

**Research & Vehicle Technology**

**“Infotainment Systems Product Development”**

**Feature – AVAS Pedestrian**

**Alert Sounder**

**Infotainment Subsystem Part Specific Specification (SPSS)**

Version 1.5

**UNCONTROLLED COPY IF PRINTED**

**Version Date: October 5, 2022**

**FORD CONFIDENTIALF**

**Revision History**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Version** | **Notes** | | |
| **October 15, 2021** | **1.0** | **Initial Release** |  | |
|  |  |  | |  |
| **February 2, 2022** | **1.1** |  | | |
|  | STR-911781/B-Physical Mapping of Classes | | | <BG> Added logical class for AVAS Audio Components |
| STR-911782/B-Logical Signal Mapping | | | <BG> removed Vehicle\_ignition\_Status and Torque status |
| AVAS-IIR-REQ-422340/B-AVAS Event Client\_Rx | | | <BG> Added Ignition Status signal |
| STR-911784/B-Functional Definition | | | <BG> Moved power Mode Functional requirements |
| PWRMAN-FUN-REQ-422330/A-AVAS Power Mode | | | jmyslin2: new function for AVAS power moding |
|  | PWRMAN-SR-REQ-473678/A-AVAS power mode state definitions | | | jmyslin2: new requirement |
|  | PWRMAN-SR-REQ-422324/B-Power-up for AVAS audio components | | | jmyslin2: updated requirement for AVAS power up |
|  | PWRMAN-SR-REQ-435883/B-Power down for AVAS audio components | | | <jmyslin2> added details for AVAS power down |
|  | PWRMAN-STM-REQ-473590/A-AVAS Power Mode state diagram - AVAS Audio Components | | | jmyslin2: new requirement |
|  | STR-911762/B-Requirements | | | bganesa7: Moved the power mode requirement |
|  | AVAS-SR-REQ-422325/B-Summary of AVAS audio generation triggers | | | <BG> Modified the logical names of igntion status and vehicle torque |
|  |  |  | |  |
| **March 7, 2022** | **1.2** |  | | |
|  | STR-911777/B-Feature Assumptions | | | <BG>updated: This Spec is appicable for Integrated AVAS Only. |
| AVAS-CLD-REQ-428397/B-AVAS Event Client | | | <BG> Updated the Class description for better Clarity |
| STR-911782/C-Logical Signal Mapping | | | <BG> Added ignition and power pack torque singals |
| STR-911762/C-Requirements | | | <BG> removed the PAC Mute/Unute req 'REQ-437037' |
| AVAS-SR-REQ-430917/B-AVAS Sound id assignment | | | <BG> Added a note for better Clarity |
|  | AVAS-SR-REQ-422327/B-Impact on AVAS audio when change in vehicle state is detected | | | <BG> As per review comments changed the order of Mute/Mute on the Generator side |
|  | AVAS-SR-REQ-433997/B-Speaker health status handling | | | <BG> Updated the requirement for better Clarity |
|  | AVAS-SR-REQ-422333/B-Error Handling when speaker fault is reported | | | <BG> Updated the requirement to change the Mute/Unmute order |
|  | AVAS-SR-REQ-430605/B-Loss of communication with Audio Source Server | | | <BG> Added requirement to update Cluster with Pedestrialn Fault notificaiton |
|  | STR-911763/B-Use Cases | | | <BG> Added new use case to handle varying vehicle speed |
|  | AVAS-UC-REQ-422328/B-AVAS audio activation | | | <BG> Updated the Pre and post conditions for better Clarity |
|  | AVAS-UC-REQ-430918/B-AVAS audio deactivation | | | <BG> Updated the exception case for better Clarity |
|  | AVAS-UC-REQ-422335/B-Speaker Fault detected on a Single speaker system | | | <BG> Updated the req for better Clarity |
|  | AVAS-UC-REQ-437378/B-Speaker Fault detected on a Two speaker system | | | <BG> Updated the req for better Clarity |
|  | AVAS-UC-REQ-484299/A-AVAS audio deactivation when vehcile speed is increased | | | <BG> Added new Use case requirement to handle varying vehicle speed |
|  | STR-911766/B-Sequence Diagrams | | | <BG> Added new requirements |
|  | AVAS-SD-REQ-436530/B-AVAS Event demands AVAS audio on Front speaker | | | <BG> Modified the SD and broke it into two SD for better Clarity |
|  | AVAS-SD-REQ-483657/A-AVAS Event that was active on Front speaker ends | | | <BG> Added new requirement |
|  |  |  | |  |
| **July 12, 2022** | **1.3** |  | | |
| AVAS-FRD-REQ-422337/B-AVAS Pedestrian Alert Sounder SPSS | | | <BG> Added General requirement section |
| STR-911775/B-Overview | | | <BG> Updated the Overview for better Clarity |
| STR-911777/C-Feature Assumptions | | | <BG> Updated the requirement for better Clarity |
| STR-911778/A-Library Calibration/Configuration file usage | | | bganesa7: Added information for more details about Library Calibration |
| STR-911782/D-Logical Signal Mapping | | | <BG> updated the Signal mapping |
| AVAS-IIR-REQ-422340/C-AVAS Event Client\_Rx | | | <BG> Added new MD for 'TrnRng\_D\_Rq' |
| MD-REQ-487737/A-Gear\_Position\_St | | | bganesa7: Add new requirement |
| STR-911783/B-General Requirements | | | <BG> Added req for missing messages |
| AVAS-SR-REQ-429678/A-AVAS Feature Configuration | | | <BG> Added new requirements for Phoenix |
| AVAS-SR-REQ-422334/A-Missing message DTC | | | <BG> Added req for missing message |
| AVAS-SR-REQ-487757/A-Information DID | | | <BG> Added new requirement |
| AVAS-SR-REQ-504357/A-Calibration & Configuration Support | | | <BG> Added new requirement |
| AVAS-SR-REQ-501277/A-Quality Factor Signal Usage | | | <BG> Added new requirement |
| STR-911784/C-Functional Definition | | | <BG> Added new requirements |
| STR-911762/D-Requirements | | | <BG> Removed 'REQ-430917' |
| AVAS-SR-REQ-422325/C-Summary of AVAS audio generation triggers | | | <BG> Updated the table to reflect new requirements |
| AVAS-SR-REQ-430917/C-AVAS sound state assignment | | | <BG> Renamed 'Sound id' as 'Sound state' as requested by SW team |
| AVAS-TMR-REQ-435822/B-Tmax\_to\_start\_audio\_generation | | | <BG> Updated the requirement for better Clarity |
| AVAS-TMR-REQ-435827/B-Tmax\_to\_stop\_audio\_generation | | | <BG> Updated the requirement for better Clarity |
| AVAS-TMR-REQ-437377/B-Tspeaker\_direction\_switch\_time | | | <BG> Updated the requirement for better Clarity |
| AVAS-SR-REQ-422327/C-Impact on AVAS audio when change in vehicle state is detected | | | <BG> Updated the requirement to reflect new requirement on TransitionDelayCfg |
| AVAS-SR-REQ-433997/C-Speaker health status handling | | | <BG> Updated speaker health status handling |
| AVAS-SR-REQ-435011/B-Pedestrian\_Fault\_St signal usage | | | <BG> Updated the requirement for better Clarity |
| AVAS-SR-REQ-422333/C-Error Handling when speaker fault is reported | | | <BG> Updated the timming requirement |
| STR-911763/C-Use Cases | | | <BG> Added new usecases for Calrity |
| AVAS-UC-REQ-506357/A-AVAS audio activation - 1 speaker system | | | <BG> Updated the case to include 1 speaker system |
| AVAS-UC-REQ-422328/C-AVAS audio activation - 2 speaker system | | | <BG> Updated the case to include 1 speaker system |
| AVAS-UC-REQ-430918/C-AVAS audio deactivation | | | <BG> Updated the usecase for better Clarity |
| AVAS-UC-REQ-437378/C-Speaker Fault detected on a Two speaker system | | | <BG> Updated the usecase for better Clarity |
| AVAS-UC-REQ-437379/B-Vehicle Gear is transitions from Front to Rear | | | <BG> Updated the usecase for better Clarity |
| AVAS-UC-REQ-484299/B-AVAS audio deactivation when vehicle speed is increased | | | <BG> Corrected the Typo |
| STR-911766/C-Sequence Diagrams | | | <BG> Added new sequence diagrams for more Clarity |
| AVAS-SD-REQ-436530/C-Vehicle event demands AVAS audio on Front speaker | | | <BG> Updated the requirement for better Clarity |
| AVAS-SD-REQ-483657/B-Vehicle event that was active on Front speaker ends | | | <BG> Updated the requirement for better Clarity |
| AVAS-SD-REQ-436531/B-Speaker Fault detected while playing AVAS audio - 1 Speaker system | | | <BG> Updated the requirement |
| AVAS-SD-REQ-436529/B-Speaker Fault detected while playing AVAS audio - 2 Speaker system | | | <BG> Updated the requirement |
| AVAS-SD-REQ-437357/B-Vehicle Gear position transitions from Forward to Reverse | | | <BG> Updated the requirement for better Clarity |
| AVAS-SD-REQ-491037/A-Vehicle Gear switched from Forward to Reverse in single speaker system | | | <BG> Added new requirement |
| AVAS-SD-REQ-496538/A-Vehicle Gear position transitioned quickly between Forward and Reverse | | | <BG> Added new requirement |
| AVAS-SD-REQ-499917/A-Vehicle Gear position transitioned from Park to Drive | | | <BG> Added new requirement |
| AVAS-SD-REQ-499957/A-Gear Position is Switched when a speaker fault is detected | | | <BG> Added new requirement |
|  |  |  | |  |
| **August 11, 2022** | **1.4** |  | | |
|  | STR-911775/B-Overview+ | | | <BG> Updated the Overview for better Clarity |
| STR-911775/C-Overview | | | <BG> Re-added AVAS calibration file details due to VSEM error |
| STR-1111670/A-Library Calibration/Configuration file usage | | | <BG> Rephrased the AVAS File Calibration details |
| STR-911782/E-Logical Signal Mapping | | | <BG> Removed Quality Factor signal usage |
| AVAS-IIR-REQ-422340/D-AVAS Event Client\_Rx | | | <BG> Removed Quality Factor signal usage |
|  | STR-911783/C-General Requirements | | | <BG> Removed Quality Factor signal usage |
|  |  |  | |  |
| **October 5, 2022** | **1.5** |  | | |
|  | PWRMAN-SR-REQ-422324/C-Power-up for AVAS audio components | | | bganesa7: Updated to add startup timing req for cold & warm boot |

