# **Audio over IP** AES67, Dante, RAVENNA, Livewire+

Quick Guide

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#### Overview

- AES67 Software option
  - General Configuration
  - AES67 Audio Channel Assignment for TH2plus / TH6, THipPro, ACip3
- THipPro Dante Module
  - Configuration: THipPro
  - Configuration: Dante Module
  - Dante Audio routing
  - Dante Domain Manager
    - SMPTE / Redundant AES67
- Configuration RAVENNA

- Configuration Livewire+
- Interworking AES67 Dante
- Interworking AES67 RAVENNA
- Interworking AES67 Livewire+
- Interworking Dante RAVENNA
- Interworking Dante Livewire+
- Support

### Content



Overview: AES67 SAP



- AES67 is an open standard for Audio over IP interoperability, developed by the Audio Engineering Society (AES).
- AES67 sets a minimum standard for audio streaming and synchronisation in Audio over IP networks such as Dante, RAVENNA and Livewire+.
- AES67 is available as a software option for AVT MAGIC telephone hybrids, audio codecs and DAB encoders and features:
  - One AES67 stream in send direction with up to 8 audio channels (depending on the device).
  - Two AES67 streams in receive direction with up to 8 audio channels each.
- For the MAGIC THipPro, a Dante module is available, which also supports AES67 with up to 32 audio channels.
  - The Dante module cannot be combined with the AES67 software option.
  - Together with Audinate's Dante Domain Manager, redundant AES67 streams are also supported via SMPTE.

### **AES67**



- SAP (Session Announcement Protocol) uses Multicast to distribute the description of each stream in the network.
- Each SAP message contains the stream description using the SDP (Session Description Protocol) format.
- Each sender of AES67 streams transmits SAP messages periodically to the multicast IP address: 239.255.255.255.
- AES67 receivers collect the stream information coming via SAP and present it to the user to chose from.
- In large networks it may be desirable to minimize periodic broadcast traffic. Therefore it is possible to exchange stream information between devices via SDP files instead of SAP.
- SDP files are text files which store the stream information in the SDP format.
- On AVT MAGIC devices you can switch of SAP on the AES67 configuration page.
- The TX stream information can be exported to an SDP file.
- To subscribe to a stream, SDP files can be imported.

#### SAP



#### **AES67 Software Option:**

**General Configuration** 



- The AES67 functionality is activated on the corresponding configuration page.
- LAN INTERFACE: The network interface of the device for AES67.
- PTP DOMAIN: The network for clock synchronization.
- QUALITY OF SERVICE (DSCP): Classification of data to prioritize network traffic.
  - PTP: DSCP classification of the clock synchronization protocol.
  - RTP: DSCP classification of audio streams.
  - SET DEFAULT QOS VALUES: Default values for PTP and RTP.

Configuration						×
Local MAGIC THipPro	AES67					
Cleast Settings     Cleast Settings     Cleast Seturity     Studio Definition     Database     Mode & Audio Line     Internal HOLD Signals     Studio Audio Assignment     Clients Audio Assignment     Clients Restrictions     Signal Processing     Line Labels     Studio Settings     Auto Answer     Intro / Data Privacy Query     Answering Machine     Night Service     DTMF     Actions     Telephone Client Application	Activate AES67 streaming     LAN Interface:     PTP Domain:     Quality of Service (DSCP):     PTP:     RTP:     Transmission:     Channels:     SAP Stream Name:     Audio Mode:     L     Sampling Rate:     Address Mode:     A	LAN 2 : 192.168.96.28 V 0 0.127 56 (CS 7) V 46 (EF) V 8 V AVT THipPro 5300 L24 V 48 kHz V Auto V	(063) DiffServ: 224dec (063) DiffServ: 184dec	0 96 28	Set Default QoS values Export SDP File	
Ember - Consumer Extension	Reception:				Update Rx Streams	
- Ender Consumer Extension - System Settings - General - Line Interface - Caller Line Grouping - VolP (LAN/SIP)	Stream 1: h Stream 2: h	Mixer Studio A; 8 channels Mixer Studio B; 8 channels		~	Import SDP File	
-Audio Interface - PRETALK Streaming - AESO7 - LAN Interface - VLAN - DHD Audio Matrix - Ember+ - Bemote Light Protocol						
Client ID: 5 Studio: 1				OK	Abbrechen Appl	y Now

## **AES67 Configuration (1)**



- TRANSMISSION: Definition of the AES67 audio stream in send direction. The stream can contain up to 8 channels and is made accessible in the network by SAP (Session Announcement Protocol).
  - CHANNELS: 1-8 mono audio channels.
  - SAP STREAM NAME: Identifier of the AES67 stream in the network.
  - RTP UDP PORT: Port of the audio stream.
  - AUDIO MODE: Algorithm for audio coding:
    - L16: Linear PCM 16 bit
    - L24: Linear PCM 24 bit
  - SAMPLING RATE: Sampling rate of the audio signal:
    - 32 kHz
    - 48 kHz

MAGIC THinPro	AFS67						
peration Settings							
- Clients / Security	Activate AES67 streaming						
- Studio Definition	LAN Interface:	LAN 2 : 192.168.96.28 🛛 🗸					
- Database	PTP Domain:	0 127					
-Mode & Audio Line	Puribus (Carries (DCCD)	0121					
-Internal HOLD Signals	Quality of Service (DSCP):	FC (CC 7)	(0, C2) DiffC 224-	4			
- Studio Audio Assignment	PIP:	36 (LS 7) V	(063) Dirrserv: 2240	Jec		Set Default QoS values	
- Clients Audio Assignment	RTP:	46 (EF) ~	(063) DiffServ: 184d	dec			
- Signal Processing	Transmission:						
-Line Labels	Channels:	8 ~				Export SDP File	
- Studio Settings	SAP Stream Name:	AVT THisPro					
-Auto Answer	SAL Stream Name.						
-Intro / Data Privacy Query	RTP UDP Port::	5300					
-Answering Machine	Audio Mode:	L24 ~					
-Night Service	Constitue Dates	10111-					
DTMF	Sampling Hate:	48 KHz V					
-Actions	Address Mode:	Auto 🗸	IP Address:	239 0 96	28		
- Telephone Ulient Application						11 1 · D O	
- GPIO Embert Consumer Extension	Heception:					Update Hx Streams	
stem Settings	Stream 1:	Mixer Studio A; 8 channels			~	Import SDP File	
- General	Stream 2:	Miner Charlie Dr. O. alexande				Incode CDD File	
-Line Interface	5000m 2.	mixer studio b; o crianheis			~	Import SUF File	
- Caller Line Grouping							
-VoIP (LAN/SIP)							
-Audio Interface							
-PRETALK Streaming							
AES67							
-LAN Interface							
-VLAN							
- DHD Audio Matrix							
-cmper+							

