continuously) 0x2 5 msec 0x3 10 msec 0x4 15 msec 0x5 20 msec 0x6 40 msec 0x7 60 msec (increment is 20 msec steps until 800 msec) cont.... 0x2C 800 msec 0x2D 850 msec 0xE 900 msc 0x2F 1 sec 0x30 1.5 sec 0x31 2 sec 0x32 3 sec 0x33 4 sec 0x34 5 sec Chime_Occurence2 (Signal) – Determines the number of repetitions the chime sound to be played or for the chime to be played continuously 0x0 Inactive 0x1 Play once 0x2 2 Repititions 0x3 3 Repititions 0x4 4 repititions 0x5 5 repetitions … 0xE 14 repetitions 0xF Continuous
AHU_Alert	Event-Periodic message from AHU to the applicable Alert components AHU_Chimes_Supported: Method from the AHU indicating to the Chime Master (ie Cluster) if chimes are supported by the AHU AHU_Chime_Not_Recognized: Method from the AHU Chime Generator to Cluster letting the Cluster know the chime requested is not recognized. If the Chime is recognized the signal remains set to inactive. AHU_Chime_Active: Method from the AHU Chime Generator to the Cluster indicating what chime is active. Note: the AHU sets this signal to No_Chime when it is not the Chime Generator (ex. when Cluster is Chime Generator). Alert_ChannelX: Method from the AHU Prompt Audio Source to the Prompt Generator indicating the status of the Prompt Audio Source input Alert Channel. Note set to Inactive if no separate Prompt	AHU_Chimes_Supported (Signal) 0x0 Inactive 0x1 Supported 0x2 Not_Supported AHU_Chime_Not_Recognized (Signal) 0x0 Inactive 0x1 Chime_Not_Recognized AHU_Chime2_Not_Recognized (Signal) 0x0 Inactive 0x1 Chime_Not_Recognized AHU_Chime_Active (Signal) 0x0 Inactive 0x1 No_Chime 0x2 Chime_1 0x3 Chime_2 0x4 Chime_3 cont. 0x3F Chime_62 AHU_Chime2_Active (Signal) 0x0 Inactive 0x1 No_Chime 0x2 Chime_1 0x3 Chime_2 0x4 Chime_3 cont. 0x3F Chime_62

	Generator (ie SYNC) Chime_Alert_Chan: Method to mute the Chime Audio Source Alert channel after the Chime Generator is done producing the chime	Alert_Channel1 (Signal) 0x0 Inactive 0x1 Initialized for Prompts 0x2 Muted 0x3 Reserved Chime_Alert_Chan (Signal) 0x0 Inactive 0x1 Mute 0x2 Reserved Chime_Alert_Chan 2 (Signal) 0x0 Inactive 0x1 Mute 0x2 Reserved
DSP_AMP_Alert	Event-Periodic message from DSP AMP to the applicable Alert components DSP_Chimes_Supported: Method from the DSP AMP indicating to the Chime Generator if chimes are supported by the DSP AMP Alert_ChannelX: Method from the DSP AMP Alert Source to the Alert Generator indicating the status of the Alert Channels.	DSP_Chime_Not_Recognized (Signal) 0x0 Inactive 0x1 Chime_Not_Recognized DSP_Chime2_Not_Recognized (Signal) 0x0 Inactive 0x1 Chime_Not_Recognized DSP_Chimes_Supported (Signal) 0x0 Inactive 0x1 Supported 0x2 Not_Supported Alert_Channel1 (Signal) 0x0 Inactive 0x1 Reserved 0x2 Muted 0x3 Initialized for Chimes Alert_Channel2 (Signal) 0x0 Inactive 0x1 Reserved 0x2 Muted 0x3 Initialized for Chimes Alert_Channel3 (Signal) 0x0 Inactive 0x1 Initialized for Prompts 0x2 Muted 0x3 Reserved
SYNC_Alerts	Event-Periodic message from SYNC to the applicable Alert components Alert_ChanX: Method from the SYNC Prompt Generator to the Prompt Audio Source to control the Alert channels	Alert_Chan (Signal) 0x0 OFF_Inactive (prompts OFF) 0x1 Mute 0x2 Initialize for Prompts (keep set while prompts are active) Attn_Info_Audio (Signal) – Attenuates the

	Attn_Info_Audio: From the SYNC Prompt Generator to the Prompt Audio Source for attenuating the active audio source.	Infotainment Audio 0x0 No Attenuation of Audio 0x1 Attenuation_1 0x2 Attenuation_2 cont. 0x6 Attenuation_6 (higher attenuation number indicates a greater increase in audio attenuation) 0x7 Unknown
	New_Attn_Event: From the SYNC Prompt Generator to the Prompt audio source for an attenuation event.	New_Attn_Event (Signal) 0x0 Inactive 0x1 Active
	PromptX_Directionality: From the SYNC Prompt Generator to the Prompt audio source indicating what speaker(s) to play the prompt(s) through.	Prompt_Directionality (Signal) 0x0 Inactive / OFF 0x1 All 0x2 Front 0x3 Rear
	Audible_Beep: Event-Periodic signal from the SYNC Beep Client to the Beep Generator so the Beep Generator can produce an audible beep	Audible_Beep(Signal) 0x0 Inactive 0x1 Active
_Chimes_Supported	Signal from the chime component indicating to the Chime Generator if chimes are supported	0x0 Inactive 0x1 Supported 0x2 Not_Supported
_Audible_Beep	Event-Periodic signal from the Beep Client to the Beep Generator so the Beep Generator can produce an audible beep	0x0 Inactive 0x1 Active

1.1.1.2 ALERT-GIF-263780-1-Turn Signal Chime Method Descriptions

Method	Notes	Parameters
TurnLghtLeftOn_B_Stat	Signal from the Turn Signal Client to the Turn Signal Chime Server and Turn Signal Visual Indicator Server for indicating the Left Turn Signal is activated	0x0 OFF 0x1 ON
TurnLghtRightOn_B_Stat	Signal from the Turn Signal Client to the Turn Signal Chime Server and Turn Signal Visual Indicator Server for indicating the Right Turn Signal is activated	0x0 OFF 0x1 ON

1.1.2 Alert-GCLD-202535-1-Chime Client

The Chime Client is the chime master that tells the infotainment system what chime(s) to play

1.1.3 Alert-GCLD-202536-1-Chime Generator Server

The Chime Generator Server produces the chime signal for a respective chime

1.1.4 Alert-GCLD-202537-1-Chime Audio Source Server

The Chime Audio Source Server produces the chime sound heard in the infotainment system

1.1.5 Alert-GCLD-202538-1-Prompt Client/Generator Server

The Prompt Client/Generator Server is responsible for the prompt function and will produce a prompt signal for the Prompt Audio Source

1.1.6 Alert-GCLD-202539-1-Prompt Audio Source Server

The Prompt Audio Source Server is responsible for playing the prompt sound through the infotainment system

1.1.7 Alert-GCLD-202534-1-Beep Client

The Beep Client requests the Beep Generator to produce the beep

1.1.8 Alert-GCLD-202533-1-Beep Generator Server

The Beep Generate Server creates the signal for the beep

1.1.9 Alert-GCLD-202532-1-Beep Audio Source Server

The Beep Audio Source Server produces the sound for the beep through the infotainment system

1.2 General Requirements

ALERT-GREQ-40349-4-Alert Configuration Table (System) -
The Alert Generator and Alert Audio Source will vary depending on the infotainment system module availability. The Infotainment System Alert set-up will follow the table below.

Modules Present	Chime Client (Chime Master)	Beep Generator	Prompt Generator	Chime Generator	Alert Audio Source (Module to Play & Mix Audio)
AHU / SYNC / DSP AMP	Cluster	DSP AMP	SYNC	AHU	DSP AMP
SYNC / AHU	Cluster	AHU	SYNC	AHU	AHU
AHU / DSP AMP	Cluster	DSP AMP	N/A	AHU	DSP AMP
AHU	Cluster	AHU	N/A	AHU	AHU

Alert Configuration Table

1.3 Functional Definition

1.3.1 Alert-GFUN-119786-1-Chimes

1.3.1.1 Chime Activation Requirements

ALERT-GREQ-40351-1-Infotainment System Chime Source (System) -
The Infotainment System shall NOT be the chime source unless the IPC_Infotainment.St() message has signal 'Chime_Source = Infotainment_System'.

ALERT-GREQ-40352-1-Infotainment Components Power Mode signals (System) -
The Infotainment Chime Components shall be capable of producing chimes when:

'Power_Up_Chime_Modules == Active' AND the Infotainment System is the Chime Source 'IPC_Infotainment.St() : Chime_Source == Infotainment_System'.

The infotainment components responsible for chimes shall be capable of producing chimes regardless of the HMIAudioMode status when Chimes is enabled through the Infotainment System.

ALERT-GREQ-40353-1-Chime Power Mode signal usage (System) -
The Cluster shall wake and keep up the Infotainment bus (if not already awake) and set 'Power_Up_Chime_Modules = Active' for predictive triggers (ex. open door) as defined in the Cluster engineering specification.

When a predictive trigger does occur then the minimum time the signal 'Power_Up_Chime_Modules' is set equal to 'Active' is 180 seconds.
An exception would be for error states such as the AHU setting AHU_Chime_Supported = Not_Supported where the Cluster would set Power_Up_Chime_Modules = Inactive when it receives Not_Supported.

When the predictive triggers are no longer valid then the signal 'Power_Up_Chime_Modules = Inactive'.

ALERT-GREQ-40354-4-Power-up time for infotainment components (System) -
The infotainment chime components shall be capable of producing chime audio within 2.0 seconds of 'Power_Up_Chime_Modules = Active'.

ALERT-GREQ-40355-2-Chime Power mode signal usage when Chimes are not through the infotainment system (System) -
~~If chimes are not configured to use the Infotainment Audio System (IPC_Infotainment : Chime_Source = Cluster) then infotainment components shall not use the Power_Up_Chime_Module signal and the Cluster shall set the 'Power_Up_Chime_Module = Inactive'.~~

Requirement deleted.

Reference IDS for chime diagnostics start-up

ALERT-GREQ-40356-3-Timing for single Chime Source module to produce Chime audio (System) -
When the Chime Generator and Chime Audio Source are the same Chime Source module then the Chime Source module shall start producing chime audio within 70 msec of receiving the new chime request message.

ALERT-GREQ-40357-4-Chime initialization timing when there is a separate Chime Generator and Chime Audio Source (System) -
When there is both a separate Chime Generator and Chime Audio Source on the vehicle at the same time then the Chime Generator shall generate the line level signal to the Chime Audio Source once Chime Generator receives the Chime Request signal from the Chime Client AND once it receives "Alert_Channel = Initialized for Chimes" signal from the Chime Audio Source.

If the Chime Generator receives "Alert_Channel = Initialized for Chimes" within 50 msec of receiving IPC_Chime.St chime request message from the Chime Client then the Chime Generator shall produce the chime line level signal to the Chime Audio Source within 70 msec of receiving IPC_Chime.St

If the Chime Generator receives "Alert_Channel = Initialized for Chimes" between 50 – 90 msec of receiving IPC_Chime.St chime request message from the Chime Client then the Chime Generator shall produce the chime line level signal to the Chime Audio Source within 20 msec of receiving "Alert_Channel = Initialized for Chimes"

If the Chime Generator does NOT receive "Alert_Channel = Initialized for Chimes" after 90 msec has elapsed from receiving the IPC_Chime.St chime request message from the Chime Client then the Chime Generator shall generate the chime line level signal to the Chime Audio Source within 20 msec from 90 msec elapsing

ALERT-GREQ-40358-3-Timing for Chime Audio Source being capable of producing chime audio (System) -
When there is both a separate Chime Generator and Chime Audio Source on the vehicle at the same time AND a new Chime is activated (no chime previously active so audio source input muted) then the infotainment Chime Audio Source shall be capable of producing the Chime audio within 70 msec of receiving the chime request from the Cluster.