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# Overview

This SPSS defines system functional and system requirement for AVAS (Approaching Vehicle Audible System) intended for electric vehicles.

Due to quiet operation on Electric Vehicles (EV), Hybrid Electric Vehicles (HEV) and Plug-in Hybrid Electric Vehicle (PHEV) at low vehicle speeds, there exists a higher risk of vehicle/pedestrian’s collisions. The purpose of the AVAS is to have the function of a ‘vehicle sounder’ to create pleasing noise to alert pedestrians of the presence of vehicles when they are nearby. AVAS should provide alerting information at least equivalent to the cues provided by internal combustion engine (ICE).

## Feature Assumptions

The AVAS Sound feature integrates the AVAS Status Client (Cluster), AVAS Event Client (APIM) and AVAS Generator Server (APIM) functionality into one Phoenix Domain Controller module and they are no longer separate modules on the CAN bus. The AVAS Status Client, AVAS Event Client functionality are separate core processors at the time this spec was written so an internal interface must still be developed. From this spec the logical signals could be used to develop signals internal to APIM PDC (ex. logical Pedestrian\_Fault\_St message between Cluster and APIM).

This specification and the requirements mentioned in this document is meant for Phoenix Domain Controller (PDC) with integrated AVAS module in FNV3 architecture. When there is separate AVAS module used outside of Phoenix Domain Controller, this below specification and requirements are no longer valid.

Note:

If the sequences diagrams reference CAN that should be ignored as the sequence diagrams should be considered at the logical level (i.e., not network dependent).

## Library Calibration/Configuration file usage

**AVAS Acoustic Calibration File – Configuration Contents per Feature**

The acoustic calibration “file” used for AVAS audio feature is unique to a specific vehicle model / trim / feature combination and is generated as part of the vehicle acoustic tuning process. It encapsulates the following configurable behaviors for each feature as follows:

**AVAS**

* Audio signal generation parameters and vehicle inputs affecting modulation.
* Perform appropriate mute/unmute behavior based on Feature Enable and Heartbeat VINs.
* Audio signal generation conditions, e.g., speed range, direction, transition delay, etc.

# Architectural Design

## AVAS-CLD-REQ-429477/A-AVAS Event Server

The AVAS Event Server is responsible to notify the change in vehicle status.

## AVAS-CLD-REQ-428397/B-AVAS Event Client

The AVAS Event Client is the master that tells the AVAS system (i.e., Generator & Source Server) when and where to play the sound. It also receives vehicle status from the AVAS Event Server and controls the AVAS sound based on the status received. The AVAS Event Client is also required to interface ‘AVAS Status Client’ to indicate the status of AVAS System.

## AVAS-CLD-REQ-422338/A-AVAS Audio Generator Server

The AVAS Sound Generator Server is responsible for controlling the AVAS sound function is also responsible to generate sound signal for respective state.

## AVAS-CLD-REQ-422339/A-AVAS Audio Source Server

The AVAS Audio Source Server is responsible for producing sound heard in the external vehicle speaker(s).

## AVAS-CLD-REQ-435101/A-AVAS Status Client

The AVAS Status Client is responsible for notifying the vehicle user with the status of the AVAS system (i.e. Capable of producing AVAS audio or not).