# **AES67 Configuration (2)**



#### TRANSMISSION: ....

- ADDRESS MODE:
  - MANUAL: Free entry of the multicast address of the audio stream.
  - AUTO: The multicast address is derived from the IP address of the device. Only a multicast subnet can be entered.
- IP ADDRESS: Multicast IP address of the audio stream.
- EXPORT SDP FILE: Not all manufacturers support SAP to automatically discover AES67 streams in the network. In this case, the definition can be exported to a file in SDP format. Recipients must be able to import this file.

figuration						
Local MAGIC THipPro	AES67					
Operation Settings	Activate AES67 streaming					
Studio Definition	LAN Interface:	LAN 2 : 192.168.96.28 $-\sim$				
Database Mode & Audio Line	PTP Domain:	0 0127				
Internal HOLD Signals	Quality of Service (DSCP):					
Studio Audio Assignment	PTP:	56 (CS 7) 🗸 🗸 🗸	(063) DiffServ: 224dec		Cat Datault Datauter	
Clients Audio Assignment	BTP:	46 (EF) ~	(0.63) DiffServ: 184dec		Set Delauit dios values	
Clients Restrictions	Transmission:		()			
Signal Processing	Channels:	8 ~			Export SDP File	
Studio Settings		-			Enportobilitio	
- Auto Answer	SAP Stream Name:	AV1 THipPro				
Intro / Data Privacy Query	RTP UDP Port:	5300				
Answering Machine	Audio Mode:	124				
Night Service	Addio Mode.	L24 *				
DTMF	Sampling Rate:	48 kHz $\checkmark$				
Actions	Address Mode:	Auto ~	IP Address: 239	0 96 28		
Telephone Client Application			1			
GPIO	Reception:				Update Rx Streams	
Ember + Consumer Extension	Stream 1:	Mixer Studio A; 8 channels			<ul> <li>Import SDP File</li> </ul>	
General General	Star 2					
line Interface	Stream 2:	Mixer Studio B; 8 channels			Import SDP File	
VoIP (LAN/SIP)						
Audio Interface						
PRETALK Streaming						
AES67						
LAN Interface						
VLAN						
- Kemole Light Protocol						
ID: 5 Studio: 1					OK Abbrechen App	ply Now

## **AES67 Configuration (3)**



RECEPTION: If AES67 is activated, the device searches the network for AES67 streams. It may take up to 5 minutes for all available streams to be listed. AVT devices can subscribe to one or two AES67 streams.

•

- UPDATE RX STREAMS: Restarts the search for AES67 streams.
- STREAM 1 / 2: All AES67 streams published in the network via SAP are offered for selection.
- If the definition of an AES67 stream is available as a file in SDP format, it can be subscribed to using IMPORT SDP FILE.

Configuration							×
Local MAGIC THipPro	AES67						
Operation Settings     Officients / Security     Officients / Definition     Officients Audio Assignment     Officients Audio Assignment     Officients Audio Assignment     Officients Restrictions     Signal Processing     Line Labels     Studio Settings     Autio Answer     Intro / Data Privacy Query     Answering Machine     Night Service	Activate AES67 streaming LAN Interface: PTP Domain: Quality of Service (DSCP): PTP: RTP: Transmission: Channels: SAP Stream Name: RTP UDP Port: Audio Mode:	LAN 2 : 192.168.96.28       ✓         0       0.127         56 (CS 7)       ✓         46 (EF)       ✓         8       ✓         AVT THipPro       5300         L24       ✓	(063) DilfServ: 224dec (063) DilfServ: 184dec			Set Default QoS values Export SDP File	
DTMF Actions Telephone Client Application ⊕- GPIO Ember+ Consumer Extension ⊕- System Settings	Sampling Rate: Address Mode: Reception: Stream 1:	48 kHz Auto Mixer Studio A; 8 channels	IP Address: 2	39 0 96	28	Update Rx Streams	
- General - Line Interface - Caller Line Grouping - VolP (LAN/SIP) - Audio Interface - PRETALK Streaming - ALSOT - LAN Interface - VLAN - DHD Audio Matrix - Ember+ - Remote Light Protocol	Stream 2:	Mixer Studio B; 8 channels			~	Import SDP File	
Client ID: 5 Studio: 1					OK	Abbrechen Apply	Now

## **AES67 Configuration (4)**



#### **AES67 Software Option:**

AES67 Audio Channel Assignment for TH2plus / TH6

THipPro

ACip3



- On the MODE & AUDIO LINE page, an AES67 channel can be assigned to any audio line.
  - AUDIO INTERFACE: Select an AES67 channel.
  - AES67 RX: Select a subscribed AES67 channel.
- All other audio interfaces of the MAGIC TH2plus / TH6 remain available.