This includes the Chime Audio Source initializing and unmuting the dedicated Alert input channel for chimes.

'IPC_Chime: Chime = Chime_X' initializes and unmutes Alert channel 1 on the Chime Audio Source. Within 70 msec of receiving the Chime Request signal the Chime Audio Source shall respond with "initialized for chimes". The Chime Audio Source keeps the state as "Initialized for Chimes" for the duration of the chime.

'IPC_Chime2: Chime2 = Chime_X' initializes and unmutes Alert channel 2 on the Chime Audio Source. Within 70 msec of receiving the Chime Request signal the Chime Audio Source shall respond with "initialized for chimes". The Chime Audio Source keeps the state as "Initialized for Chimes" for the duration of the chime.

ALERT-GREQ-40359-3-Chime overwriting another chime on the same Alert channel (System) -
When there is a chime active and a new chime request is received by the Chime Generator and Chime Audio Source on the same Alert channel then:

Criticality_High:
1. When the Chime Generator receives the new chime request in the same IPC_Chime CAN message with the signal Chime_Time_Criticality = Criticality_High it shall generate the new chime within 90 msec of receiving the new chime request or sooner if it receives Alert_Chan = Intialized_for_Chimes (old chime) → Inactive / Muted → Initialized for Chimes (new chime) from the Chime Audio Source.

2. When the Chime Audio Source receives the new chime in the IPC_Chime CAN message with the signal Chime_Tim_Criticality = Criticality_High it shall change its chime parameters (ex. volume, speakers directionality) to the new settings within 70 msec of receiving the new chime request.

When the Chime Audio Source receives the new chime request with Criticality_High then the Chime Audio Source shall set Alert_Channel = Inactive / Muted and within 70 msec of receiving the new chime request and then the Chime Audio Source shall set Alert_Channel = Initialized_for_chimes. Note: the Chime Audio Source sets Alert_Channel = Inactive if the conditions for setting Alert_Channel = Muted are not met. See requirement ALERT-GREQ-40365-Mute/Unmute Alert Channel on Muting for when Chime Audio Source sets Alert_Channel = Muted.

Criticality_Low:
1. When the Chime Generator receives the new chime request in the same IPC_Chime CAN message with the signal Chime_Time_Criticality = Criticality_Low it shall finish playing the currently playing chime sound (ex. DNA B) and then set AHU_Alert : AHU_Chime_Active = No_Chime and then set to the new chime.

2. When the Chime Audio Source receives the new chime in the IPC_Chime CAN message with the signal Chime_Time_Criticality = Criticality_Low it shall continue playing the currently playing chime sound (ex. DNA B) with the existing chime parameters (ex volume, directionality) while the AHU_Alert : AHU_Chime_Active has not changed from the currently playing chime (hasn't changed to No_Chime).

When the AHU_Alert : AHU_Chime_Active = No_Chime (chime generator finished generating the previous chime sound) then the Chime Audio Source shall set Alert_Channel = Inactive / Muted and within 70 msec of receiving AHU_Chime_Active = No_Chime the Chime Audio Source shall initialize for the new chime request from the Cluster and set Alert_Channel = Initialized_for_chimes. Note: the Chime Audio Source sets Alert_Channel = Inactive if the conditions for setting Alert_Channel = Muted are not met. See requirement ALERT-GREQ-40365-Mute/Unmute Alert Channel on Muting for when Chime Audio Source sets Alert_Channel = Muted.

ALERT-GREQ-40360-1-Cluster Chime Requests (System) -
Once the Cluster receives a chime request (from the vehicle network) it shall process and transmit to the Infotainment System within 60 msec the applicable IPC_Chime message to the infotainment system with the chime signal parameters set.

If there is a currently playing chime the Cluster shall determine the priority of the currently playing chime to see if it should be overwritten by the new chime request. If the new chime request has a higher priority then a currently playing fixed repetitive chime then the Cluster may want to monitor the AHU_Chime_Active signal to see if the new chime can be delayed until the current chime is complete or if it should immediately be overwritten.

The Cluster shall set all the signals in the IPC_Chime (1 or 2) messages and keep all the signals populated as long as the chime is active. Only when the Chime is done should the IPC_Chime signals be set to No_Chime and Inactive.

ALERT-GREQ-40361-3-Chime_Vol_Level signal (System) -
The Chime Audio Source stores the volume levels for each of the individual chimes. The Chime Audio Source will use the Chime_Vol_Level signal from the Cluster to determine how much lower the chime should be played from the stored volume level.

If the stored chime volume level in the chime audio source is to be played at 100% of the stored volume level then the Cluster shall set the signal Chime_Vol_Level = Inactive.

Once a chime is selected by the Cluster and broadcast on the infotainment bus the Cluster shall not change the selected chime volume level until the chime has ended or until there is a new chime activated.

ALERT-GREQ-40362-1-Chime Mixing (System) -
The Chime Audio Source shall be capable of mixing the Chimes together with the main audio source as defined in the applicable Chime Audio Source component engineering specifications.

ALERT-GREQ-40364-4-_Chime_Not_Recognized signal (System) -
If the Chime Generator ~~or Chime Audio Source (ie for stored volume)~~ receives a command from the Cluster to play a particular chime that the Chime Generator ~~and/or Chime Audio Source~~ does not recognize (Chime_X were X is unknown) then the Chime Generator ~~and/or Chime Audio Source~~ shall send the 'XXX_Chime_Not_Recognized = Chime_Not_Recognized' signal within 75msec of receiving the chime command.
When the Chime Generator sets the signal Chime_Not_Recognized = Chime_Not_Recognized then at the same time in the same message the AHU_Chime_Active signal will be used to say what Chime the Chime Generator cannot play.
The Chime Generator shall end whatever chime it was playing (finish playing chime sound) before it was requested to play a chime it did not recognize.

The Cluster shall monitor the Chime Generators _Chime_Not_Recognized signal and when it equals Chime_Not_Recognized the Cluster shall then play the requested Chime indicated in the AHU_Chime_Active signal and update the IPC_Chime / IPC_Chime2 message to reflect the chime is no longer requested for the infotainment system.

When there is a separate Chime Generator and Chime Audio Source then the Chime Audio Souce shall go to its default volume when it receives a chime request for a chime it does not recognize.

ALERT-GREQ-40365-5-Mute/Unmute Alert Channel (System) -
The Chime Generator shall send a message to the Chime Audio Source to Mute it's Alert channel when it is finished producing it's chime AND after "IPC_Chime : Chime" is updated to "0x0 No Chime". The Chime generator shall mute the Chime Audio Source by sending the signal 'AHU_Alert : Chime_Alert_Chan = Mute' and then set the signal AHU_Alert : Chime_Alert_Chan = Inactive'.

The Chime Audio Source shall mute its Chime Alert input channel when it receives AHU_Alert : Chime_Alert_Chan = Mute AND IPC_Chime : Chime = No Chime. When muted the Chime Audio Source shall set Alert_Channel = Muted.

If the Chime Audio Source doesn't receive the mute command within 30 seconds of 'IPC_Chime : Chime = No_Chime' then the Alert channel shall be muted by the Chime Audio Source.

When a chime is first played the Chime Audio Source unmutes the alert channel based off the new chime request (regardless of the AHU_Alert : Chime_Alert_Chan status). Since the Chime Audio Source is unmuted for all new IPC_Chime requests and doesn't know if the Chime Generator will play the chime or not (ie Chime_Not_Recognized) the Chime Generator shall always be responsible for muting the chime alert channel for every chime request whether the Chime Generator excepts the request or not.

ALERT-GREQ-40366-1-OFF_Time_Between_Chime signal (System) -
The Cluster shall tell the Chime Generator how long there is no chime audio between playing a particular chime sound using the OFF_Time_Btwn_Chime signal (ex. pauses between repeating Chime_17 Reverse Park Aid sound). For the same chime this value may change.

Within a particular Chime Request from the Cluster the OFF_Time_Btwn_Chime signal could change for the same chime but this should not change the state of the Chime Audio Source Alert input channel settings (ex volume, directionality). While the OFF_Time_Btwn_Chime signal is changing for the same chime the Alert_Channel would remain Initialized_For_Chimes.

For example for a reverse park aid chime as the vehicle backs up the OFF_Time_Btwn_Chime signal could change to increase the beep rate by making the OFF_Time_Btwn_Chime time a smaller value.

ALERT-GREQ-40367-1-Chime_Time_Criticality = Criticality_High (System) -
The Cluster shall set 'Chime_Time_Criticality = Criticality_High' if a new Chime is a chime that needs the currently playing chime sound (ex Chime_8 Ford DNA B) to be immediately ended so the new Chime can be played as quickly as possible (ex. FCW).

Ex.
Pre-Condition:
Infotainment Chime Generator and Chime Audio Source are playing a continuous chime.

Event:
Chime Clients ends the chime with Criticality_High No Chime event. Chime Client sends IPC_Chime (Chime = No Chime, Chime_Time_Criticality = Criticality_High, Chime_Vol_level = Inactive; Chime_Directionality = Inactive; OFF_Time_Btwn_Chime = Inactive; Chime_Occurence = Inactive)

Post-Condition:
The Chime Generator ends it currently playing Chime_X sound (ex DNB) before it is finished and immediately sets Chime_Active = No Chime

ALERT-GREQ-40368-1-Chime_Time_Criticality = Criticality_Low (System) -
The Cluster shall set 'Chime_Time_Criticality = Criticality Low' if a new Chime is a chime that can wait for the currently playing chime to finish playing the chime sound (ex. finish Ford DNA B sound) before playing the new chime.

Example: If the Chime_Occurance was set to 8 repetitions of the Chime_X sound (ex Ford DNA B) and the 3rd repetition Chime_X sound is currently being played when the new Chime_Y is requested with Chime_Time_Criticality = Criticality Low then the Chime Generator would finish the 3rd repetition of the Chime_X sound but not play the remaining 5 repetitions but instead switch to the new chime.

Note: The Cluster can always just wait for the chime to complete it's repetitions by monitoring the AHU_Chime_Active = Chime_X signal to avoid having to interrupt a chime.

Example 2.
Pre-Condition:
Infotainment Chime Generator and Chime Audio Source are playing a continuous chime.

Event:
Chime Clients ends the chime with Criticality_Low No Chime event. Chime Client sends IPC_Chime (Chime = No Chime, Chime_Time_Criticality = Criticality_Low, Chime_Vol_level = Inactive; Chime_Directionality = Inactive; OFF_Time_Btwn_Chime = Inactive; Chime_Occurence = Inactive)

Post-Condition:
The Chime Generator ends it currently playing Chime_X sound (ex DNA B) after the Chime Generator is finished producing the Chime_X sound and sets ChimeGenerator_Chime_Active = No_Chime after it is done producing the sound

ALERT-GREQ-40369-5-Chime_Directionality signal (System) -
The Cluster shall tell the Chime Audio Source what speakers to play the chime through using the signal Chime_Directionality.

If the AHU has one polyphonic chime generator and one non-polyphonic chime generator the following rules apply:

Vehicle with Front and Rear Speakers:
- The AHU polyphonic chime generator can only produce polyphonic DNA chimes when the Chime_Directionality = Front or All.
- If the Chime_Directionality = Rear only simple non-polyphonic chimes can be generated (ie DNA chimes cannot be produced when Chime_Directionality = Rear).