## Physical Mapping of Classes

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

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

|  |  |
| --- | --- |
| **Logical Class** | **Physical Module (ECU)** |
| AVAS Event Server | BCM/PCM |
| AVAS Event Client | APIM PDC CCPU |
| AVAS Audio Generator Server  aka. AVAS Internal Generator | APIM PDC CCPU |
| AVAS Status Client | APIM PDC VMCU |
| AVAS Audio Source Server | PAC/AHU |
| AVAS Audio Components | APIM, PAC/AHU |

## Logical Signal Mapping

The CAN signals mentioned throughout this document shall refer to the CAN signal’s logical name. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping. The InfoCAN database file is the master file for the actual CAN signal names. Note: There may be cases where the actual CAN signal name is used in this documentation.

|  |  |
| --- | --- |
| **Logical Name** | **CAN Signal Name** |
| VehicleSpeed\_St | Veh\_V\_ActlEng |
| Gear\_Position\_St | TrnRng\_D\_Rq |
| Speaker\_Health\_St.External\_Front | SpkrCnnctFront\_D\_Stat |
| Speaker\_Health\_St.External\_Rear | SpkrCnnctRear\_D\_Stat |
| AVAS\_Directionality\_Rq | SpkrSel\_D\_Rq |
| Ignition\_Status | Ignition\_Status |
| PwPckTq\_D\_Stat | PwPckTq\_D\_Stat |

Table: Logical name/CAN signal mapping

## AVAS-IIR-REQ-422340/D-AVAS Event Client\_Rx

### MD-REQ-367940/A-VehicleSpeed\_St

Message Type: Status

This signal is used to represent the vehicle speed.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** | |
| Type | - | - | Indicates vehicle speed. |
|  | <Range> | 0x0 – 0xFFFF | 0 to 655.35 kilometers / hour. Unit: kph Resolution:0.01 Offset:0 |

### MD-REQ-422345/A-Speaker\_Health\_St.External\_Front

Message Type: Status

Method sent from the AVAS Audio Source Server to indicate AVAS external Front speaker status

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Speaker\_Health\_St.External\_Front | - | - | External Front speaker status. |
| Null/Inactive | 0x0 |
| Normal Operation | 0x1 |
| Faulted/No audio | 0x2 |
| Not Used | 0x3 |

### MD-REQ-440297/A-Speaker\_Health\_St.External\_Rear

Message Type: Status

Method sent from the AVAS Audio Source Server to indicate AVAS external Rear speaker status.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Speaker\_Health\_St.External\_Rear | Null/Inactive | 0x0 | External Rear speaker status. |
| Normal Operation | 0x1 |
| Faulted/No audio | 0x2 |
| Not Used | 0x3 |

### MD-REQ-273747/A-PwPckTq\_D\_Stat

**Message Type**: Status

Signal sent to the Infotainment System indicating the engine torque status

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| PwPckTq\_D\_Stat | Off Tq Not Available | 0x0 |  |
| On Tq Not Available | 0x1 |  |
| Strt In Prg No Tq | 0x2 |  |
| On Tq Available | 0x3 |  |

### MD-REQ-273750/A-Ignition\_Status

**Message Type**: Status

Signal sent to the infotainment system indicating the ignition status of the vehicle

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Ignition\_Status | Unknown | 0x0 |  |
| OFF | 0x1 |  |
| Accessory | 0x2 |  |
| Run | 0x4 |  |
| Start | 0x8 |  |
| Invalid | 0xF |  |

### MD-REQ-487737/A-Gear\_Position\_St

Message Type: Status

This signal is used to indicate the Gear Lever Position.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| Gear\_Position\_St | - | - |  |
| Park | 0x0 |  |
| Reverse | 0x1 |  |
| Neutral | 0x2 |  |
| Drive | 0x3 |  |
| Sport\_DriveSport\_Mposition | 0x4 |  |
| Low | 0x5 |  |
| Range1\_M1\_L1 | 0x6 | Gear 1 |
| Range2\_M2\_L2 | 0x7 | Gear 2 |
| Range3\_M3\_L3 | 0x8 | Gear 3 |
| Range4 | 0x9 | Gear 4 |
| Range5 | 0xA | Gear 5 |
| Range6 | 0xB | Gear 6 |
| NotUsed\_1 | 0xC |  |
| NotUsed\_2 | 0xD |  |
| UnknownPosition | 0xE |  |
| Fault | 0xF |  |

## AVAS-IIR-REQ-422343/A-AVAS Event Client\_Tx

### MD-REQ-422344/A-AVAS\_Directionality\_Rq

Message Type: Request

Request from the AVAS Audio Generator Server to play AVAS Audio in the specified speaker directionality.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| AVAS\_Directionality\_Rq | - | - | AVAS speaker directionality |
| OFF / Inactive | 0x0 |
| External\_All | 0x1 |
| External\_Front | 0x2 |
| External\_Rear | 0x3 |

### MD-REQ-425234/A-Pedestrian\_Fault\_St

Message Type: Status

This signal is used by the AVAS Event Client to report the status of pedestrian alert fault status to the AVAS Status Client

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| Pedestrian\_Fault\_St | - | - |  |
| Normal | 0x0 |
| Faulted | 0x1 |

# General Requirements

## AVAS-SR-REQ-429678/A-AVAS Feature Configuration

The Infotainment system shall have a configurable parameter/DID to configure the AVAS feature as below

|  |  |  |
| --- | --- | --- |
| **Configure Parameter** | **Value** | **Description** |
| AVAS | Enable | When enabled, all the functionality and signals defined in this SPSS shall be supported |
| Disable | When disabled, AVAS functionality shall not be available, and the functionality defined in this SPSS shall not be supported. |
| AVAS Configuration Type | Internal | When Internal AVAS is enabled, it means AVAS module is integrated with the PDC module, and all the functionality and signals defined in this SPSS shall be supported. |
| External | When External AVAS is enabled, it means external AVAS module is present in the vehicle and so the functionality defined in this SPSS shall not be applicable. |
| Number of AVAS Speakers | 0 | One external AVAS speaker |
| 1 | Two external AVAS speaker |
| TransitionDelayCfg | <Range> | Delay in msec before transitioning from playing sound in the front speaker to playing sound in the rear speaker and vice versa. |

Note: Refer to the Infotainment Diagnostic Specification for the details on the configuration.

## AVAS-SR-REQ-422334/A-Missing message DTC

When AVAS Event Client loses communication for more than 5 seconds for any of the signals listed below AVAS Event Client shall set ‘lost Communication’ DTC. The AVAS Event Client shall stop all AVAS sound generation (if any) and the feature shall remain disabled for the same ignition cycle. AVAS Event Client shall also set the ‘AVAS\_Directionality\_Rq=Inactive’. The AVAS Event Client shall also set ‘lost Communication’ DTC.

1. Gear\_Position\_St
2. PwPckTq\_D\_Stat
3. Ignition\_Status
4. Veh\_V\_ActlEng
5. ‘Speaker\_Health\_St. External\_Front’
6. ‘Speaker\_Health\_St. External\_Rear’

Note: Refer IDS for more details on ‘lost communication’ DTC.