garadon													
peration Settings	Mode	Mode & Audio Line											
Line Interface	Mo	Mode Operation Mode · Two Fasters v											
- VolP (LAN/SIP)		Operation Mode : Two Faders PRE TALK Conference Use only 1 VoIP Line Anonymous Calling Voice Disguise											
- HOLD Signal													
- Signal Processing													
Monitoring Source Line Labels	Au	Audio Line Assignment											
Database		Name	Audio Line	Audio Interface		AES67 Rx		ON AIR Access	Custom Label	Chat Name			
Night Service		PRE 1	PRE TALK Keypad 1	not used	•	i i		~					
DTMF		PRE 2	PRE TALK Keypad 2	not used	-	1		<b>v</b>					
System Settings – General – Audio Interface – AES67 – LAN Interface – VLAN DHD Audio Matrix		PRE 3	PRE TALK Keypad TH2plus	not used	•	]		<b>v</b>					
		PRE 4	PRE TALK PC 1	Handset 1	-	]		~		PC1			
		PRE 5	PRE TALK PC 2	IP Audio Stream 1	•	]		<b>~</b>		PC2			
		PRE 6	PRE TALK PC 3	AES67 Channel 1	•	Channel 1	•	<b>~</b>		PC3			
		AIR 1	ON AIR 1	AES67 Channel 2	•	Channel 2	•						
		AIR 2	ON AIR 2	AES67 Channel 3	•	Channel 3	•						
Ember+		HLD	HOLD/Monitoring	Audio 1/AES Left	•	]							
Remote Light Protocol													
- SNMP													
Quick Dials													
ain													
2													
		Caution: Inv	valid settings are red! Set	tings for this client hav	e da	ırk gray backg	pround	d colour.		Default Settings			
		Default Auc	tio Line on Drop for Keypad TH2plu	15		_							
			HOLD			$\sim$							

# **AES67** Audio Assignment TH2plus / TH6



- On the MODE & AUDIO LINE page, an audio line (function) is assigned to each of the AES67 channels.
  - TX CHANNEL: Each line represents one channel of the outgoing AES67 stream.
  - FUNCTION: Select an audio line.
  - RX ASSIGNMENT: Assign channels of the subscribed AES67 streams to the audio lines.
- All other audio interfaces of the MAGIC THipPro, except for the Dante module, remain active.

Configuration									
Local MAGIC THipPro	Mode & Audio Line	•							
Operation Settings		4 F 01 AFG	67						
Clients / Security Studio Definition	Audio Interfaces Audio Streams ALS5/								
Database	Tx Channel	Function		Rx Assignment	N	o Input Alarm	Ringing Tone	Label	
Mode & Audio Line	1	Pretalk 1	-	Console A; Ch. 1	-		<b>v</b>		
-Internal HOLD Signals	2	External HOLD 1	-	Console A; Ch. 2	-				
	3	On Air 1	•	Console A; Ch. 3	•				
Clients Restrictions	4	On Air 2	-	Console A; Ch. 4	-				
Signal Processing	5	Pretalk 2	-	Console B; Ch. 1	-		<b>v</b>		
	6	External HOLD 2	-	Console B; Ch. 2	-				
Auto Answer	7	On Air 3	-	Console B: Ch. 3	•				
Intro / Data Privacy Query		On Air 4	-	Console B; Ch. 4					
		OTTAIL 4		Console B, Crit 4	-				
DTMF									
Actions	_								
Telephone Client Application									
Ember + Consumer Extension									
- System Settings									
General									
VoIP (LAN/SIP)									
Audio Interface									
	Caution: Invalid s	ettings are red!						Default Settings	
LAN Interface									
VLAN									
-Remote Light Protocol									
ient ID: 5 Studio: 1								OK ékkezken é	
								UN Abbrechen A	

## **AES67** Audio Assignment *THipPro*



- First, on the AES67 page of the *MAGIC ACip3*, logical audio interfaces must be defined. These consist of AES67 channels of the transmit and receive audio streams.
  - AUDIO INTERFACE: Each logical audio interface consists of two mono AES67 channels.
  - OUTPUT CHANNELS: The AES67 channels in the send direction are automatically assigned continuously. The number of logical audio interfaces is limited by the number of channels defined under TRANSMISSION → CHANNELS.
  - INPUT CHANNELS: The channels of the subscribed AES67 streams in RX direction can be freely assigned to the logical audio interfaces.

- Clients / Security       - Line Interface         - AolP (LAN/SIP)       LAN Interface:         - Audio Distribution       Quality of Service (DSCP):         - Audio Distribution       Quality of Service (DSCP):         - Auto Answer       PTP:         - Alarm Signalling       RTP:         - Marm Signalling       RTP:         - TTL / Relay       Transmission:         © Transmission Modes       Channels:         - System Settings       SAP Stream Name:         - Audio Interface       Audio Mode:         - VLAN       Audio Mode:         - VLAN       Audio Mode:         - VLAN       Audio Mode:         - OthD       Steam 1:         - Bicker       Mixer Studio A; 8 channels         - OHD       Steam 1:         - Ember+       Audio Interface:         - OHD       Steam 1:         - Export SDP File         - Audio Interface:       Output Channels         - OHD       Steam 2:         - Ember+       Audio Interface:         - OHD       Steam 2:         - Actio Interface       Output Channels         - OHD       Steam 2:         - Ember+       Audio Interface:         -	🗐 - Operation Settings	AES67				
In Th Z Relay       Transmission:         In Transmission Modes       Channels:         System Settings       SAP Stream Name:         - General       AVT ACip3         - Audio Interface       RTP UDP Port:         - Data Interface       Audio Mode:         - VLAN       Address Mode:         - VLAN       Address Mode:         - SNMP       Reception:         - SConnect       Stream 1:         - DHD       Stream 2:         Mixer Studio A; 8 channels       Import SDP File         Import SDP File       Import SDP File         Login       Audio Interface:       Output Channels         AES67 1:       1, 2         AES67 2:       3, 4       Mixer Studio 8; Ch. 1         Mixer Studio 8; Ch. 1       Mixer Studio 8; Ch. 2         AES67 2:       3, 4       Mixer Studio 8; Ch. 1	- Clients / Security - Line Interface - AoIP (LAN/SIP) - Audio Assignment - Audio Distribution - Backup - Auto Answer - Alarm Signalling	Activate AES67 streaming LAN Interface: PTP Domain: Quality of Service (DSCP): PTP: RTP:	LAN 1 : 172.20.40.120 0 ( 56 (CS 7) 46 (EF)	<ul> <li>✓</li> <li>✓ (063) DiffServ: 224d</li> <li>✓ (063) DiffServ: 184d</li> </ul>	ec ec	Set Default QoS values
LAN Interface       Sampling Rate:       48 kHz       IP Address:       239       40       120         VLAN       Address Mode:       Auto       IP Address:       239       40       120         NTP       Address Mode:       Auto       IP Address:       239       40       120         SNMP       Reception:       IP Address:       239       40       120       Update Rx Streams         ACconnect       Stream 1:       Mixer Studio A; 8 channels       Import SDP File       Import SDP File         Ember+       Stream 2:       Mixer Studio B; 8 channels       Import SDP File         Login       Audio Interface:       Output Channels       Input Channels         AES67 1:       1, 2       Mixer Studio A; Ch. 1       Mixer Studio A; Ch. 2         AES67 2:       3, 4       Mixer Studio B; Ch. 1       Mixer Studio B; Ch. 2         AES67 3:       5. 6       Mixer Studio B; Ch. 3       Mixer Studio B; Ch. 3	TTL / Relay     Transmission Modes     System Settings     General     Audio Interface <u>ASS67</u>	Transmission: Channels: SAP Stream Name: RTP UDP Port:: Audio Mode:	6 AVT ACip3 5300 L24	×		Export SDP File
ACconnect     Stream 1:     Mixer Studio A; 8 channels     Import SDP File       DHD     Stream 2:     Mixer Studio B; 8 channels     Import SDP File       Login     Audio Interface:     Output Channels     Import SDP File       Audio Interface:     Output Channels     Import SDP File       AES67 1:     1, 2     Mixer Studio A; Ch. 1     Mixer Studio A; Ch. 2       AES67 2:     3, 4     Mixer Studio B; Ch. 1     Mixer Studio B; Ch. 2       AES67 3:     5, 6     Mixer Studio A; Ch. 3     Mixer Studio B; Ch. 3	LAN Interface VLAN NTP SNMP	Sampling Rate: Address Mode: Reception:	48 kHz Auto	V V IP Address:	239 0 40 120	Update Rx Streams
Login     Audio Interface:     Output Channels       AES67 1:     1, 2     Mixer Studio A; Ch. 1     Mixer Studio A; Ch. 2       AES67 2:     3, 4     Mixer Studio B; Ch. 1     Mixer Studio B; Ch. 2       AES67 3:     5, 6     Mixer Studio A; Ch. 3     Mixer Studio B; Ch. 3	ACconnect DHD Ember+	Stream 1: Stream 2:	Mixer Studio A; 8 chann Mixer Studio B; 8 chann	els Hs	~	Import SDP File
Action of the standard of the	L- Login	Audio Interface: AES67 1: AES67 2: AES67 3:	Output Channels 1, 2 3, 4 5, 6	Input Mixer Studio A; Ch. 1 ~ Mixer Studio B; Ch. 1 ~ Mixer Studio A; Ch. 3 ~	Channels Mixer Studio A; Ch. 2 ~ Mixer Studio B; Ch. 2 ~ Mixer Studio B; Ch. 3 ~	