Vehicle with Front Speakers Only (no rear speakers):
- The AHU polyphonic chime generator can only produce polyphonic DNA chimes when the Chime_Directionality = Front or All.
- If the Chime_Directionality = Rear then the chime will be played out of the front speakers and only simple non-polyphonic chimes can be generated (ie DNA chimes cannot be produced when Chime_Directionality = Rear).

The Chime Generator and Chime Audio Source shall be configured for Front speakers only vehicles when applicable so they know when to play rear chimes out of the front speakers.

The Cluster shall only set one chime active at a time in the front speakers and only one chime active for the rear speaker at the same time. See below for allowable combinations for the Cluster to send.

If the AHU chime generator receives 2 chime requests for the same speakers (ie Chime_Directionality & Chime_Directionality2 both equal Front, both equal to Rear, or All) then the second chime request the AHU shall respond with AHU_Chime_Not_Recognized / AHU_Chime_Not_Recognized2 = Chime_Not_Recognized and shall not be played by the AHU (would be played by the Cluster).

Example two chimes requested with the same directionality on different alert channels.
Pre-Condition:
1. Cluster sending "IPC_Chime (Chime =Chime_X; Directionality = Front)" and "IPC_Chime2 (Chime2 = No_Chime; Directionality = Inactive)".
2. The AHU is sending "AHU_Alert (AHU_Chime_Active = Chime_X; AHU_Chime2_Active = No_Chime)".

Event:
1. While the Cluster is sending "IPC_Chime (Chime = Chime_X; Directionality = Front)" it also sends "IPC_Chime2 (Chime2 = Chime_Y; Directionality2 = Front)"

Post-Condition:
1. AHU responds by sending AHU_Alert (AHU_Chime_Active = Chime_X; AHU_Chime_Not_Recognized = Inactive; AHU_Chime_Active2 = Chime_Y; AHU_Chime2_Not_Recognized = Chime_Not_Recognized);
   - The AHU would not play the 2nd chime since it is not a valid chime request on the same speakers but would set Chime_Not_Recognized for that chime
   - The Cluster would see Chime_Y set to Chime_Not_Recognized and would play that chime in the Cluster

Allowable Combinations:
1. 1 chime Front speakers only (Chime_Directionality = Front)
2. 1 chime Rear speakers only (Chime_Directionality = Rear)
3. 1 chime out for Front speakers and one chime out of Rear speakers at the same time
4. 1 chime out of All speakers (second chime request the AHU would respond with Chime_Not_Recognized)

~~If a particular vehicle does not have rear speakers (only front speakers on vehicle) and the AHU receives a request for rear speakers the AHU shall respond with Chime_Not_Recognized as called out in requirement "ALERT-GREQ-40364-4-_Chime_Not_Recognized signal". The Cluster would then play the back-up chime when it received Chime_Not_Recognized.~~

ALERT-GREQ-40370-1-Chime Audio Attenuation (System) -
While chime(s) are active the Cluster shall tell the Chime Audio Source if the infotainment audio will be attenuated, muted, or if there will be no effect on non-chime infotainment audio via the 'IPC_Infotainment.St() : Attn_Info_Audio' signal.

ALERT-GREQ-40410-2-Chimes in Single and Dual Play (System) -
The chimes shall be played regardless if the infotainment system is in Single Play or Dual Play.

If in Dual Play with the rear speakers muted and if the rear speakers are needed for the chime (as indicated in the Chime_Directionality signal then:
1. The AHU shall mute the line level signal to the RSE module for the headphones within 30 msec and then
2. unmute the rear speaker audio for chimes within 50 msec

If in Dual Play with a DSP AMP present then the DSP AMP shall unmute the rear speakers for chimes if the Chime_Directionality signal indicates that the rear speakers are needed. The rear speakers should not unmute until after 30 msec have passed from receiving the Chime CAN command signal but before 70 msec have passed from receiving the chime signal.

Note: If the RSE audio source is internal to the FES / RSEM (ex. rear DVD) then this will not affect the audio to the rear headphones. Only the line level audio from the AHU would be muted to the headphones.

After the Chime event has ended the AHU / RSE audio source line level signal would return to the FES / RSEM headphones if in dual play.

ALERT-GREQ-40394-3-_Chime_Active signal from Chime Generator (System) -
The Chime Generator shall indicate what chime it is playing to the chime components (ex. Cluster, Chime Audio Source) via the '_Chime_Active = Chime_X' signal. This event-periodic signal will be updated on event when the Chime Generator starts or stops playing a chime.

When there is no chime being played then the '_Chime_Active' signal shall equal 'No_Chime'. Note: this does not mean that in between chime sounds (Off_Time_Btwn_Chime) that 'No_Chime' is set.

When the Chime_Occurance signal is set to a fixed repetition rate the Chime Generator shall not set the _Chime_Active signal equal to "No_Chime" until the last repetition and chime sound is finished playing. Until the last chime sound is played the _Chime_Active shall be set to the current chime.

ALERT-GREQ-40395-1-Chime_Occurance signal (System) -
The Cluster shall tell the Chime Generator the Occurrence of the chime to be played using the Chime_Occurance signal.
-- If Chime_Occurence is set to 1, 2, 3… repetitions then the chime shall be played 1, 2, 3… times respectively and then the chime shall end. The Cluster shall know that the chime has ended by looking at what the Chime Generator signal 'XXX_Chime_Active' is set equal to. If it's set to 'No_Chime' then the chime has ended.
-- If Chime_Occurence is set to 'Continuous' then the Chime shall play as long as the Chime_X signal in 'IPC_Chime : Chime = Chime_X' doesn't change.
- When the chime is turned off (IPC_Chime : Chime = No Chime') or changes to another chime then the currently playing chime will end. It shall either finish playing the chime or immediately end depending on the Chime_Time_Criticality signal state.

ALERT-GREQ-40432-5-Chime / Prompt / Beep Prioritization (System) -
The Chime Audio Source shall be capable of mixing a chime and prompt together at the same time. If a beep event occurs while both a chime and prompt are active then the chime audio source shall mix in the beep if it is capable otherwise the beep shall not be heard.

The Prompt Generator can monitor the IPC_Infotianment : Attn_Info_Audio / New_Attn_Event signal to see if the prompt is muted or attenuated. This could be used by the prompt generator to avoid prompts seeming to be starting mid-sentence to the user because of a muting event caused by a chime.

Alert Channel 1 between the Chime Generator and Chime Audio Source is used for Chime1 as indicated in the IPC_Chime.St message

Alert Channel 2 between the Chime Generator and Chime Audio Source is used for Chime2 as indicated in the IPC_Chime2.St message.

ALERT-GREQ-167427-3-Chime ID Assignments (System) -

Chime_X	Chime Sound ID
Chime_0	No Chime
Chime_1	Turn Signal (Tic)
Chime_2	Turn Signal (Toc)
Chime_3	1.0 Second Chime
Chime_4	0.5 Second Chime
Chime_5	0.25 Sec Chime
Chime_6	1 Sec Tone (1KHz Alert)
Chime_7	0.1 Sec Chime
Chime_8	Ford DNA Chime B (Soft Warning)
Chime_9	Ford DNA Chime C (Hard Warning)
Chime_10	Ford DNA Chime D (Non-Critical Alert) - Info
Chime_11	Ford DNA "B" shortened to 0.5 sec
Chime_12	Perimeter Warn. Chime A
Chime_13	Perimeter Warn. Chime B
Chime_14	Perimeter Warn. Chime C
Chime_15	Cross-Traffic Alert (CTA)
Chime_16	Forward Park Aid
Chime_17	Reverse Park Aid
Chime_18	Lincoln DNA Chime B (Soft Warning)
Chime_19	Lincoln DNA Chime C (Hard Warning)
Chime_20	Lincoln DNA Inf Chime D (Non-Critical Alert)- Info
Chime_21	Lincoln DNA "B" shortened to 0.5 sec
Chime_22	ACC-High, and FCW
Chime_23	Lane Departure Warning (LDW)
Chime_24	Push Button
Chime_25	Beltminder A
Chime_26	Beltminder B
Chime_27	RPA Continuous
Chime_28	FPA Continuous
Chime_29	Power Liftgate (POT) / Power Sliding Door
Chime_30	Chime_30

ALERT-GREQ-198071-2-ANC Network Activation (System) -
The ANC module shall vote to keep the network bus awake as long as Power_Up_Chimes_Modules = Active.

Note: this is so the ANC module can send its heartbeat signal to the Chime Generator

1.3.1.2 Chimes Error Management Requirements

Note: During Crank audible chimes may not be supported by the Infotainment System

ALERT-GREQ-40440-2-Default Chime Source at Start-Up (System) -
Upon bus wake-upthe default is for the Cluster to set the Infotainment System as the Chime Generator & Chime Audio Source via the 'IPC_Infotainment.St() : Chime_Source = Infotainment_System' signal unless an Error state had been entered previously. This is assuming the Cluster was configured to have the Infotainment System as the Chime Source.

ALERT-GREQ-40441-5-Loss of communication with Chime module (System) -
The Cluster shall monitor the AHU_Alert heartbeat periodic message for determining if the Chime Generator fell off the bus. If the Cluster loses communication with the Chime Generators AHU_Alert message for more then 5 seconds then the Cluster shall become the Chime Generator and Chime Audio Source and shall set the signal 'IPC_Infotainment.St() : Chime_Source = Cluster' and 'Power_Up_Chime_Modules = Inactive'.

If Chimes are supported through the infotainment system then the Chime Generator has to determine if a vehicle has the DSP AMP, AAM or ANC module present on a vehicle. If the Chime Generator loses communication with the DSP AMP, AMM or ANC module for more then 5 seconds then the Chime Generator shall set AHU_Chime_Supported = Not Supported so the Cluster becomes the Chime Generator and Chime Audio Source.

ALERT-GREQ-40443-11-Chime Error States / Fault handling (System) -
If the Chime Generator sets its signal 'XXX_Chimes_Supported' equal to 'Not_Supported' for a particular configuration then the Cluster shall become the Chime Generator and Chime Audio Source and sets the 'IPC_Infotainment.St() : Chime_Source = Cluster' and Power_Up_Chime_Modules = Inactive.

The Chime Generator shall monitor the Infotainment System Chime components (ie ANC, AAM, DSP AMP) XXX_Chimes_Supported signals. If the ANC, AAM or DSP AMP XXX_Chimes_Supported signals equal Not_Supported then the AHU shall set its AHU_Chimes_Supported signal = Not Supported. Note: The AHU shall not monitor the ANC Chime_Supported signal when ANC is integrated in the AHU or when a DSP AMP module is present.

The Chime components are responsible for setting "_Chimes_Supported = Not_Supported" whenever they are no longer able to produce chimes because of a fault condition, otherwise their signal shall be set to 'Supported'. A normal crank event is not considered a fault condition. A normal crank event would not cause the _Chime_Supported signal to change. For example if Chime_Supported = Supported and a normal crank event occurs the _Chime_Supported value would remain equal to Supported and would not change because of the crank event (ie would never change to Inactive or Not_Supported). A chime FMEA shall be performed on all the chime components to verify that fault conditions are detected and _Chimes_Supported is set to Not_Supported when necessary.

Any infotainment component that could prevent chimes from being played through the infotainment system needs to have a "XXX_Chimes_Supported" signal so chimes can be transferred to the Cluster for an error condition.

Some fault conditions (while not limited to these) that would result in the _Chimes_Supported signal being set to Not_Supported: 1) Short/open circuit to any of the chime speakers 2) short/open circuit on the line level signals to the chime components 3) low voltage preventing the chime components from producing audio…

When the Audio Enable line is keeping the Audio Muted for more then 5 seconds then the chime source being muted shall set its chime signal 'XXX_Chime_Supported' equal to 'Not_Supported' (example DSP AMP, ANC, AAM).