## AVAS-SR-REQ-487757/A-Information DID

The AVAS Event Client shall update the status of AVAS Audio Components on an informational DID as follows

* Not initialized/Not Ready
* Normal/Not Faulted/ready to Produce audio
* Temporarily disabled/ Cannot produce audio
* Faulted /disabled/Muted.

Note: Refer to IDS specification for details on this DID.

## AVAS-SR-REQ-504357/A-Calibration & Configuration Support

The AVAS Event Client shall support calibration/configuration, to fine tune the operation. When the calibration/configuration are not available then the AVAS Event Client shall support to log appropriate DTC and disable the AVAS feature.

Note: Refer IDS specification for more detail on the DTC.

According to GBT 37153-2018 AVAS, it is optional for the manufacturer to configure the pause switch or not；Can provide a variety of sound options, Comply with national standard requirements.

CDC Config\_phase6：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DE block | Byte | Start bit | Length | Definition | Coding |
| DE05 | 17 | 6 | 1 | AVAS | 0x0: Disabled  0x1: Enabled |
| DE05 | 17 | 5 | 1 | Number of AVAS Speakers | 0x0: One Speaker  0x1: Two Speaker |
| DE05 | 19 | 7 | 3 | AVAS sound | 0x0: Disabled  0x1: 2 Sounds  0x2: 3 Sounds  0x3: 4 Sounds  0x4 5 Sounds |

### AVAS DTC: DTC F00093 - ANC/EVSE/AVAS Initialization Fault

Fault indicates failure to initialize NVH Service. This includes:

* Failure to initialize dependent software components.
* Failure to load acoustic calibration.
* Failure to initialize DSP framework or library communication.

Detailed cause can be determined by reading can log.

The ANC/EVSE/AVAS feature will be non-functional/muted when this fault is active.

DTC F00093  Fault Type

* Byte1/bit7 - AVAS initialization failure
* Byte1/bit6- AVAS AVAS internal operation error
* Byte2/bit7 – EVSE EVSE initialization failure
* Byte2/bit6 – EVSE EVSE internal operation error

AVAS speaker 4 fault codes

* AVAS Speaker Generic Electrical Failure 928A01 B128A-01
* AVAS Speaker Circuit Short To Ground 928A11 B128A-11
* AVAS Speaker Circuit Short to Battery 928A12 B128A-12
* AVAS Speaker Circuit Open 928A13 B128A-13

P/N: 14J124 DID F17D

# Functional Definition

## PWRMAN-FUN-REQ-422330/A-AVAS Power Mode

### Requirements

#### Physical Mapping of Classes

The table below shows how the logical classes may be mapped to physical modules for the AVAS power moding feature. The table below covers the lead program.

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

|  |  |
| --- | --- |
| **Logical Class** | **Physical Module (ECU)** |
| AVAS Internal Generator | APIM |
| AVAS Audio Source Server | PAC/AHU |
| AVAS Audio Components | APIM, PAC/AHU |

#### PWRMAN-SR-REQ-473678/A-AVAS power mode state definitions

AVAS Sleep:

AVAS Sleep State is defined as the state where the CAN bus is asleep and AVAS functionality is powered down.

AVAS Standby:

AVAS Standby State is defined as the state where the CAN bus is active but AVAS functionality is not active and is powered down if possible.

* Note this can be a low power state if the AVAS Audio Source Server is not powered up for other non-AVAS features.

AVAS Functional:

AVAS Functional State is defined as the state where the CAN bus is active and AVAS functionality is powered up (including any external amps and speakers to support AVAS).

#### PWRMAN-SR-REQ-422324/C-Power-up for AVAS audio components

AVAS Audio Components shall transition from AVAS Standby/Sleep state to AVAS Functional state within 2 seconds of the Ignition\_Status signal transitioning to Run.

* When the Ignition\_Status signal changes to Start/Crank it will not cause a change in the current power mode system state (ex won’t exit AVAS functional mode) unless specifically noted elsewhere.
* For the AVAS Internal Generator if the 2 second start-up time not possible then predictive triggers shall be used to improve start-up times to help improve the start-up time. Reference APIM requirement “PWRMAN-REQ-3324997-Predictive Triggers – APIM” for more details.
* The AVAS Audio Generator shall be capable of producing AVAS audio within 5 seconds of ‘Ignition\_Status’ transition ‘OFF-> RUN’ coming out of a cold boot (i.e., not coming out of suspend to RAM). AVAS Functional state transition from suspend to RAM shall still happen within 2.0 seconds.
* Note: from sleep state this 2 second requirement to AVAS Functional starts at T0 on requirement PWRMAN-REQ-014475-Power Mode transitions Timing Table” if the CAN bus is asleep.

When in AVAS Functional state the AVAS audio components shall be able to generate and play AVAS audio through infotainment external speakers. The AVAS components responsible for AVAS audio shall be capable of producing audio regardless of the following signal states:

* LifeCycMde\_D\_Actl signal whether set to Normal, Transport or Factory shall have no impact to AVAS power moding of AVAS audio components. This signal is a don’t care for AVAS power moding.
* HMIAudioMode/HMI\_HMIMode\_St signal whether set to OFF, ON or Load Shed shall have no impact to AVAS power moding of AVAS audio components. This signal is a don’t care for AVAS power moding
* Power\_Up\_Chime\_Module signal whether set to Active or Inactive shall have no impact to AVAS power moding of AVAS audio components. This signal is a don’t care for AVAS power moding.

Only when the AVAS audio components DE bits are configured as enabled then the AVAS Audio Generator Server, AVAS Audio Source Server shall support the requirements covered in this spec (refer IDS spec for details of DE bits).

#### PWRMAN-SR-REQ-435883/B-Power down for AVAS audio components

When the Ignition\_Status signal is not equal to Run or Start (ex OFF or Accesssory) then the AVAS Audio Components shall transition to AVAS Standby state (or Sleep if the CAN bus is not active).

When the Ignition\_Status signal is not equal to Run or Start (ex OFF or Accesssory) AVAS audio components shall not be active, the AVAS audio components shall stop playing the AVAS audio (if active earlier) and shall support to gracefully mute the speaker audio channels within 150ms so that no audio blips or pops heard.

* To support the 150 msec gracefully mute the AVAS Audio Components shall wait 200 msec from Ignition\_Status going from RUN/Start 🡪 OFF/Accessory before powering down AVAS functionality to give the AVAS audio components time to mute.

#### PWRMAN-STM-REQ-473590/A-AVAS Power Mode state diagram - AVAS Audio Components



## AVAS-FUN-REQ-422323/A-AVAS Audio Activation

### Requirements

#### AVAS-SR-REQ-435477/A-Speaker health status availability before generation

On system start up, the AVAS Event client shall support to generate AVAS audio only when it receives the speaker status from AVAS Audio Source Server on ‘Speaker\_Health\_St.External\_Front=Normal Operation’ and/or ‘Speaker\_Health\_St.External\_Rear=Normal Operation’ (based on the number of speaker configuration).

#### AVAS-SR-REQ-422326/A-Timing for single AVAS Event Client and AVAS Audio Generator Server module

When AVAS Event Client and AVAS Audio Generator Server are in the same module then the AVAS Audio Generator Server shall start producing AVAS audio signal within ‘Tmax\_to\_start\_audio\_generation’ of detecting change in vehicle state.