# AES67 Audio Assignment ACip3 (1)



- On the AUDIO ASSIGMENT page, one of the logical AES67 interfaces can be assigned to each channel.
  - AC1: Codec 1
  - AC2: Codec 2
  - AUX: Mono command channels 1 and 2. The first channel of the logical AES67 interface is assigned to AUX1.
- All other audio interfaces of the MAGIC ACip3 remain available.

onfiguration		
- Operation Settings Clients / Security	Audio Assignment	
– Line Interface – AoIP (LAN/SIP) – <mark>Audio Assignment</mark> – Audio Distribution – Backup	AC 1: AES67 1 ~ Loopback audio input to output	
Auto Answer Alarm Signalling TTL / Relay Transmission Modes	AC 2: AES67 2 Loopback audio input to output	
<ul> <li>System Settings</li> <li>General</li> <li>Audio Interface</li> <li>AES67</li> <li>Data Interface</li> <li>LAN Interface</li> <li>VLAN</li> <li>NTP</li> <li>SNMP</li> <li>ACconnect</li> <li>DHD</li> <li>Ember +</li> <li>Login</li> </ul>	AUX: AES673 V left = AUX1 / right = AUX2	

# AES67 Audio Assignment ACip3 (2)



MAGIC Dante module





- Optional Dante module
- Available for MAGIC THipPro VoIP
- Two Ethernet interfaces
  - Option to select between redundancy and switch.

- 32 audio inputs
- 32 audio outputs

#### **Dante/AES67 module for MAGIC THipPro**



- The Configuration page OPERATION SETTINGS
   → MODE & AUDIO LINES shows the tab Dante CHANNELS if a Dantemodule is equipped and AES67 is deactivated under SYSTEM SETTINGS – AES67.
- Audio lines can be assigned to 32 Dantechannels.
- Standard audio interfaces remain operational without limitations.

Clients / Security	Audio Interfaces Audio St	reams DANTE Channels				-
- Studio Definition Database	Audio Interface	Function	No Input Alarm	Ringing Tone	Label	
Mode & Audio Line		On Air 1	•			
- Internal HOLD Signals - Studio Audio Assignment	2	On Air 2	•			
Clients Audio Assignment	3	On Air 3	•			
Remote Light Audio Assignn	4	On Air 4	•		E	
- Clients Restrictions - Signal Processing	5	On Air 5	•			
Line Labels	6	On Air 6	•			
Studio Settings	7	External HOLD 1	•			
Auto Answer Answering Machine	8		•			
Night Service	9		•			
DTMF	10	On Air 10	•			
Telephone Client Application	11	On Air 11	•			
TTL	12	External HOLD 2	•			
Relay DHD Set Logic	13	Pretalk 10	•			
Ember+		Pretalk 11	•	, 		
tem Settings	15					
- General	16				-	
Caller Line Grouping	•		III.		•	
VoIP (LAN/SIP)	Caution: Invalid settings are	e red!			Default Settings	
PRETALK Streaming						1
LAN Interface						
VLAN +						
					OK Abbrechen Ac	ply Now

### **Configuration MAGIC THipPro**



**Configuration Dante Module** 



- Start the Dante Controller software and select DEVICE → DEVICE VIEW from the menu bar.
- Select the desired Dante device and open the tab NETWORK CONFIG.
- Set the IP-address as desired.
- Set the latency on the tab DEVICE CONFIG to the same value on all Dante devices in the network.
- Click REBOOT to apply the changes.
- Also switch the *MAGIC THipPro* off and on again if the front display signals an alarm.