The Chime Audio Components (ex.AHU, DSP AMP, AAM, ANC…) shall set their _Chime_Supported signal to Supported or Not_Supported within 2000 msec of the start of Chime Diagnostics. Reference the IDS for entering chime diagnostics.

If the Chime Generator doesn't receive the ANC, AAM or DSP AMP Chimes_Supported signal equal to Supported within 3000 msec after the start of chime diagnostics it shall treat 'Inactive' the same as 'Not Supported' and set AHU_Chimes_Supported = Not Supported. During the 3000 msec since chime diagnostics started if the ANC, AAM or DSP AMP has their chime supported signal set to "Inactive" then the Chime Generator shall also have its _Chime_Supported signal set as "Inactive".
If the Chime Client (Cluster) receives 'AHU_Chimes_Supported = Inactive' 5000 msec after Power_Up_Chime_Modules transitions from Inactive to Active then it shall treat 'Inactive' the same as 'Not_Supported'.

Note: The IPC_Infotainment : Chime_Source signal has no effect on the _Chime_Supported signal.

The user adjusted Bass, Treble, Balance, Mid-Range, Fade settings shall not effect chimes. For example if the BTMBF setting did effect chimes the user could fade to front speakers and a chime that is supposed to be played out of the rear speakers only would not be heard.

ALERT-GREQ-40444-2-_Chime_Supported signal changes to Supported from Not_Supported (System) -
If the Chime Generator set its signal 'XXX_Chimes_Supported' equal to 'Supported' after previously being set to 'Not_Supported' in the same ignition state then the Cluster shall not set the infotainment system as the chime source until the next ignition cycle. The 'IPC_Infotainment.St() : Chime_Source' shall remain equal to 'Cluster' for that ignition state.

ALERT-GREQ-40447-3-Load Shed (System) -
During an infotainment Load Shed event (HMIAudioMode = Load Shed) the Cluster shall set the 'IPC_Infotainment.St() : Chime_Source' signal equal to 'Cluster' AND Power_Up_Chimes_Modules = Inactive for that ignition cycle and the Cluster shall become the Chime Generator and Chime Audio Source.

Note: see PWRMAN-GREQ-66172-2-Infotainment Components Load Shed State requirements for when an infotainment load shed event is active

ALERT-GREQ-193435-1-Response when chime signals from Chime Client set to inactive (System) -
If any of the signals Chime, Chime_Directionality, Chime_Time_Criticality, OFF_Time_Btwn_Chime, or Chime_Occurance in the IPC_Chime (1 or 2) messages are set to 'inactive' then the Chime Generator won't create a new chime sound and the AHU_Alert : AHU_Chime_Active signal will be set to No_Chime to tell the Cluster that it is not playing the chime.

1.3.1.3 Sequence Diagrams

ALERT-GSD-40403-4-Cluster ending Continous Chime event, or Fixed Repetition Chime event where Cluster ends chime before repetitions finished