#### AVAS-SR-REQ-422325/C-Summary of AVAS audio generation triggers

The AVAS Event Client shall support to produce AVAS audio only when

1. **‘**Ignition\_Status= RUN‘.
2. ‘PwPckTq\_D\_Stat= PwPckOn\_TqAvailable’.
3. ‘Vehicle speed <= Max\_Speed\_Sound\_Cfg‘ and when any of the below condition is satisfied.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Use Case | ‘Gear\_Position\_St’ Signal state | AVAS Audio Components action | ‘AVAS\_Directionality\_Rq’ signal usage | |
| Single Speaker Config | Two Speaker Config |
| Case 1 | Is in ‘Fault/Unknown’ | Not Allowed  (Shall stop ongoing sounding if any immediately). | Inactive | Inactive |
| Case 2 | Is in ‘Park’ | Not Allowed  (Shall stop ongoing sounding if any immediately). | Inactive | Inactive |
| Case 3 | Is in ‘Reverse’ | Allowed to generate  AVAS Sounder for reverse position. | External Front | External Rear |
| Case 4 | Is in ‘Neutral | Allowed to generate  AVAS Sounder for Drive position. | External Front | External Front |
| Case 5 | Is in ‘Drive/Low/Sport//Gear 1 to 6’ | Allowed to generate  AVAS Sounder for Front position. | External Front | External Front |

Note1: AVAS Event Client shall support to read the allowed vehicle speed limit configuration on ‘Max\_Speed\_Sound\_Cfg’. Based on the configuration the AVAS Event Client shall support to alter its allowed vehicle speed limit algorithm.

#### AVAS-SR-REQ-430917/C-AVAS sound state assignment

|  |  |
| --- | --- |
| AVAS Sound state | AVAS audio type |
| 0x0 | Stop AVAS Sounding (if any). |
| 0x1 | AVAS Sounder for Reverse position. |
| 0x2 | AVAS Sounder for Forward position. |

Note: Sound state usage between ‘AVAS Event Client’ and ‘AVAS Generator Server’ is used to tell when to play sound and which sound to play. The above table is just for reference and not necessary the implementation shall follow this.

#### AVAS-TMR-REQ-435822/B-Tmax\_to\_start\_audio\_generation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Description** | **Units** | **Range** | **Resolution** | **Default** |
| Tmax\_to\_start\_audio\_generation | Maximum time for the AVAS Event Client and the AVAS Audio Generator Server to generate AVAS audio signal on the line.  Note: Use default value. | msec | 0-300 |  | 70 |

#### AVAS-TMR-REQ-435827/B-Tmax\_to\_stop\_audio\_generation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Description** | **Units** | **Range** | **Resolution** | **Default** |
| Tmax\_to\_stop\_audio\_generation | Maximum time for the AVAS Event Client and the AVAS Audio Generator Server to stop the ongoing AVAS audio generation signal on the line.  Note: Use default value. | msec | 0-300 |  | 70 |

#### AVAS-TMR-REQ-437377/B-Tspeaker\_direction\_switch\_time

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Description** | **Units** | **Range** | **Resolution** | **Default** |
| Tspeaker\_direction\_switch\_time | Maximum allowed time for the AVAS Audio Source Server to switch the speaker directionality and be readily available to route the audio so that no audio pops or blips is heard.  Note: Use default value. | msec | 0-200 |  | 50 |

#### AVAS-SR-REQ-422327/C-Impact on AVAS audio when change in vehicle state is detected

When the AVAS Components is not playing any AVAS audio and the change in vehicle state demands a new ‘sound state’ and new Speaker Directionality, then

1. The AVAS Event Client shall request the ‘AVAS Generator Server’ with appropriate ‘sound state’ information.
2. The AVAS Event Client shall load ‘AVAS\_Directionality\_Rq=Inactive-> new directionality’ and shall request ‘AVAS Audio Source Server’ to switch the speaker.
3. Upon speaker selection, the AVAS Event Client shall wait for ‘Tspeaker\_direction\_switch\_time’ before requesting the ‘AVAS Audio Generator Server’ to generate new AVAS audio within ‘Tmax\_to\_start\_audio\_generation’.

When the AVAS Components is playing AVAS audio and the change in vehicle state demands a new ‘Sound state’ and new Speaker Directionality, then

1. The AVAS Event Client shall request the ‘AVAS Generator Server’ with appropriate ‘sound state’ information to stop the current active AVAS audio within ‘Tmax\_to\_stop\_audio\_generation’. At the same time, the AVAS Event Client shall start the timer for ‘TransitionDelayCfg’ time.
   1. When the timer expires and the new vehicle gear position remains unchanged, the AVAS Event Client shall load ‘AVAS\_Directionality\_Rq=previous directionality -> new directionality’ and shall request ‘AVAS Audio Source Server’ to switch the speaker.
2. Upon speaker selection, the AVAS Event Client shall wait for ‘Tspeaker\_direction\_switch\_time’ before requesting the ‘AVAS Audio Generator Server’ to generate new AVAS audio within ‘Tmax\_to\_start\_audio\_generation’.

When the change in vehicle state demands new ‘Sound state’ but on the same Speaker Directionality,

1. The AVAS Event Client shall request the ‘AVAS Generator Server’ with appropriate ‘sound state’ information to stop the current active AVAS audio within ‘Tmax\_to\_stop\_audio\_generation’.
2. Once the current audio is stopped, the ‘AVAS Audio Generator Server’ shall generate new AVAS Audio within ‘Tmax\_to\_start\_audio\_generation’.

When the change in vehicle state demands to stop the ongoing AVAS audio

1. The AVAS Event Client shall request the ‘AVAS Generator Server’ with appropriate ‘sound state’ information to stop the current active AVAS audio within ‘Tmax\_to\_stop\_audio\_generation’.
2. The AVAS Event Client shall load

‘AVAS\_Directionality\_Rq=previous directionality -> Inactive’ and shall request ‘AVAS Audio Source Server’ to switch the speaker.

#### AVAS-SR-REQ-429677/A-Speaker directionality signal usage based on speaker configuration

Based on the configuration the AVAS Event Client shall support to request the ‘AVAS Audio Source Server’ with the directionality information on ’AVAS\_Directionality\_Rq‘ signal. The value on the signal shall remain unchanged unless until the AVAS audio need to be interrupted (or) stopped by AVAS Event Client. AVAS Audio Source Server shall route the audio to the respective external speakers depending upon the speaker directionality received on ‘AVAS\_Directionality\_Rq’.

When the speaker directionality is switched from ‘External Front’ to ‘External Rear’ or vice versa, then the ‘AVAS Audio Source Server’ shall support to switch the audio routing to respective speaker within Tspeaker\_direction\_switch\_time.

For a Single speaker configuration:

1. When the ‘AVAS\_Directionality\_Rq = External Front’, the AVAS Source Server shall support to route the audio through external Front speaker (if available).
2. When the ‘‘AVAS\_Directionality\_Rq = External Rear/External All’, the AVAS Source server shall treat it as ‘Inactive’.