Net with They         Transmit         Transmit         Status         Latency         Device Config         Network Config         Darte Redundancy         Current:         Redundancy         Current:         Network         Redundancy         Current:         Network         Redundancy         Paddresse:         Pite         Device         View         Redundancy         Paddresse:         Paddress:         T2;       5;         Paddress:	te Controller - Device View (THipPro-Messe)		- 🗆 ×	
Transmit       Status       Latency       Device Config       Network Config       AESS7 Config         Parte       Fedundarcy       Current:       Redundart       Pile		THipPro-Messe V	0	
Darte Redundancy     Current: Redundant     New: Redundant     New: Redundant     Addresse:     Pinary   Octans an P Address   P Addresse:   P Rest Device   Restor   R	Transmit Status Latency Device Config Network Config	9 AES67 Config		
Addresses       Primary         Obtain an IP Address Automatically (default)       Imanually configure an IP Address         IP Address:       IZZ + 16 + 75 + 10         IP Address:       IP Address:         INE mask:       IZZ + 16 + 75 + 10         INS Server:       IZZ + 16 + 75 + 10         INS Server:       IZZ + 16 + 75 + 10         INS Server:       IZZ + 16 + 75 + 10         Gateway:       IZZ + 16 + 75 + 10         INS Server:       Gateway:         IZZ + 16 + 75 + 10       INS Server:         Gateway:       IZZ + 16 + 75 + 10         INS Server:       Gateway:         Gateway:       IZZ + 16 + 75 + 10         Reset Device       Reset Device         Reset Device       Rebot         Clear Config       Preferred Encoding:         Preferred Encoding:       PM 24         Unicast Delay Requests:       Disabled v         ISS user       Gabit network with one switch         Ogabit network with three switches       Gabit network with 100Mbps leaf nodes         ISS user       Same       Gabit network with 100Mbps leaf nodes         ISS user       Same       Same       Gabit network with 100Mbps leaf nodes <td>-Dante Redundancy</td> <td>undant undant ↓</td> <td>Controller - Device View (THipPro-Messe) View Help</td> <td>++</td>	-Dante Redundancy	undant undant ↓	Controller - Device View (THipPro-Messe) View Help	++
	Primary Obtain an IP Address Automatically (default) Manually configure an IP Address IP Address: 172 . 16 . 75 . 100 Netmask: 255 . 255 . 0 . 0 DNS Server: 172 . 16 . 75 . 1 Gateway: 172 . 16 . 75 . 1 Apply Reset Device	Obtain an IP A     Manually conf     IP Address:     IDNS Server:     Gateway:     Clear Config	Rename Device       THipPro-Messe         Sample Rate       Sample Rate:         This device does not support       Sample Rate:         Sample Rate:       Sample Rate:         This device does not support       Sample Rate:         Device Latency:       Preferred Encoding:         Device Latency:       Device Latency:         Current latency:       2 msec         Ggabit network with one swite       Ggabit network with five swite         S00 usec       S00 usec         S00 usec       Ggabit network with three swite         Sold usec       Ggabit network with three swite         Sold usec       Sample Rate configuration         Store       Sample Rate configuration	Pull-up/down: This device does not support Pull-up/down configuration. Clocking Unicast Delay Requests: Disabled this share thes share hes or gigabit network with 100Mbps leaf nodes leaf nodes

### **Configuration Dante module (1)**



- Select the tab AES67 CONFIG and enable AES67 Mode (①).
- Set the MULTICAST ADDRESS PREFIX to the exact same value for all units in the audio network. (Note: Avoid using "0" since it is not supported by every device). (2).
- Press button 

   to create a MULTICAST FLOW.
- Activate the check box AES67 FLOW
   (④).
- Select up to 8 channels in the column ADD TO NEW FLOW and press the button CREATE (G).
- Create another flow if you need more than 8 channels.
- Channels added to the flow are displayed on tab TRANSMIT (<sup>G</sup>).



### **Configuration Dante module (2)**



**Dante Audio Routing** 



- Start the Dante Controller software and select the tab ROUTING to see all devices in the network supporting the Danteprotocol.
- The Dante, AES67 und RAVENNA TX STREAMS show up under DANTE TRANSMITTERS (①).
- A click with the left mouse button sets cross points in the matrix connecting the streams to DANTE RECEIVERS (like the *THipPro* Dante module).



### **Configuration Dante audio routing**



Dante Domain Manager SMPTE / Redundant AES67



- Dante Domain Manager brings user authentication, role-based access and network management to Dante Audio-over-IP networks.
- Dante Domain Manager also enables the SMPTE mode in Dante networks.
- Redundant AES67 audio streams are only available in SMPTE mode.
- The AVT MAGIC Dante module supports SMPTE from software version 1.0.4.
- Any Dante Domain Manager Edition (Silver, Gold, Platinum) supports SMPTE.
- Dante Domain Manager contains its own OS and comes as an ISO image which must be installed on bare metal hardware or a hypervisor (VMware, VirtualBox, ...).
- Instructions for installing and starting up the Dante Domain Manager can be found on the Audinate support website (registration required).

### **Overview**



- Log in to the Dante Domain Manager via a web browser.
- Click ADD DOMAIN ① on the DOMAINS page and enter a name for the new domain.
- Select the new domain

   and click ENROLL
   DEVICES (3) to add the
   MAGIC Dante modules
   to the domain.
- Click ADVANCED SETTINGS ④ to configure the domain.

Dante Don	ain Manager			⑦ ▾ 🕤 admin ▾
ılı	Dashboard 2		Domain Details	
6	Domains	StudioComplex-A	😥 StudioComplex-A	
8	Devices		Settings	ADVANCED SETTINGS
*	Users		CLOCKING TYPE Single-subnet	AUTO-CONFIGURE
ది	Roles		GRAND MASTER None	
రి	Settings		Shared Audio	
6	Audit Log		Devices in this domain can be configured to share audio with devices in	o other domains in the same group
			GROUP MEMBERSHIP Enter a name	
			Devices	DEVICES UNENROLL DEVICES (0)
Dante Di		ADD DOMAIN DELETE DOMAIN	Enroll By IP Address Status	
Dante De	umain Manager v1.1	ADD DOMAIN DELETE DOMAIN	Enroll By IP Address Status	GANCEL ALL

### **Create a Domain**



- Enter ADVANCED
   SETTINGS and set the MODE to SMPTE 1.
- Set the RTP PREFIX V4

   (2) to the multicast address prefix used throughout the rest of the AES67 network. Otherwise audio will not come through. (e.g. if set to 69 the RTP streams will use multicast addresses in the 239.<u>69</u>.xxx.xxx range).