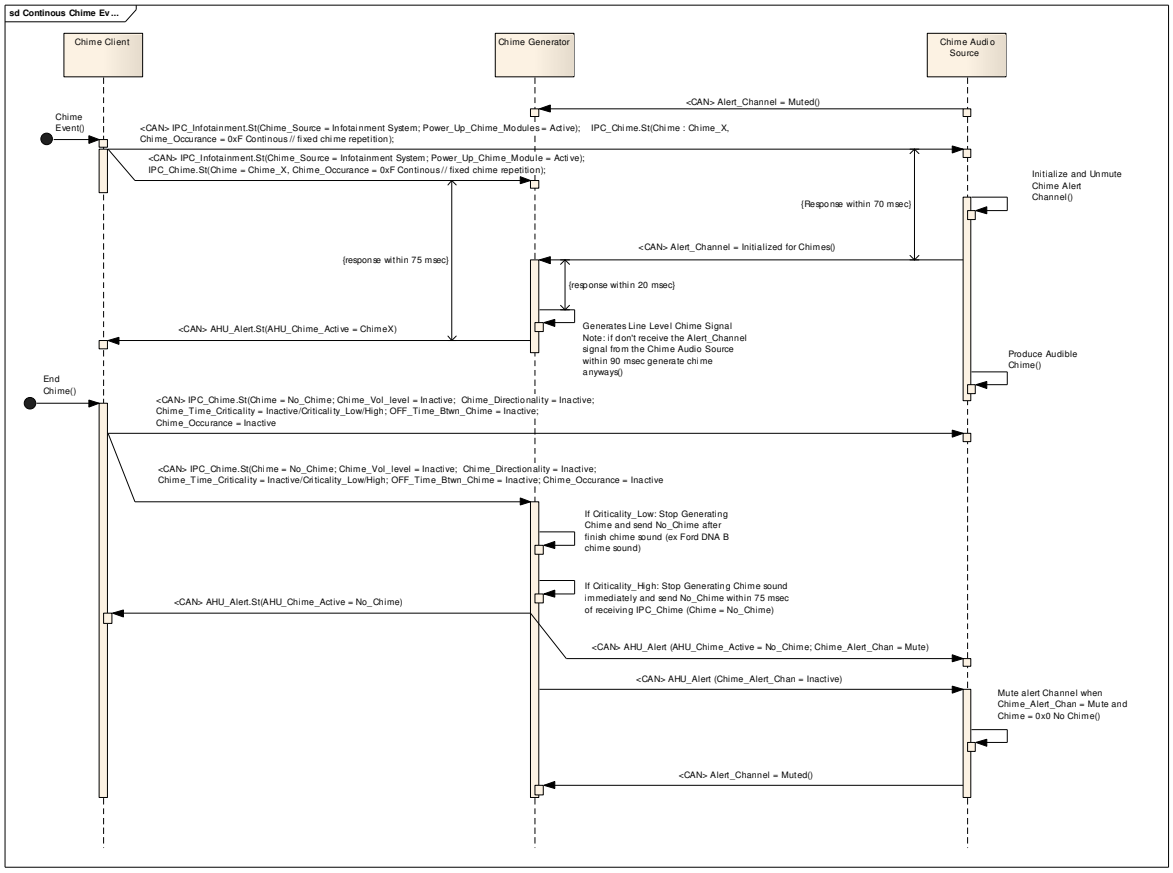
Linked Elements

Pre-condition
No Chimes are active

Scenario
Chime Client initiates a chime

Post-condition
Chime is ended by the Chime Client

Sequence Diagram



ALERT-GSD-167429-2-Fixed Repetitive Chime Event

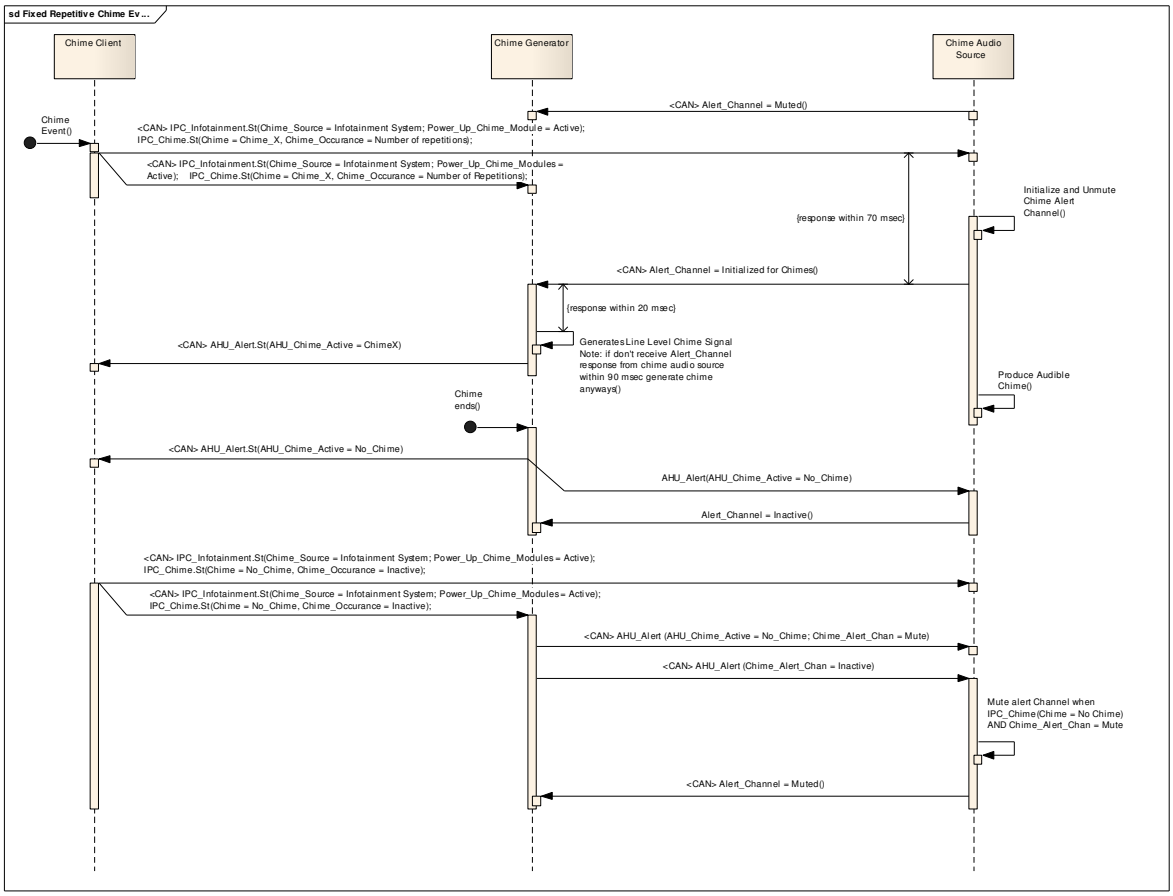
Linked Elements

Pre-condition
No Chimes are active

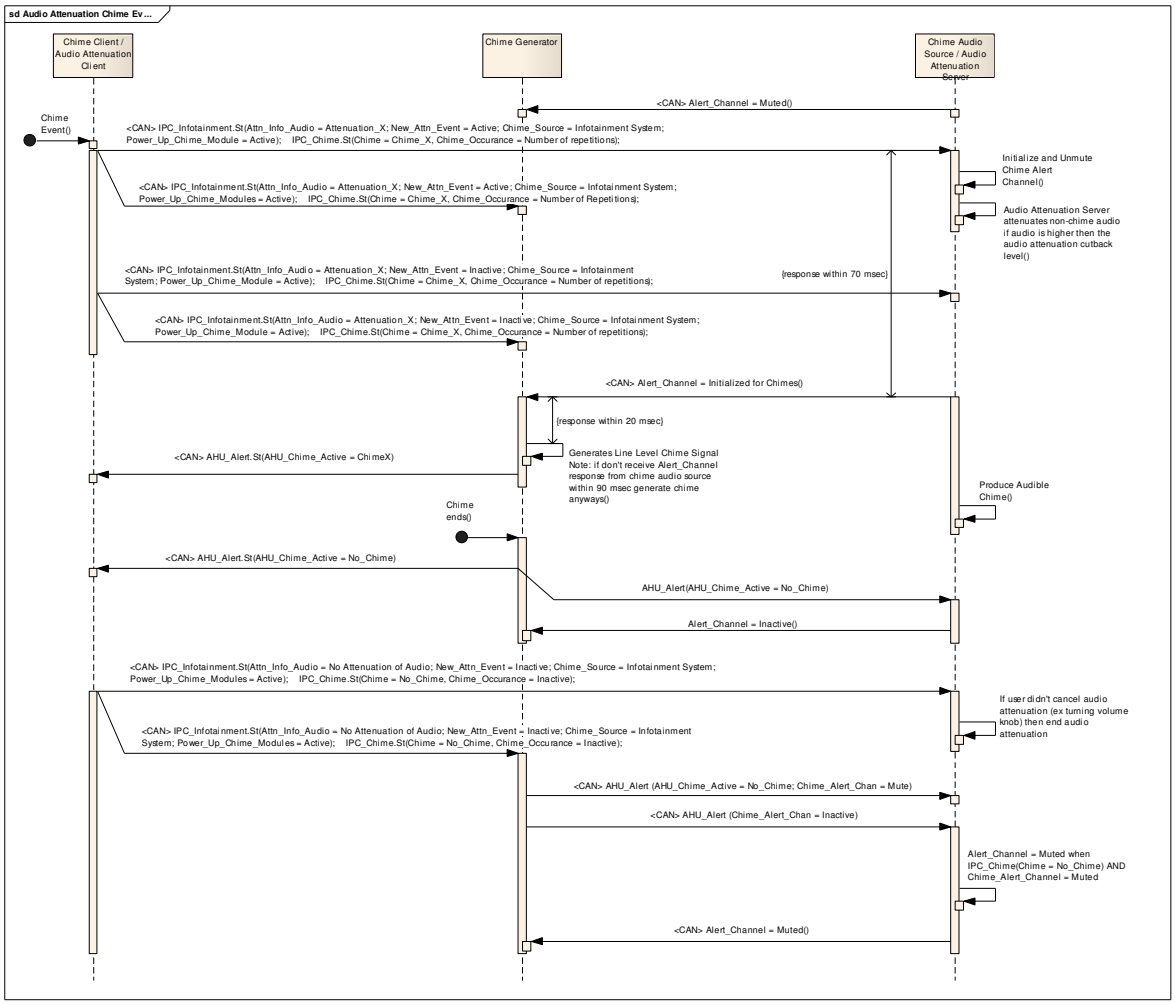
Scenario
Chime Client initiates a Fixed Chime Event

Post-condition
Chime is completed

Sequence Diagram



Sequence Diagram



ALERT-GSD-200749-2-Low Priority Chime overwriting another Chime on the same Alert Channel

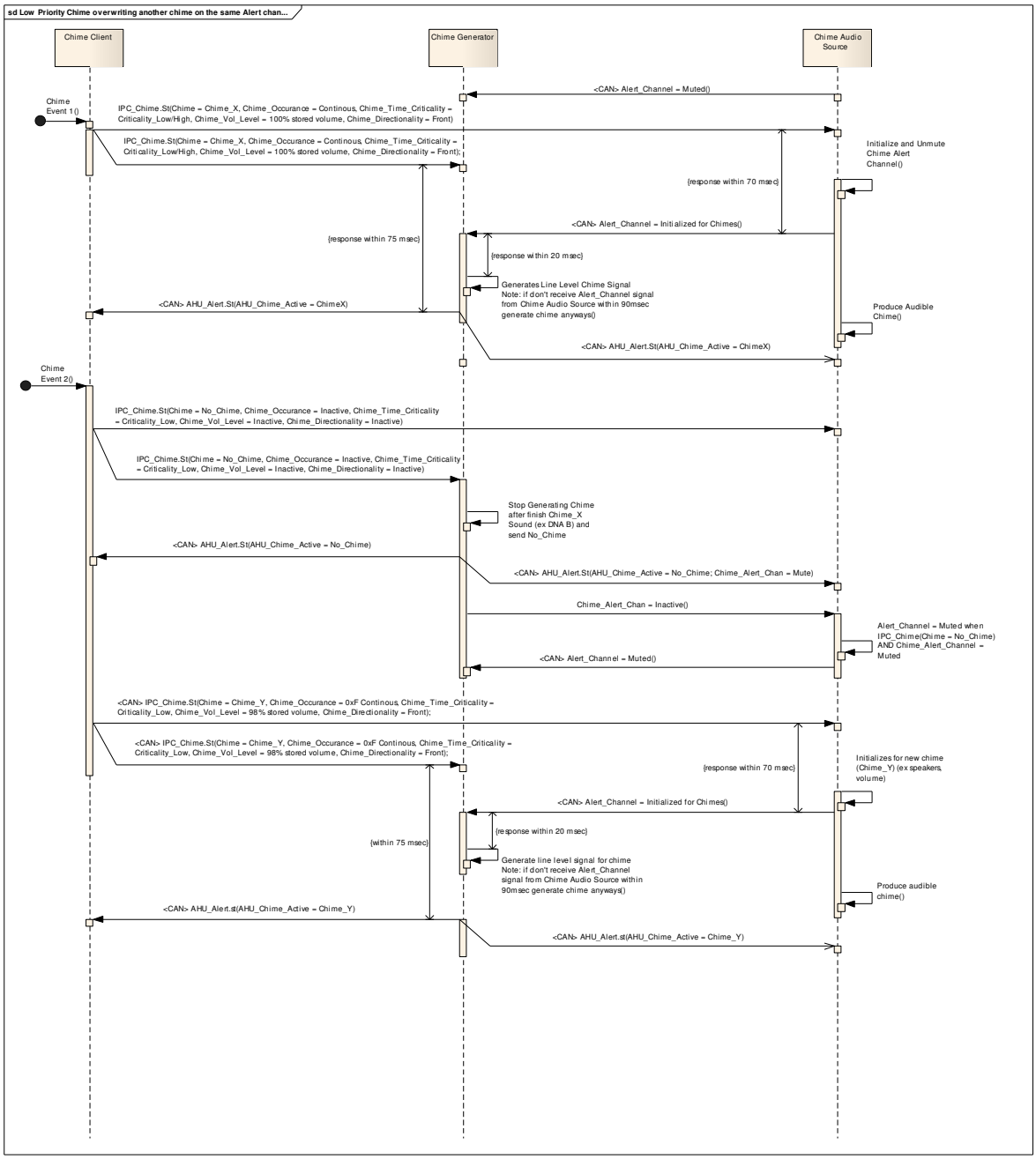
Linked Elements

Pre-condition
Chime event 1 is active on Alert Channel 1

Scenario
Chime Client initiates a low criticality Chime event 2 on Alert Channel 1

Post-condition
Chime event 2 is playing through the infotainment system on Alert Channel 1

Sequence Diagram



ALERT-GSD-200760-3-High Priority Chime overwriting another Chime on the same Alert Channel