For a Two speaker configuration:

1. When the ‘AVAS\_Directionality\_Rq = External Front’, the AVAS Source Server shall support to route the audio through external Front speaker.
2. When the ‘AVAS\_Directionality\_Rq = External Rear’, the AVAS Source Server shall support to route the audio through external Rear speaker.
3. When the ‘AVAS\_Directionality\_Rq = External All’, the AVAS Source Server shall treat it as ‘Inactive’.

Refer Infotainment Diagnostics Specification for AVAS speaker configuration.

#### AVAS-SR-REQ-433997/C-Speaker health status handling

The AVAS Source Server shall report the speaker health on ‘Speaker\_Health\_St.External\_Front’ or ‘Speaker\_Health\_St.External\_Rear’ signal respectively

1. When the AVAS Source Server is capable to produce audio through the respective vehicle speaker(s) then the AVAS Source Server shall set the corresponding signal to ‘Normal Operation’ and shall remain unchanged unless until noted in this spec.
2. When the AVAS Source Server is not capable to produce audio through the respective vehicle speaker(s) then the AVAS Source Server shall set the corresponding speaker status to ‘No Audio’ within 50 ms and shall remain unchanged for the same ignition cycle.

When the AVAS Event Client did not receive the speaker health status for 5sec when the vehicle power state is switched from OFF-> RUN, then the AVAS Event client shall treat the signal status 'Inactive' same as 'No Audio'. The AVAS Event Client shall also assume AVAS audio generation through that speaker is not available for the entire ignition cycle. When both the speaker’s status is received as ‘No audio’ then the feature shall be disabled for the same ignition cycle.

For a Single speaker configuration, the AVAS Source Server shall report the status of the Rear speakers as ‘Speaker\_Health\_St.External\_Rear=Inactive’ always.

Note:

Example speaker fault conditions (while not limited to these)

1) Short/open circuit to any of the AVAS speakers.

2) low voltage preventing the AVAS Source Server from producing audio (not applicable to crank but if stuck at a low voltage).

3) A2B link error / A2B loss of communication (see A2B SPSS for details).

#### AVAS-SR-REQ-433995/A-Support to play concurrent media and AVAS audio

The AVAS Source Server shall be capable of playing AVAS audio on the external speaker independent of media audio played on the vehicle interior speakers. The exterior AVAS audio levels shall not be affected by the interior volume levels and audio settings.

#### AVAS-SR-REQ-435011/B-Pedestrian\_Fault\_St signal usage

The AVAS Event Client shall report if the AVAS components is capable to sound the audio on the vehicle speakers on the ‘Pedestrian\_Fault\_St’ signal. When AVAS Event Client is not able play AVAS audio through any of the AVAS speaker, then it shall log a DTC.

In a One speaker Configuration:

1. When the AVAS components is **not available** to generate and play AVAS audio on the available speaker, then the ‘AVAS Event Client’ shall send ‘Pedestrian\_Fault\_St=Faulted’.
2. When the AVAS components **is available** to generate and play AVAS audio on any of the available speaker(s), then the ‘AVAS Event Client’ shall send ‘Pedestrian\_Fault\_St=Normal’.

In a two speaker Configuration:

1. When the AVAS components is **not available** to generate and play AVAS audio on any of the available speaker(s), then the ‘AVAS Event Client’ shall send ‘Pedestrian\_Fault\_St=Faulted’.
2. When the AVAS components **is available** to generate and play AVAS audio on both of the speaker(s), then the ‘AVAS Event Client’ shall send ‘Pedestrian\_Fault\_St=Normal’.

Note: Refer IDS specification for more details on the DTC.

#### AVAS-SR-REQ-422333/C-Error Handling when speaker fault is reported

AVAS Event Client shall support to check the speaker status reported by ‘AVAS Audio Source Server’ on ‘Speaker\_Health\_St.External\_Front’ or ‘Speaker\_Health\_St.External\_Rear’ signal. On the same ignition cycle when any of the speaker is reported as faulty, then the AVAS Event Client shall support to switch the active audio to the next available speaker immediately and shall assume the next available speaker is the only speaker for any future request in the same ignition cycle.

In a One speaker Configuration:

When the AVAS Event Client is actively generating AVAS audio and when the speaker status of corresponding speaker is received as (ex. ‘Speaker\_Health\_St.External\_Front=Faulted’, then on the same ignition cycle

1. The AVAS Event Client shall request the ‘AVAS Audio Generator Server’ to stop the ongoing AVAS audio generation within Tmax\_to\_stop\_audio\_generation msec.
2. Once the audio generation is stopped, the AVAS Event Client shall also request the ‘AVAS Audio Source Server’ with the speaker directionality on ’AVAS\_Directionality\_Rq’ signal as ‘Inactive’ (i.e., Previous Directionality -> Inactive).

In a two speaker Configuration:

When the AVAS Event Client is actively generating AVAS audio and when the speaker status of corresponding speaker is received as (ex. ‘Speaker\_Health\_St.External\_Front=Faulted’, then on the same ignition cycle

1. The AVAS Event Client shall request the ‘AVAS Audio Generator Server’ to stop the ongoing AVAS audio generation within Tmax\_to\_stop\_audio\_generation msec. At the same time, the AVAS Event Client shall start the timer for ‘TransitionDelayCfg’ time.
   1. At the expiry of the timer, the AVAS Event Client shall request the ‘AVAS Audio Source Server’ with the new speaker directionality on ’AVAS\_Directionality\_Rq’ signal as (i.e., Previous Directionality -> New directionality).
   2. Once the new speaker directionality is sent, the AVAS Event Client shall wait Tspeaker\_direction\_switch\_time before it requests the ‘AVAS Audio Generator Server’ to start AVAS audio generation within Tmax\_to\_start\_audio\_generation.
2. When both the speakers are Faulted, then the AVAS Event Client shall stop all the AVAS sound generation within ‘Tmax\_to\_stop\_audio\_generation’ (if there is any) and shall set the speaker directionality to ‘AVAS\_Directionality\_Rq= Inactive’ and shall remain unchanged for entire ignition cycle.

Note: Depending upon the speaker fault detected, the AVAS Event Client shall set the ‘Pedestrian\_Fault\_St’ as mentioned in the ‘AVAS-SR-REQ-435011’.