Dante Dom	ain Manager						⑦ ▾ 🗗 admin
ıl.	Dashboard	▲ 2			Audio/Clocking Parameter	s	
0	Domains		🚯 StudioComplex		MODE 1	SMPTE	~
					PTP V1 MULTICAST		
	Devices				PTP V2 DOMAIN NUMBER	127	۲
:	Users				PTP V2 PRIORITY 1	128	•
					PTP V2 PRIORITY 2	128	•
ది	Roles				PTP V2 SYNC INTERVAL	-3	•
~	Settings				PTP V2 ANNOUNCE	-2	۲
~	Settings				INTERVAL		
6	Audit Log				PTP V2 MULTICAST TTL	16	•
					PTP SLAVE ONLY		
					RTP TRANSMIT PORT	5004	\$
					SYSTEM PACKET TIME	1ms	~
					RX LATENCY	2ms	~
					RTP PREFIX V4	69	٢
Dante Do	omain Manager v1.1		ADD DOMAIN	DELETE DOMAIN			,
Dante Do				DELETE DOMAIN	EIP PRESIX VA		(E)

### **Enable SMPTE for the Domain**



- Open Dante Controller and Login ① to the Domain configuration.
- Domain and logged in user are displayed on the menu bar 2.
- Select the DEVICE INFO tab ③.
- Double click on a Device to open the Device View.



### **Login to the Domain in Dante Controller**



Select the TRANSMIT • tab (1) in the Device View.

- Click ADD FLOW (2) to • open the CREATE MULTICAST FLOW window.
- Select SMPTE A (3) as • stream type.
- Select the channels (4)• to be included in the new audio stream.

e Device View	/ Help <b>2</b>		Create Multicast Flow	/
<u>}</u> % ©	•<		THipPro-A su to 64 channels	pports up per flow.
eceive Transmit	Status Latency D Transmit Ch	Device Config Network Conl	Select one or more transmit channels	to be placed in multicast flows.
Thannel	Signal	Channel Label	Flow Config (Optional)	
				) SMPTE B () SMPTE C
			Packet time: 1 mse	c
			Destination Address:	uto 🔿 Manual
			Channel Name	Add to New Flow
			TX_CH1	× 1
			TX_CH2	
			ТХ_СНЗ	
			TX_CH4	
			TX_CH5	
			TX_CH8	(4) ¦
			TX CH9	
			TX CH10	
			TX CH11	
			TX_CH12	
			TX_CH13	
			TX_CH14	
			TX_CH15	
			TX_CH16	
			TX_CH17	
			Create	Cancel

### **Create SMPTE TX Flows**



- Active audio streams are displayed on the TRANSMIT tab 1 in the Device View:
  - Name of the audio stream.
  - Channels contained in the audio stream.
  - Multicast addresses of the audio streams in the primary and the secondary network.

🥺 Dante Controll File Device View	er - Device View (T Help	HipPro-A)				_		>
6	ج 🕀 🗗			THipPro 🗸				(
Receive Transmit	Status Latency D	Device Config Network C	Ionfig In	terop Status				
	Transmit Ch	annels			Transmit Flo	ows		
Channel	Signal	Channel Label		Unicast: 0				
TX_CH1	0(0)		^	Multicast: 1 Total: 1 of 32	(1)			
TX_CH2	0.00			PTP Multicast Flor		TY CH2	ту сна т	v c
ТХ_СНЗ	u(0)			Primary: 239.69.108	150:5004	10_012,	17_010,1	~_~
TX_CH4	(I))			Secondary: 239.69.	223.70:5004			
TX_CH5	(I)							
TX_CH6	u(1)							
TX_CH7	u(1)							
TX_CH8	u(0)							
TX_CH9	u(10)							
TX_CH10	0(0)							
TX_CH11	0(0)							
TX_CH12	C (0)							
TX_CH13	C (0)							
TX_CH14	C[[0]							
TX_CH15	u[](1)							
TX_CH16	u (1)							
TX_CH17	C (0)							
TX_CH18	u (1)							
TX_CH19								
TX_CH20	0(0)							
TX_CH21								
TX_CH22	0(0)							
TX_CH23	0							
TX_CH24	0.0							
TX_CH25	0.00							
TX_CH26	u[]0)							
TX_CH27	000				6.11			
TX_CH28	0.0		~		Delete			

### **Check SMPTE TX Flows**



- The ROUTING tab of the Dante Controller shows SMPTE flows available in the network in blue.
- Set a cross point 1 to subscribe to a channel of the SMPTE flow.