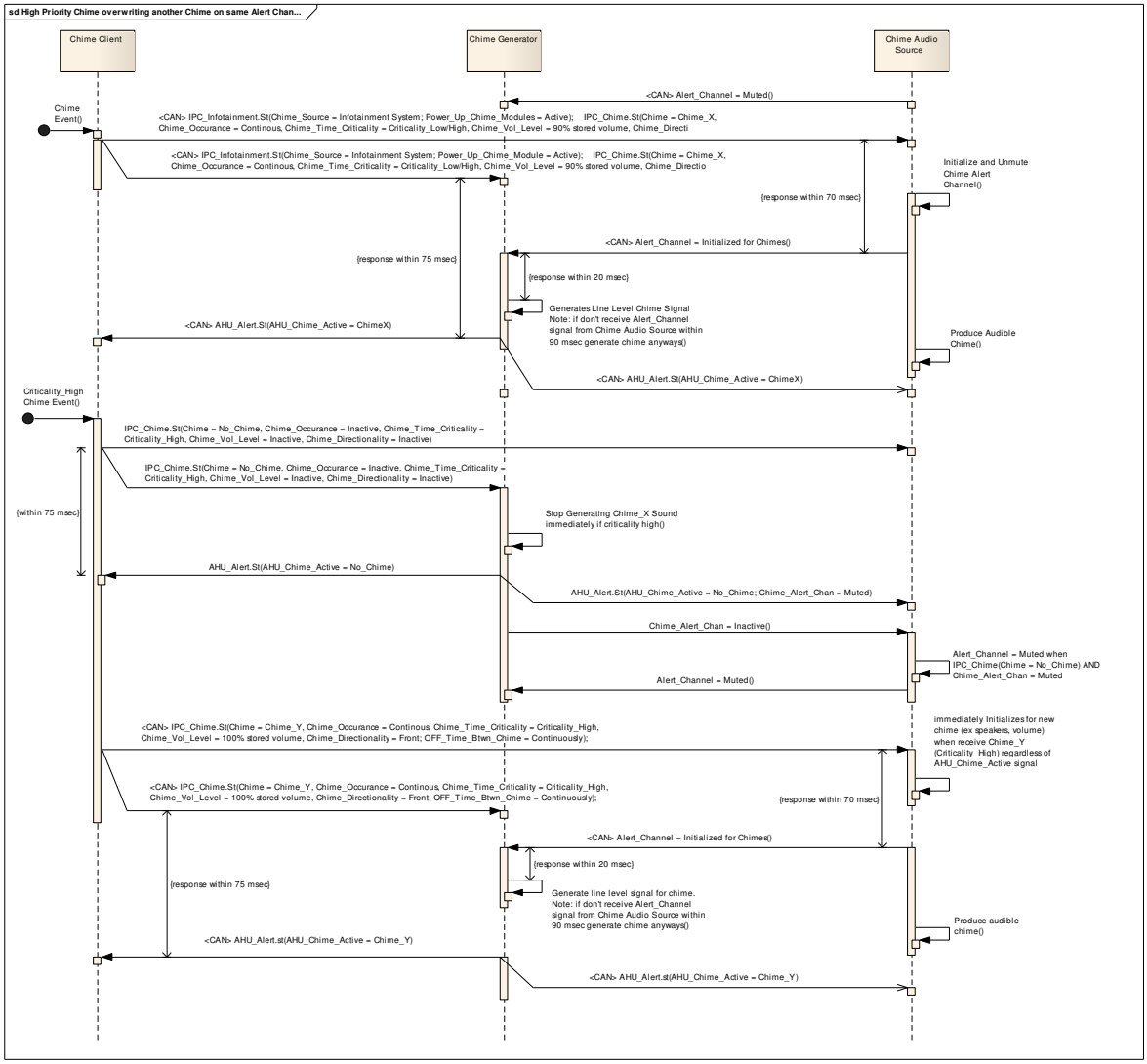
Linked Elements

Pre-condition
There is a chime active on Alert Channel 1

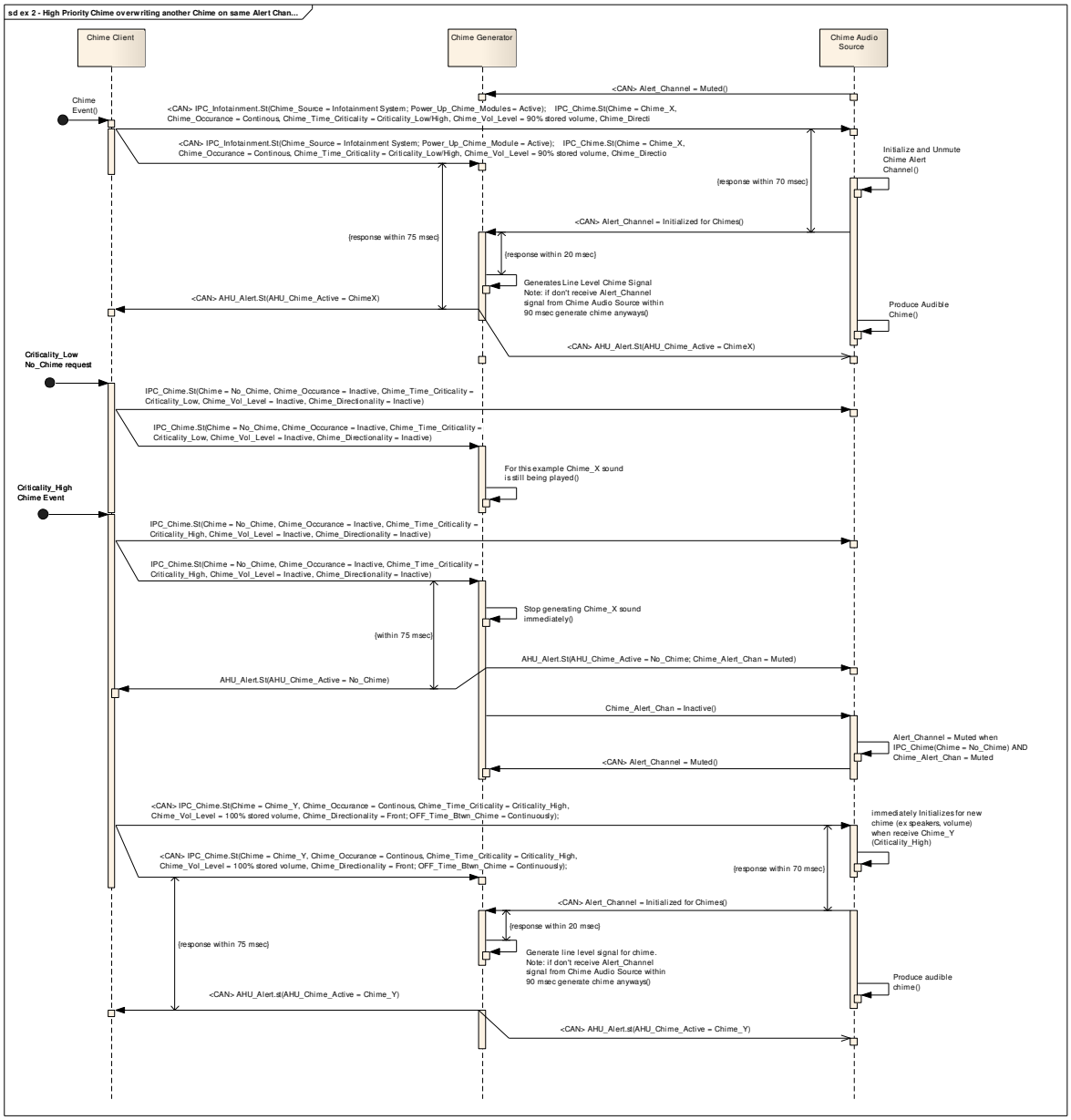
Scenario
Chime Client initiates a High Criticality Chime on Alert Channel 1

Post-condition
The new high priority chime is playing through the infotainment system on Alert Channel 1

Sequence Diagram



Sequence Diagram



ALERT-GSD-285762-1-Low Priority Chime - requesting a new chime on a different Alert channel with the same directionality

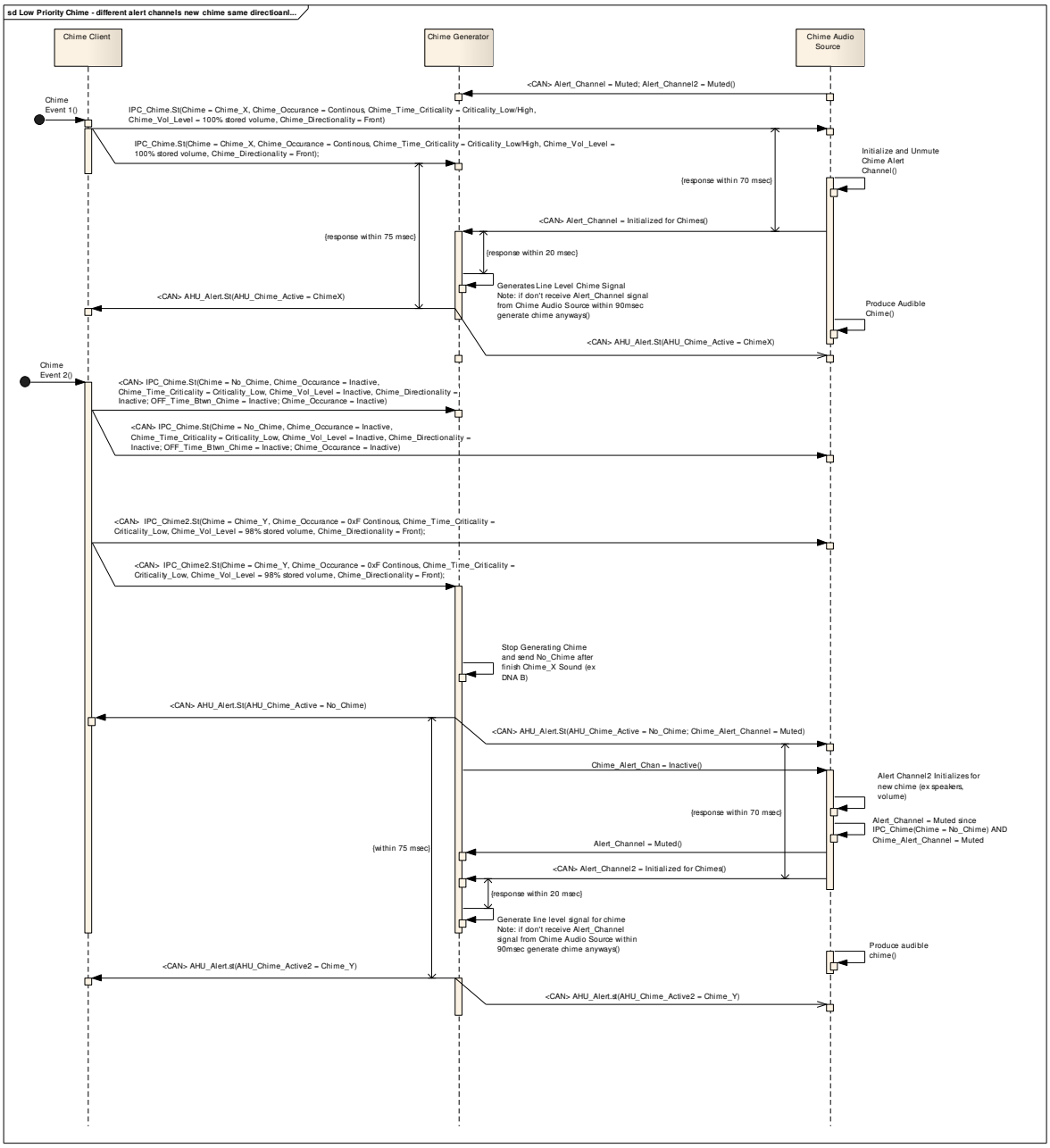
Linked Elements

Pre-condition
Chime event 1 is active on Alert Channel 1

Scenario
Chime Client initiates a new low criticality Chime event 2 on Alert Channel 2

Post-condition
Chime event 2 is playing through the infotainment system on Alert Channel 2

Sequence Diagram



ALERT-GSD-285767-1-High Priority Chime - requesting a new chime on a different Alert channel with the same directionality

Linked Elements

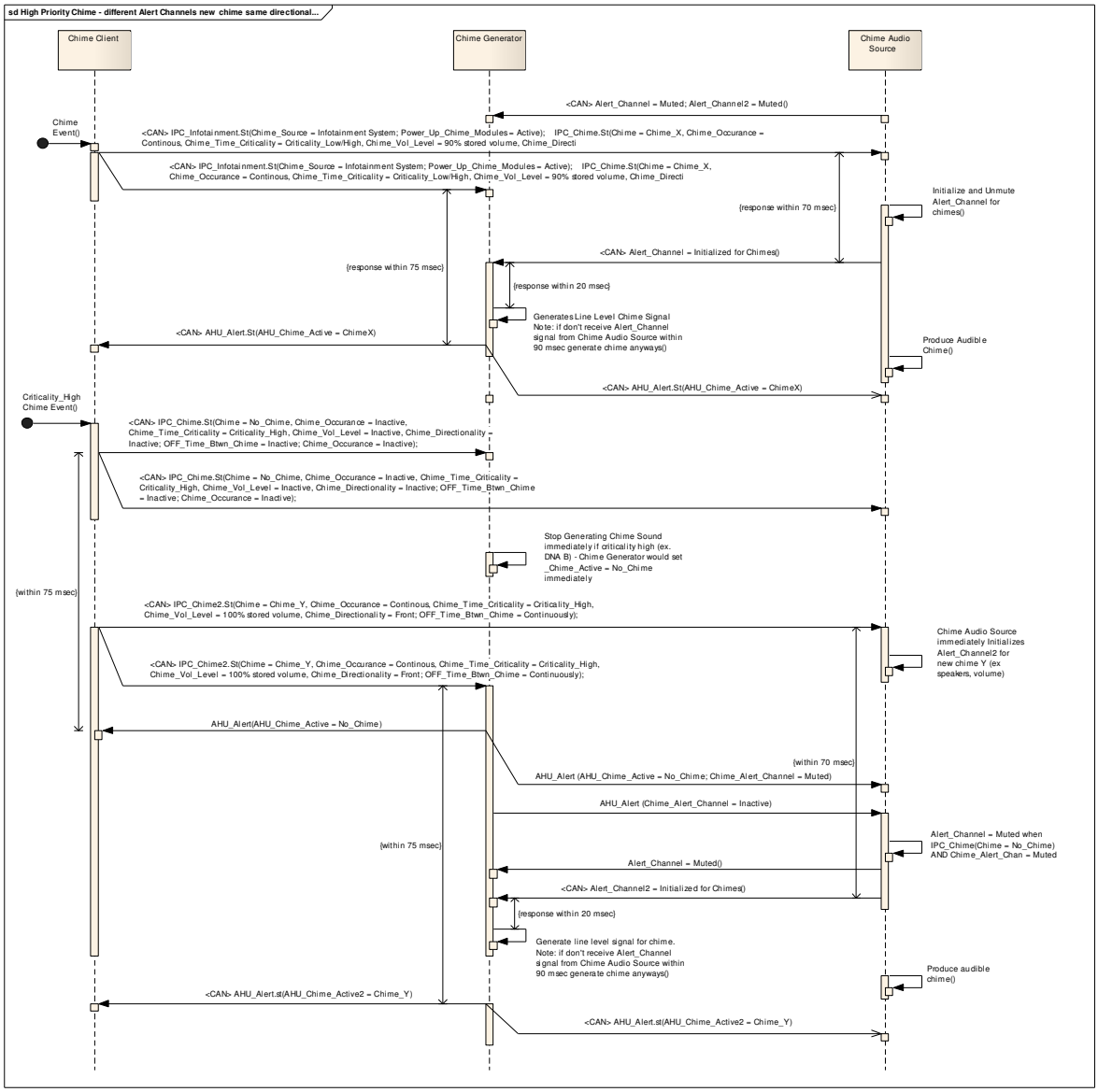
Pre-condition

Chime event 1 is active on Alert Channel 1

Scenario
Chime Client initiates a new high criticality Chime event 2 on Alert Channel 2

Post-condition
Chime event 2 is playing through the infotainment system on Alert Channel 2

Sequence Diagram



1.3.2 Alert-GFUN-119787-1-Mixable Prompts

1.3.2.1 Prompt Activation Requirements

ALERT-GREQ-41487-3-Prompt Generator requests for prompts from Prompt Audio Source (System) -
When the Prompt Generator (prompt client) requests from the Prompt Audio Source to play the prompts the Prompt Generator shall:

1. Tell the Prompt Audio Source to initialize for prompts within $T_{prompt\_initializaiton}$ using the signal 'Alert_ChanX = Initialize for Prompts'. The Prompt Generator shall keep Alert_ChanX = Initialize for Prompts for the duration of the prompts.
2. Tell the Prompt Audio Source if there is attenuation of the Active Audio Source using the Attn_Info_Audio and New_Attn_Event signals.
3. Tell the Prompt Audio Source what speakers to play the prompts through using the PromptX_Directionality signal. The Prompt Generator shall keep Prompt_Directionality = Directionality_X for the duration of the prompt.