### Use Cases

#### AVAS-UC-REQ-506357/A-AVAS audio activation - 1 speaker system

|  |  |
| --- | --- |
| **Actors** | AVAS User |
| **Pre-conditions** | * Vehicle Ignition is OFF * AVAS audio is not active in the vehicle. * Vehicle gear is in Park state. * Vehicle Torque Status is not available. * ‘Speaker\_Health\_St.External\_Front’ status is received as ‘Inactive’ * Vehicle is equipped with 1 speaker system. |
| **Scenario Description** | * Vehicle ignition is transitioned to RUN. * Vehicle Torque status is PwPckOn\_TqAvailable. * Vehicle gear is switched to ‘Drive/Low/Sport/Reverse’ position. * Vehicle speed is less than the allowed limit (i.e., Max\_Speed\_Sound\_Cfg). * ‘Speaker\_Health\_St.External\_Front’ status is received as ‘Normal’ |
| **Post-conditions** | * AVAS Audio is sounded on the vehicle exterior Front speaker. * AVAS Status Client is notified with the status of AVAS system as Pedestrian\_Fault\_St(Normal). |
| **List of Exception Use Cases** | * Speaker fault is detected by the AVAS Audio Source Server. |
| **Notes** |  |
| **Interfaces** | AVAS Event Client, AVAS Audio Generator Server, AVAS Audio Source Server, AVAS Status Client |

#### AVAS-UC-REQ-422328/C-AVAS audio activation - 2 speaker system

|  |  |
| --- | --- |
| **Actors** | AVAS User |
| **Pre-conditions** | * Vehicle Ignition is OFF * AVAS audio is not active in the vehicle. * Vehicle gear is in Park state. * Vehicle Torque Status is not available. * ‘Speaker\_Health\_St.External\_Front’ and ‘Speaker\_Health\_St.External\_Rear’ status is received as ‘Inactive’ * Vehicle is equipped with 2 speaker system. |
| **Scenario Description** | * Vehicle ignition is transitioned to RUN. * Vehicle Torque status is PwPckOn\_TqAvailable. * Vehicle gear is switched to ‘Drive/Low/Sport’ position. * Vehicle speed is less than the allowed limit (i.e., Max\_Speed\_Sound\_Cfg). * ‘Speaker\_Health\_St.External\_Front’ and ‘Speaker\_Health\_St.External\_Rear’ status is received as ‘Normal’ |
| **Post-conditions** | * AVAS Audio is sounded on the vehicle exterior Front speaker. * AVAS Status Client is notified with the status of AVAS system as Pedestrian\_Fault\_St(Normal). |
| **List of Exception Use Cases** | * Speaker fault is detected by the AVAS Audio Source Server. |
| **Notes** | * For a 2 speaker system, the above use case is also applicable when the Gear position is shifted to ‘ Neutral/Gear 1 to 6’ then the AVAS audio is sounded on exterior Front speaker. * For a 2 speaker system, the above use case is also applicable when the Gear position is shifted to ‘Reverse’ then the AVAS audio is sounded on exterior Rear speaker. |
| **Interfaces** | AVAS Event Client, AVAS Audio Generator Server, AVAS Audio Source Server, AVAS Status Client |

#### AVAS-UC-REQ-430918/C-AVAS audio deactivation

|  |  |
| --- | --- |
| **Actors** | AVAS User |
| **Pre-conditions** | * Vehicle Ignition is RUN * AVAS audio is active in the vehicle. * Vehicle gear is not in Park state. * Vehicle speed is less than the allowed limit (i.e., Max\_Speed\_Sound\_Cfg). * AVAS Status Client is notified with the status of AVAS system as Pedestrian\_Fault\_St(Normal) |
| **Scenario Description** | * Vehicle gear is switched to ‘Park’ position. |
| **Post-conditions** | * The actively generated AVAS audio shall be stopped. |
| **List of Exception Use Cases** | * Speaker fault is detected by the AVAS Audio Source Server. |
| **Notes** | * The above use case is applicable to both 2 speaker and 1 speaker system. |
| **Interfaces** | AVAS Event Client, AVAS Audio Generator Server, AVAS Audio Source Server, AVAS Status Client |

#### AVAS-UC-REQ-422335/B-Speaker Fault detected on a Single speaker system

|  |  |
| --- | --- |
| **Actors** | AVAS User |
| **Pre-conditions** | * Vehicle Ignition is RUN. * AVAS system is configured for Single speaker system. * AVAS audio is active in the external Front vehicle. |
| **Scenario Description** | * Speaker fault is detected by AVAS Audio Source Server. * Speaker Fault is reported on the signal Speaker\_Health\_St.External\_Front=Faulted |
| **Post-conditions** | * The actively generated AVAS audio on the Front speaker is stopped playing. * The AVAS audio shall remain unavailable for the same ignition cycle. * AVAS Status Client is notified with the status of AVAS system as Pedestrian\_Fault\_St(Faulted) |
| **List of Exception Use Cases** |  |
| **Interfaces** | AVAS Event Client, AVAS Audio Generator Server, AVAS Audio Source Server, AVAS Status Client |

#### AVAS-UC-REQ-437378/C-Speaker Fault detected on a Two speaker system

|  |  |
| --- | --- |
| **Actors** | AVAS User |
| **Pre-conditions** | * Vehicle Ignition is RUN. * AVAS system is configured for Two speaker system. * AVAS audio is active in the external Front vehicle. * No Speaker Fault is detected on External Speakers. |
| **Scenario Description** | * Front Speaker fault is detected by AVAS Audio Source Server. * Speaker Fault is reported on the signal Speaker\_Health\_St.External\_Front=Faulted |
| **Post-conditions** | * When the ‘TransitionDelayCfg’ timer is elapsed,the actively generated AVAS audio is switched from External Front to External Rear speaker. * The AVAS Event Client shall notify AVAS Status Client with the status of AVAS system as ‘Pedestrian\_Fault\_St(Faulted)’. * The AVAS audio shall not be available on the external Front speakers for the same ignition cycle. |
| **List of Exception Use Cases** | * When both the speakers are Faulted as reported by AVAS Audio Source Server on ‘Speaker\_Health\_St.External\_Front=Faulted’ & ‘Speaker\_Health\_St.External\_Rear=Faulted’, the AVAS audio shall not be available on both external speakers for the same ignition cycle. |
| **Notes** | * The above use case is also applicable when the External rear speaker is Faulted, the AVAS audio switches from ‘External Rear -> External Front’ and remain in ‘External Front’ for the entire ignition cycle. |
| **Interfaces** | AVAS Event Client, AVAS Audio Generator Server, AVAS Audio Source Server, AVAS Status Client |

#### AVAS-UC-REQ-437379/B-Vehicle Gear is transitions from Front to Rear

|  |  |
| --- | --- |
| **Actors** | AVAS User |
| **Pre-conditions** | * Vehicle Ignition is RUN. * AVAS system is configured for Two speaker system. * AVAS audio is active in the external Front vehicle. |
| **Scenario Description** | * Vehicle Gear is shifted from Front to Rear. |
| **Post-conditions** | * The actively generated AVAS audio shall be stopped on Front speaker. * When the ‘TransitionDelayCfg’ timer is elapsed, the new AVAS audio shall played on Rear speaker |
| **List of Exception Use Cases** | * When both the speakers are Faulted as reported by ‘AVAS Audio Source Server’, the AVAS Event Client shall notify the AVAS Status Client with the status of AVAS system as Pedestrian\_Fault\_St(Faulted) |
| **Interfaces** | AVAS Event Client, AVAS Audio Generator Server, AVAS Audio Source Server, AVAS Status Client |