Notifie     Dante     ••••••••••••••••••••••••••••••••••••	1 🕗 🖿 🗙 🖬 🖪 🗄	- 🔕 🚳	Grand Master Clock: THipPro-A	Domain:	StudioComplex-A $\sim$	💄 admin (Site Adr
Image: Construction       Image: Construction         Image: Constret       Image: Construction	Routing Device Info Clock Status Ne	twork Status Even	ts			
iller Transmitters       s       iller       iller         iller Receivers       iller       iller	@Dante <sup>®</sup>	Pro-A + Dro-B + udio A -	5885			
Itter Receivers         Dante Receivers         ThipPro-A         FX_CH1         FX_CH2         FX_CH3         FX_CH4         FX_CH5         FX_CH6         FX_CH7         FX_CH8         FX_CH9         FX_CH1         FX_CH6         FX_CH13         FX_CH14         FX_CH15         FX_CH18         FX_CH19         FX_CH19         FX_CH19         FX_CH19	ilter Transmitters	tters st THip	· K K K K			
Bante Receivers         ThipPro-A         FX_CH1         FX_CH2         FX_CH3         FX_CH4         FX_CH5         FX_CH6         FX_CH6         FX_CH1         FX_CH13         FX_CH14         FX_CH13         FX_CH16         FX_CH17         FX_CH18         FX_CH18         FX_CH19         FX_CH19	ilter Receivers	Transmit				
ThipPo-A         RX, CH1         RX, CH4         RX, CH6         RX, CH10         RX, CH10         RX, CH11         RX, CH12         RX, CH13         RX, CH14         RX, CH16         RX, CH18         RX, CH19         PV, CH20		Dante				
THipPro-A       Image: Chip of the second seco	🗄 🖃 Dante Receivers	$\Xi$				
RX_CH1       RX_CH2         RX_CH3       RX_CH4         RX_CH5       RX_CH5         RX_CH6       RX_CH1         RX_CH10       RX_CH14         RX_CH10       RX_CH14         RX_CH13       Q         RX_CH14       Q         Q       Q         Image: difference dif	THipPro-A	$\pm \pm \equiv$				
RX_CH3         RX_CH4         RX_CH5         RX_CH6         RX_CH6         RX_CH7         RX_CH8         RX_CH9         RX_CH10         RX_CH11         RX_CH12         RX_CH13         RX_CH14         RX_CH15         RX_CH16         RX_CH17         RX_CH18         RX_CH19         PY_CH20         V         Unmanaged Multicast Bandwidth: 0 bps_Event Log:         C	-RX_CH1 -RX_CH2					
RX_CH4       RX_CH5         RX_CH5       RX_CH6         RX_CH6       RX_CH1         RX_CH9       RX_CH10         RX_CH10       RX_CH11         RX_CH11       Image: Ch12         RX_CH12       Image: Ch14         RX_CH15       Image: Ch14         RX_CH16       Image: Ch14         RX_CH18       Image: Ch14         RX_CH19       Image: Ch14         Image: Ch16       Image: Ch14         Image: Ch17       Image: Ch16         RX_CH18       Image: Ch14         RX_CH19       Image: Ch14         Image: Ch17       Image: Ch16         Image: Ch18       Image: Ch17         Image: Ch19       Image: Ch17         Image: Ch18       Image: Ch17         Image: Ch19       Image: Ch17         Image: Ch17       Image: Ch17 </td <td>-RX_CH3</td> <td></td> <td></td> <td></td> <td></td> <td></td>	-RX_CH3					
RX_CH6         RX_CH7         RX_CH8         RX_CH9         RX_CH10         RX_CH11         RX_CH12         RX_CH14         RX_CH15         RX_CH16         RX_CH18         RX_CH19         PX_CH10         RX_CH14         Image: display="block">Unmanaged Multicast Bandwidth: 0 bps_Event Log:	-RX_CH4 -RX_CH5					
RX_CH7         RX_CH8         RX_CH9         RX_CH10         RX_CH11         RX_CH12         RX_CH14         Q         Q         RX_CH16         RX_CH17         RX_CH18         RX_CH19         PY_CH20         Immanaged Multicast Bandwidth: 0 bps_Event Log:	-RX_CH6					
RX_CH9       RX_CH10       RX_CH11       RX_CH12       RX_CH13       RX_CH14       Q       Q       RX_CH15       Q       Q       Image: CH15       Image: CH15       RX_CH16       RX_CH17       RX_CH18       RX_CH19       PY_CH00       Image: CH15       Image: CH15 <t< td=""><td>-RX_CH7</td><td></td><td></td><td></td><td></td><td></td></t<>	-RX_CH7					
RX_CH10       RX_CH10         RX_CH11       RX_CH12         RX_CH12       Image: CH15         RX_CH15       Image: CH15         RX_CH16       Image: CH15         RX_CH17       Image: CH15         RX_CH18       Image: CH15         RX_CH19       Image: CH15         Image: CH19       Image: CH19         Image: CH19	-RX_CH9					
RX_CH12       RX_CH12       RX_CH13       RX_CH14       Q       Q       RX_CH15       Q       RX_CH16       RX_CH16       RX_CH17       RX_CH18       RX_CH19       PV_CH20       Vumanaged Multicast Bandwidth: 0 bps_Event Log:	-RX_CH10					
RX_CH13       RX_CH13         RX_CH14       Image: Chi and the state of t	-RX_CH12					
RX_CH15     Image: Ch15       RX_CH15     Image: Ch15       RX_CH17     Image: Ch15       RX_CH18     Image: Ch15       RX_CH19     Image: Ch15       Image: Ch15     Image: Ch	-RX_CH13					
RX_CH16 RX_CH17 RX_CH18 RX_CH18 RX_CH19 PV_CH20 C C Unmanaged Multicast Bandwidth: 0 bps_Event Log:	-RX_CH14 -RX_CH15					
FX2_CH18       FX2_CH18       FX2_CH19       - DV_CH20       - V_CH20       - Unmanaged Multicast Bandwidth: 0 bps_Event Log:	-RX_CH16					
- RX_CH19 - DY_CH00 - CH00 - CH00	-RX_CH18					
<     C     Unmanaged Multicast Bandwidth: 0 bps Event Log:	-RX_CH19 -PX_CH20					
	: 🗖	<		Unmanaged Mult	icast Bandwidth: 0 bp:	s EventLog: 🔲 🤇

### **Subscribe to SMPTE Flows**



Configuration RAVENNA



- Open the RAVENNAmodule configuration in a web browser and enable EXPERT SETTINGS (①).
- Use the button CONNECT
   (@) under RX STREAMS to subscribe to a AES67 stream.
- Enter a meaningful LABEL
   (③) and press APPLY.
- The subscribed channels show up under RX STREAMS. They turn green (④) if the RAVENNA module receives the AES67 streams from the *network*.



# **Configuration RAVENNA streams RX**



- Press the button CREATE
   (①) under TX STREAMS to stream audio to the network.
- Enter a meaningful NAME.
- Set PAYLOAD to AES67 STANDARD STEREO STREAM (♥).
- Press the arrow button (

   and enable SAP.
- Apart from that keep the default settings as shown.
- Press APPLY.
- The new audio streams show up under TX STREAMS (④).