Requirement#	Name	Description	Units	Range	Resolution	Default
ALERT-GREQ-41488-2-Tprompt_initialization	Tprompt_intializatio n	Maximum time allowed from when the Prompt Generator requests the Prompt Audio Source to initialize for prompts until the Prompt Audio Source responds to the Prompt Generator that it is initialized for prompts and capable of receiving the Prompt Generated signal.	msec	0-1000	10.0	50.0

ALERT-GREQ-41512-5-Prompt Audio Source response to prompt request (System) -
The volume settings sources are Media, Phone, Prompts, VR and TA. Once the Prompt Audio Source is initialized for prompts (Alert_Chan = Initialized for prompts) then prompts are the current active volume setting source. This means if there are user volume adjustments that prompts will be updated by the adjustment since it is the active volume settings source and the other volume settings sources will not be updated unless noted otherwise.

When prompts are the active volume setting source with the other audio sources attenuated (audio sources that can be attenuated during prompts are defined in requirement VOLC-GREQ-27919) then since volume user adjustments only adjust the non-attenuated prompt volume the partial attenuation of the attenuated sources would not be cancelled by volume adjustments (ex. Media attenuation wouldn't be cancelled during prompts).

Once the Prompt Audio Source is no longer initialized for prompts then the active volume settings source will not be prompts but the active volume source indicated in the ResourceUpdate.St message. See volume section for further details. Note: this means when SYNC_Alerts : Alert_Chan = "Inactive" or "Mute" the ResourceUpdate signal is used for the volume settings source.

Note: for Non-SYNC generated mixable prompts (ex. FoE Nav module) will use the prompt strategy in the audio management section for determining when prompts are active.

1.3.2.2 Sequence Diagrams

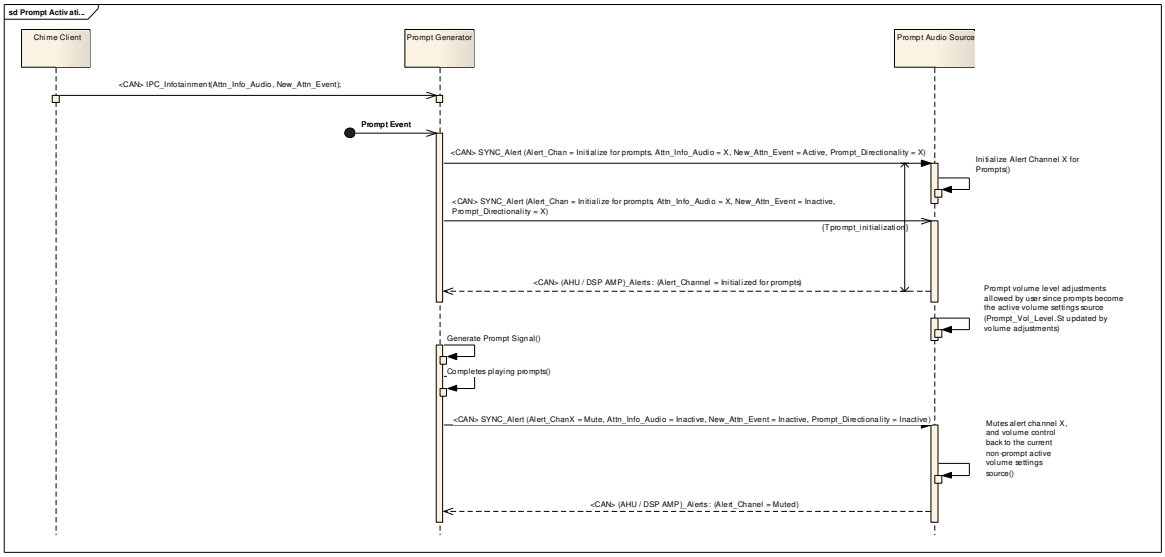
ALERT-GSD-41489-4-Prompt Activation

Linked Elements

Pre-condition
No prompts are active

Post-condition
Prompt is completed

Sequence Diagram


sd Prompt Activati...
Chime Client
Prompt Generator
Prompt Audio Source
<CAN> IPC_Infotainment(Attn_Info_Audio, New_Attn_Event);
Prompt Event
<CAN> SYNC_Alert (Alert_Chan = Initialize for prompts, Attn_Info_Audio = X, New_Attn_Event = Active, Prompt_Directionality = X)
Initialize Alert Channel X for Prompts()
<CAN> SYNC_Alert (Alert_Chan = Initialize for prompts, Attn_Info_Audio = X, New_Attn_Event = Inactive, Prompt_Directionality = X)
{Tprompt_initialization}
<CAN> (AHU / DSP AMP)_Alerts: (Alert_Channel = Initialized for prompts)
Prompt volume level adjustments allowed by user since prompts become the active volume settings source (Prompt_Vol_Level.St updated by volume adjustments)
Generate Prompt Signal()
Completes playing prompts()
<CAN> SYNC_Alert (Alert_ChanX = Mute, Attn_Info_Audio = Inactive, New_Attn_Event = Inactive, Prompt_Directionality = Inactive)
Mutes alert channel X, and volume control back to the current non-prompt active volume settings source()
<CAN> (AHU / DSP AMP)_Alerts: (Alert_Chanel = Muted)

1.3.3 Alert-GFUN-119788-1-Beep

For enabling / disabling touch panel beeps and for touch panel beeps configuration reference VS-GFUN-129114-1-Touch Panel Beeps Settings.

1.3.3.1 Beep Activation Requirements

For certain events (ex. touch sense press event) the infotainment system may need to produce audible beeps.

ALERT-GREQ-273468-1-Beep Generator allowable times for producing Beeps (System) -
The Beep Generator shall be able to produce beeps for the EFP (FCIM) and APIM (FCDIM) when HMIAudioMode = ON and shall not produce beeps when HMIAudioMode = OFF.

The Beep Generator shall be able to produce beeps for the OHCM when Demand_PwrModing = ON

ALERT-GREQ-273469-1-Beep Directionality (System) -
The Beep Generators / Beep Audio Source shall produce the infotainment beeps out of the front speakers

ALERT-GREQ-110897-4-Infotainment System Beep Set-up (System) -
The Beep Generator and Beep Audio Source will vary depending on the infotainment system module availability. The Infotainment System Beep set-up will follow the table below.

Modules Present	Beep Client	Beep Generator	Beep Audio Source	Comments
AHU / DSP AMP / MFD or APIM / EFP / OHCM	APIM / EFP / OHCM	DSP AMP	DSP AMP	DSP AMP produce audible beep based on infotainment network message from Beep Client
AHU / MFD or APIM / EFP / OHCM	APIM / EFP / OHCM	AHU	AHU	AHU produce audible beep based on infotainment network message from Beep Client

Beep Configuration Table

Requirement#	Name	Description	Units	Range	Resolution	Default
ALERT-GREQ-110901-1-T_Beep_Event	T_Beep_Event	The maximum time allowed from when a beep event begins until the signal 'XXX_Audible_Beep = Active' is put on the infotainment bus by the beep client.	msec	0-1000	10.0	30.0

ALERT-GREQ-39866-4-Beep Activation (System) -
When there is both an AHU and DSP AMP on the vehicle at the same time then the DSP AMP shall become the Beep Generator. The Beep Client(s) shall send the Beep Generator the infotainment network signal 'Audible_Beep = Active' to produce an audio beep (ex. touch sense button press beeps). The Beep Generator shall produce the audible beep within T_Audible_Beep of receiving the signal 'Audible_Beep = Active'.

After the Beep Generator produces the beep it shall wait for the signal 'Audible_Beep to equal 'Inactive' before it produces another beep based on the signal 'Audible_Beep ' set to 'Active'.

Requirement#	Name	Description	Units	Range	Resolution	Default
ALERT-GREQ-56911-3-T_Audible_Beep	T_Audible_Beep	The maximum time allowed from when the Beep Generator receives the 'Audible_Beep == Active' signal until an audible beep is produced.	msec	0-1000	10.0	50.0

1.3.3.2 Sequence Diagrams

ALERT-GSD-262985-1-Beep Activation

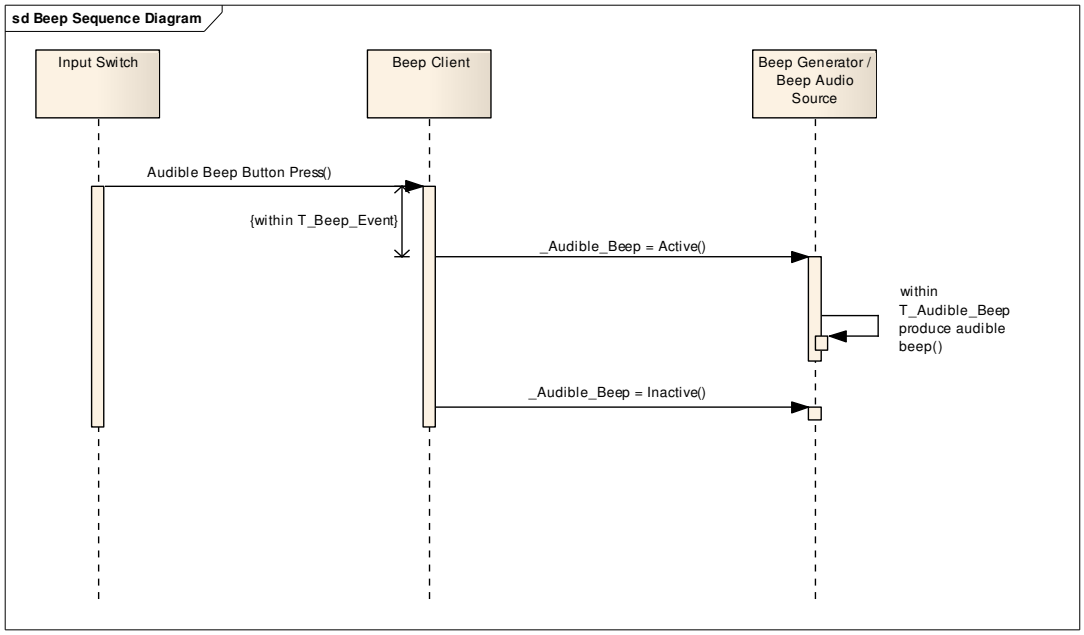
Linked Elements

Pre-condition
No beep active and beeps are supported

Scenario
Audible Beep event (ex touch sense button press event)

Post-condition
Audible Beep is produced

Sequence Diagram



1.3.4 Alert-GFUN-119789-1-Audio Attenuation/Muting Strategy

There may be multiple audio attenuation / muting requests from outside of the Infotainment System (ex. FCW, RPA…) but the AHU / DSP AMP shall only support 1 audio attenuation / muting request signal from outside the Infotainment System. The 'IPC_Infotainment.St() : Attn_Info_Audio' signal shall be used to Attenuate / Mute the infotainment audio. The Cluster is the Audio Attenuation Request Prioritizer responsible for sending the audio attenuation requests from outside the Infotainment System to the AHU / DSP AMP.

There may also be muting requests internal to the infotainment system such as for prompts using the 'SYNC_Alerts : Attn_Info_Audio' signal.