#### AVAS-UC-REQ-484299/B-AVAS audio deactivation when vehicle speed is increased

|  |  |
| --- | --- |
| **Actors** | AVAS User |
| **Pre-conditions** | * Vehicle Ignition is RUN * AVAS audio is active in the vehicle. * Vehicle gear is not in Park state. * Vehicle speed is less than the allowed limit (i.e., Max\_Speed\_Sound\_Cfg). * AVAS Status Client is notified with the status of AVAS system as Pedestrian\_Fault\_St(Normal) |
| **Scenario Description** | * Vehicle speed is greater than the configured limit. |
| **Post-conditions** | * The actively generated AVAS audio shall be stopped by the AVAS Event Client within Tmax\_to\_stop\_audio\_generation. * The ‘AVAS\_Directionality\_Rq’ signal value from AVAS Event Client shall remain unchanged. * When the vehicle speed falls below the configured limit, the AVAS audio shall be started by the AVAS Audio Components within Tmax\_to\_start\_audio\_generation. |
| **List of Exception Use Cases** | * Speaker fault is detected by the AVAS Audio Source Server. |
| **Interfaces** | AVAS Event Client, AVAS Audio Generator Server, AVAS Audio Source Server, AVAS Status Client |

### White Box View

#### Activity Diagrams

##### AVAS-ACT-REQ-422321/A-AVAS audio activation handling



#### Sequence Diagrams

##### AVAS-SD-REQ-436530/C-Vehicle event demands AVAS audio on Front speaker

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for either 1 (or) 2 speaker system.
3. No Speaker Faults are detected on both the speakers.

Scenario

1. Vehicle gear is switched to Forward position.

Post-condition

1. When the change in vehicle state is detected, the AVAS System shall play the AVAS audio on Front speaker.

Sequence Diagram



##### AVAS-SD-REQ-483657/C-Vehicle event that was active on Front speaker ends

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 1 (or) 2 speaker system.
3. Vehicle level AVAS event is active and playing AVAS audio on the Front speaker.

Scenario

1. Gear position is switched to Park

Post-condition

1. When the gear is transitioned to Park, the AVAS Audio on the Front speaker shall be stopped.

Sequence Diagram



##### AVAS-SD-REQ-436531/B-Speaker Fault detected while playing AVAS audio - 1 Speaker system

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 1 speaker AVAS System.
3. No Speaker Faults are detected.
4. Vehicle level AVAS event occurs and demands a AVAS sound on the Front speakers.

Scenario

1. While sounding on the Front speaker, speaker fault is detected on the Front speaker by the AVAS Sound Source Server and the same is notified on the signal ‘AVAS\_Speaker\_Health\_St(External\_Front= Faulted)’

Post-condition

1. When the Speaker fault is detected then the AVAS System shall stop sounding the AVAS audio on the Front speaker.
2. The AVAS Event Client shall update the AVAS Status Client with the status of AVAS audio generation on ‘Pedestrian\_Fault\_St(Faulted)’.

Sequence Diagram



##### AVAS-SD-REQ-436529/B-Speaker Fault detected while playing AVAS audio - 2 Speaker system

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 2 speaker AVAS System.
3. No Speaker Faults are detected.
4. Vehicle level AVAS event occurs and demands a AVAS sound on the Front speakers.

Scenario

1. While sounding on the Front speaker, speaker fault is detected on Front speaker by AVAS Audio Source Server and the same is notified on the signal ‘AVAS\_Speaker\_Health\_St(External\_Front= Faulted)’

Post-condition

1. When the Speaker fault is detected then the AVAS System shall stop sounding the AVAS audio on Front speaker and shall switch the current AVAS audio generation to the next available Rear Speaker.
2. When the Rear speaker is also Faulted, then AVAS system shall stop the AVAS audio.
3. When External Rear and/or Front speaker is faulted, the AVAS System shall notify ‘Pedestrian\_Fault\_St(Faulted)’.

Sequence Diagram



##### AVAS-SD-REQ-437357/B-Vehicle Gear position transitions from Forward to Reverse

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 2 speaker AVAS System.
3. No Speaker Faults are detected.
4. Vehicle level AVAS event is active on the Front speakers and the audio is played on the Front speaker.

Scenario

1. Vehicle Gear is transitioned from Forward to Reverse Gear.

Post-condition

1. When the gear is transitioned from Forward to reverse, the AVAS Audio on the external Front speaker shall be stopped, and the AVAS audio shall be switched to external Rear speaker.

Sequence Diagram



##### AVAS-SD-REQ-491037/A-Vehicle Gear switched from Forward to Reverse in single speaker system

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 1 speaker AVAS System.
3. No Speaker Faults are detected.
4. Vehicle level AVAS event is active on the Front speakers and the audio is played on the Front speaker.

Scenario

1. Vehicle Gear is transitioned from Forward to Reverse Gear.

Post-condition

1. When the gear transition from Forward to Reverse, the AVAS Audio for Forward gear shall be stopped and the AVAS audio for Reverse shall be played on the Front speaker.

Sequence Diagram



##### AVAS-SD-REQ-496538/A-Vehicle Gear position transitioned quickly between Forward and Reverse

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 2 speaker AVAS System.
3. No Speaker Faults are detected.
4. Vehicle level AVAS event is active on the Front speakers and the audio is played on the Front speaker.

Scenario

1. When the gear transition from Forward to Reverse is detected the current active AVAS Audio on the Front speaker.

Post-condition

1. When the gear transition from Forward to Reverse is detected the current active AVAS Audio on the Front speaker shall be stopped.
2. While the current Forward AVAS audio is being stopped and when a new gear change is detected (i.e., Forward -> Reverse -> Forward) then the AVAS system shall stop the last active Forward AVAS audio and then start playing the new AVAS Audio (Forward Gear audio again).

Sequence Diagram



##### AVAS-SD-REQ-499917/A-Vehicle Gear position transitioned from Park to Drive

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 2 speaker AVAS System.
3. No Speaker Faults are detected.
4. Vehicle is in Park state and No AVAS Audio is played on the vehicle speaker.

Scenario

1. Vehicle Gear is transitioned from Park to Drive (Reverse Gear being intermittent state).

Post-condition

1. When the gear is transitioned from Park to Drive, AVAS audio shall be played on the Front speaker (Forward Gear audio).

Sequence Diagram



##### AVAS-SD-REQ-499957/A-Gear Position is Switched when a speaker fault is detected

Pre-condition

1. Vehicle ignition is in RUN state.
2. Vehicle is configured for 2 speaker AVAS System.
3. Vehicle Gear position is switched to Forward position.
4. Speaker Fault is detected on the Front speaker, so AVAS audio is played out of Rear speaker.

Scenario

1. When AVAS audio is played on the rear speaker, vehicle gear is switched from Forward to Rear.

Post-condition

1. When the Vehicle Gear is switched to Reverse, the current active AVAS audio for forward shall be stopped and AVAS audio for Reverse shall be played through rear speaker.

Sequence Diagram



# Appendix: Reference Documents

|  |  |
| --- | --- |
| Reference # | Document Title |
| 1 | AVAS Functional Spec Candidate for Phoenix |
| 2 |  |
| 3 |  |
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