1.3.4.1 Cluster Prioritizing Audio Attenuation Requests

ALERT-GREQ-39883-2-Cluster Prioritizing Audio Attenuation Requests (System) -
The Cluster may receive multiple audio attenuation requests at the same time from outside the infotainment system. While multiple audio attenuation requests are active at the same time the Cluster shall use the request with the greatest attenuation of audio for the Attn_Info_Audio signal. The Cluster Attn_Info_Audio signal shall be broadcast on the Infotainment bus.

For example, while FCW (forward collision warning) is active with a full audio mute if a Reverse Park Aid signal is requesting the audio be partially attenuated then the audio will remain fully muted since FCW has the highest attenuation level.

Upon exiting the audio attenuation / muting request with the greatest attenuation, the next highest audio attenuation request shall be serviced until there are no longer any active audio attenuation requests.

1.3.4.2 AHU / DSP AMP Prioritizing Audio Attenuation Requests

ALERT-GREQ-39884-2-Multiple Attenuation Requests (System) -
The AHU / DSP AMP may receive multiple audio attenuation requests at the same time whether from outside the infotainment system (ex. chime requests sent to the Cluster which sends attenuation requests to infotainment components) or internal to the infotainment system (ex. SYNC prompts attenuation requests). While multiple audio attenuation requests are active at the same time the AHU / DSP AMP shall use the request with the greatest attenuation of audio.

Upon exiting the audio attenuation / muting request with the greatest attenuation, the next highest audio attenuation request shall be serviced until there are no longer any active audio attenuation requests.

1.3.4.3 Infotainment System Audio Attenuation

ALERT-GREQ-39889-2-Audio Attenuation to Attenuation_X volume level (System) -
When the AHU / DSP AMP receives the signal Attn_Info_Audio with New_Attn_Event = Active then the AHU / DSP AMP will lower their infotainment volume to Attenuation_X audio level as defined in the AHU / DSP AMP component requirements (see requirement VOL-GREQ-27919-6-Volume Attenuation/Restoration).

The Transmitter Audio Attenuation Client shall set Attn_Info_Audio to the desired attenuation level for the duration of the requested audio attenuation. See ALERT-GREQ-39896-3-Transmitters usage of New_Attn_Event signal for the usage of the New_Attn_Event signal.

Ex.
1. Audio Attenuation Client sends an attenuation request with Attn_Info_Audio = Attenuation_X / New_Attn_Event = Active
2. Audio Attenuation Client sends Attn_Info_Audio = Attenuation_X / New_Attn_Event = Inactive (See requirement 39896 Transmitters usage of New_Attn_Event for details).
3. Audio Attenuation Client keeps sending Attn_Info_Audio = Attenuation_X / New_Attn_Event = Inactive while the attenuation event is occuring (note: Audio Attenuation Client has no knowledge if a partial attenuation is cancelled).

4. When Audio Attenuation Client no longer needs the attenuation it shall send Attn_Info_Audio = 'No Attenuation of Audio" / New_Attn_Event = Inactive.

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ALERT-GREQ-39890-2-Audio Attenuation Timing (System) -
The AHU / DSP AMP shall lower their volume to the predefined audio level within 100 msec of receiving the Attn_Info_Audio signal with the New_Attn_Event = Active if the Attn_Info_Audio signal causes an attenuation event.

The AHU / DSP AMP shall lower their volume assuming that the present audio volume level is higher than the Attenuation_X level, otherwise the audio volume and XXX_Volume_Level signal shall not change.

VOL-GREQ-39891-2-Volume signal update for Audio Attenuation (System) -
The AHU / DSP AMP shall update the XXX_Volume_Level signal after receiving the Attn_Info_Audio signal that results in a decrease in audio.

Note: the corresponding XXX_Volume_Updated signal with the XXX_Volume_Level signal shall be set to "No Update" for an Attn_Info_Audio attenuation event that changes the XXX_Volume_Level signal.

ALERT-GREQ-39892-3-User Volume adjustment lock-out period (System) -
During an Attn_Info_Audio audio attenuation event volume user adjustments won't be able to lower or increase volume ~~shall be ignored~~ until 200 msec after the AHU / DSP AMP first receives the Attn_Info_Audio signal set to an attenuation level with the signal New_Attn_Event = Active.

Only after 200 msec from first receiving Attn_Info_Audio = Attenuation_X / New_Attn_Event = Active shall volume user adjustments cancel the partial attenuation.

ALERT-GREQ-39893-4-Volume user adjustments during a partial attenuation (System) -
Volume user adjustments are allowed after 200 msec from first receiving the Attn_Info_Audio signal with the signal New_Attn_Event = Active. Volume user adjustments to any of the attenuated volume sources shall effectively cancel the active partial attenuation attenuating the affected volume sources.

Ex.
1. Pre-Condition: XXX_Volume_Level = 20
2. Audio Attenuation Clients sends a partial Attenuation request with Attenuation_X / New_Attn_Event = Active which sets the volume level to volume step 4
3. Then the Audio Attenuation Client sets Attn_Info_Audio = Attenuation_X / New_Attn_Event = Inactive
4. The Audio Attenuation Server volume goes to XXX_Volume_Level = 4 and XXX_Volume_Updated = No Update.
5. The user adjust the attenuated volume up with SetVolume = +1 step while the partial attenuation is active
6. The partial attenuation is then cancelled and volume is increased to volume step 5 (XXX_Volume_Level = 5)

Note: If two partial attenuations are active at once then cancelling the partial attenuation of one partial attenuation doesn't necessarily cancel the attenuation of another partial attenuation.

Ex.
Pre-Condition:
1. There is both a Chime (IPC_Infotainment) AND Prompt (SYNC_Alerts) partial attenuation event active at the same time.
2. A media source (ex AM/FM) is granted in the Resource Update message and Prompts are active. Since prompts are active they are the active volume source

Event:
User adjust the volume while prompts are active

Post-Condition:
The chimes partial attenuation (IPC_Infotainment) is cancelled so prompts are no longer attenuated but the media source still is attenuated from the Prompt partial attenuation (SYNC_Alerts). The prompt partial attenuation is active so media is still attenuated. The prompt partial attenuation is still active per requirements 41512 and 27919.

ALERT-GREQ-39894-2-Volume user adjustments during a full mute (System) -

During an Attn_Info_Audio attenuation event volume user adjustments shall be ignored while a full mute Attenuation event is active unless otherwise noted in the AHU / DSP AMP component requirements. The AHU / DSP AMP shall update the XXX_Volume_Level signal accordingly.

ALERT-GREQ-39895-2-New Attenuation request at the same attenuation level that was cancelled because of a volume user adjustment (System) -
To protect for the case were another Attn_Info_Audio attenuation event happens requesting a partial attenuation at the same Attn_Info_Audio attenuation level that the AHU / DSP AMP is ignoring (because of a previous user volume adjustment) then to make sure the attenuation is still acted on the AHU / DSP AMP shall monitor the "New_Attn_Event".

If the AHU / DSP AMP receive the "New_Attn_Event = Active" concurrently with "Attn_Info_Audio" signal set to an attenuation level then the audio shall be attenuated (if applicable per other attenuation requirements) even if "Attn_Info_Audio" signal attenuation level did not change.

ALERT-GREQ-39896-3-Transmitters usage of New_Attn_Event signal (System) -
The Audio Attenuation Transmitting module shall set the "New_Attn_Event = Active' when it requests a new Attenuation event.

The "New_Attn_Event" signal shall be set equal to "Active" and then set to "Inactive" (within 30 msec) and then all subsequent periodic status updates shall set the signal "New_Attn_Event = Inactive" until a new Attenuation event occurs.

Ex. Audio Attenuation Client requesting the same audio attenuation at different times:
1. The Audio Attenuation Client (audio attenuation transmitting module) requests a new attenuation event when a Reverse Park Aid chime begins. The Audio Attenuation Client sends a partial attenuation request with Attn_Info_Audio = Attenuation_X and New_Attn_Event = Active.

2. Then the Audio Attenuation Client keeps Attn_Info_Audio equal to Attenuation_X and sets New_Attn_Event = Inactive

3. the Audio Attenuation Client keeps Attn_Info_Audio equal to Attenuation_X for as long as the Reverse Park Aid beeps are playing but keeps New_Attn_Event = Inactive

4. The Audio Attenuation Client requests the Seat Belt chime to play out of the front speakers while the Reverse Park Aid chime continues to play out of the rear speakers. The Audio Attenuation Clients sends a partial attenuation request with Attn_Info_Audio = Attenuation_X and New_Attn_Event = Active.

5. Then the Audio Attenuation Client keeps Attn_Info_Audio equal to Attenuation_X and sets New_Attn_Event = Inactive

6. the Audio Attenuation Client keeps Attn_Info_Audio equal to Attenuation_X for as long as the Seat Belt chime or Reverse Park Aid chime are playing but keeps New_Attn_Event = Inactive

7. After some time the Reverse Park Aid chime ends and the Audio Attenuation Client keeps Attn_Info_Audio = Attenuation_X and keeps New_Attn_Event = Inactive.

8. Some time after the Reverse Park Aid chime ends the Seat Belt chime ends and the Audio Attenuation Client sets Attn_Info_Audio = 'No Attenuation of Audio' and keeps New_Attn_Event = Inactive.

Note: The seat belt chime and RPA chime are used as examples and may or may not be the same attenuation level. Please reference the applicable function specifications for what attenuation to use

ALERT-GREQ-39897-2-Volume when changing to a lower attenuation from a higher attenuation (System) -
When the 'Attn_Info_Audio = Attenuation_X' signals change to a lower attenuation level or to no attenuation resulting in an increase in volume then the AHU / DSP AMP shall gracefully increase the volume at a rate defined in the AHU / DSP AMP components requirements.

Upon exiting the audio attenuation / muting request with the greatest attenuation, the next highest audio attenuation request shall be serviced until there are no longer any active audio attenuation requests.

Example:

1. Pre-Condition: XXX_Volume_Level = 20
2. Audio Attenuation Client A sends a partial Attenuation request with Attenuation_X / New_Attn_Event = Active which sets the volume level to volume step 16
3. Then the Audio Attenuation Client A sets Attn_Info_Audio (Module A) = Attenuation_X / New_Attn_Event = Inactive
4. The Audio Attenuation Server volume goes to XXX_Volume_Level = 16 and XXX_Volume_Updated = No Update.
5. Audio Attenuation Client B sends a partial Attenuation request with Attenuation_X / New_Attn_Event = Active which sets the volume level to volume step 4
6. Then the Audio Attenuation Client B sets Attn_Info_Audio (Module B) = Attenuation_X / New_Attn_Event = Inactive
7. The Audio Attenuation Server volume goes to XXX_Volume_Level = 4 and XXX_Volume_Updated = No Update.
8. Then the Audio Attenuation Client B sets Attn_Info_Audio (Module B) = No Attenuation of Audio / New_Attn_Event = Inactive
9. The Audio Attenuation Server volume goes to XXX_Volume_Level = 16 and XXX_Volume_Updated = No Update.
10. Then the Audio Attenuation Client A sets Attn_Info_Audio (Module A) = No Attenuation of Audio / New_Attn_Event = Inactive
11. The Audio Attenuation Server volume goes to XXX_Volume_Level = 20 and XXX_Volume_Updated = No Update.

ALERT-GREQ-39898-2-Timing to increase volume because of a lowering of the attenuation level (System) -
When the 'Attn_Info_Audio = Attenuation_X' signals change to a lower attenuation level or to no attenuation resulting in an increase in volume then the ACM / DSP AMP shall start to increase the volume level no later then 200 msec after receiving the Attenuation update.

1.4 Appendix: Reference Documents

Reference #	Document Title
1	
2	
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