AVTLawo bare 946/41-60 ×		±	0 ×	
C 172.16.75.57/#/overview			☆ :	
RAVENNA Expert Settings - About		Other RAVENNA Dev	rices 🔻	
AVTLawo bare 946/4 00-0b-72-05-94-2c) /	-60 (on comimx-bare-			
	mi.MX bare 946/41-60 :0b:72:05:94:2c			
				Advertise this session as
- Network & Sync	4 Media	Tx Stream Pi	roperties	DNS-SD/RAVENNA DNS-SD/SIPURI SAP
Address         172.16.75.57         PTP         Master           ra1         Address         192.168.101.252         Other network settings	RAVENNA RAVENNA Configure rou	Stream Settings Name	LAWO THipP	<sup>710</sup> <b>8 m</b>
• Tx Streams	Rx Streams     Connect O Toggle Delete	Payload Address	AES67 Stand	dard Stereo Stream 2 -
	THipProLAWO 11. 118 21. 28 21. 38 41.	Media Settings Medium	RAVENNA A	udio-ra0 •
		Consecutive tracks		
		Recording tracks	1L, 1R	· · · · · · · · · · · · · · · · · · ·
Tx Streams		Your configuration re	sults in 288 data bj	ytes/packet.
Create D Toggle	🛍 Delete	Link RTSP URI	rtsp://172.16.75.	57:8081/by-id/15874928097930248195
LAWO THipPro				Apply Cancel

# **Configuration RAVENNA streams TX**



- If SAP (Session Announcement Protocol) should not be used, Ravenna can exchange the stream information as text in SDP format.
- Open the RAVENNA-module configuration in a web browser and enable EXPERT SETTINGS.
- Subscribe to an existing AES67 stream:
  - Press CONNECT under RX STREAMS and choose CUSTOM URL.
  - Enable SHOW RAW SDP.
  - Paste the content of an SDP file.
- Create a TX an SDP file for a TX stream:
  - Click on an AES67 stream under TX STREAMS.
  - Click on SDP.
  - Copy the content and paste it to a text file with \*.sdp extension.

### **RAVENNA streams without SAP**



Configuration Livewire+



- Open the Axia xNode configuration page in the web browser.
- Under SOURCES, audio streams in send direction are assigned to the audio inputs.
- Two modes are available for AES67:
  - Stereo 1ms (AES67) generates an AES67 stream with 2 channels.
  - 8ch 1ms (AES67) generates an AES67 stream with eight channels.
- Via the link DOWNLOAD STREAM DESCRIPTION (SDP) the definition of the AES67 stream can be downloaded to your PC as a file in SDP format.



System options

Advanced option Sources

Simple Setup

#### Axia xNode AES/EBU 4x4 I/O

#	Source Name:	Channel/Address:	Stream Mode:	Input Gain [dB]:
1	Axia01_8ch	239.0.100.14	8ch 1ms (AES67) ~	0.0
	AES67: Download strea	im description (SDP), RTSP: r	tsp://172.20.100.14/by-id/1	
AES 1-L			Surround: Center, LFE	0.0
AES 1-L			Surround: Back L, R	0.0
AES 1-L			Stereo L, R	0.0
5	SRC 5	105	Disabled ~	0.0
6	SRC 6	106	Disabled ~	0.0
7	SRC 7	107	Disabled ~	0.0
8	SRC 8	108	Disabled ~	0.0
	Show source allocation	status		
		Apply		
Channe	Chappel Nu	Access Using AES67/SIF	P of RTSP. IP unicast will be u	used as a transport. (any number from 1 to 22
	IP Address	Destination multicast ac	dress of the stream if other i	range than Livewire is requi
	1 1144 665	Bood ladon malababe ad		

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# **Axia xNode Configuration (1)**



- Under DESTINATIONS, audio streams are assigned to the audio outputs in the receiving direction.
- Two types are available:
  - FROM SOURCE to receive a 2-channel AES67 stream.
  - SURROUND to receive an 8channel AES67 stream.
- The multicast address of the AES67 stream is entered under CHANNEL/ADDRESS. If the port differs from the Axia standard port 5004, it can be appended with ":".

stem options					
ome imple Setup	Destination	S			
nicast Link Ivanced options	# Name:	Channel/Address:		Type:	Gain [dB]:
ources estinations	<sup>1</sup> DST 1	239.0.30.15:5300		Surround: Front L, R ~	0.0
ixer eters	3			Surround: Back L, R	0.0
nchronization and QoS stem	4			Stereo L, R	0.0
	5 DST 5	5		From source ~	0.0
		6		From source	0.0
	8 DST 8	8		From source ~	0.0
		Apply	1		
	<b>Channel</b> Type: Fro <b>Address</b> Type: Fro Type: Rav	m/To/Surround Livewire channel number or stream m/Surround AES67 SIP URI renna Ravenna session name	n address (stereo or 8-	channel)	

## **Axia xNode Configuration (2)**



Interworking AES67 – Dante



#### • Audio stream AES67 $\rightarrow$ Dante:

- Create an AES67 TX audio stream using the AVT MAGIC PC software.
  - Select the second byte of the multicast address matching the AES67 MULTICAST ADDRESS PREFIX of the Dante network.
- Connect these streams to the Dante receivers via the Dante Controller software.
- Audio stream Dante → AES67:
  - Create AES67 TX audio streams using the Dante Controller software.
  - Subscribe to these audio streams using the AVT MAGIC PC software.

# **Interworking AES67 – Dante**



Interworking AES67 – RAVENNA



- Audio stream AES67 → RAVENNA:
  - Create AES67 TX audio streams using the AVT MAGIC PC software.
  - Subscribe to these audio streams via the RAVENNA web interface.
- Audio Stream RAVENNA → AES67 :
  - Create AES67 SAP audio streams using the RAVENNA web interface.
  - Subscribe to these audio streams using the AVT MAGIC PC software.

# **Interworking AES67 – RAVENNA**



Interworking AES67 – Livewire+



#### • Audio stream AES67 $\rightarrow$ Livewire+:

- Create AES67 TX audio streams using the AVT MAGIC PC software.
  - An Axia xNode only accepts AES67 streams with 2 or 8 channels and 48 kHz sampling rate.
  - Either L16 or L24 can be selected as bitrate. This is automatically detected by the Axia xNode.
- Enter the streams information into the Axia xNode web interface.
- If no audio signal is output although all parameters have been entered correctly, restarting the Axia xNode may help.
- Audio Stream Livewire+ → AES67 :
  - Create AES67 audio streams using the Axia xNode web interface.
  - Download the stream description as an SDP file from the Axia xNode web interface.
  - Change the file extension of the SDP file to ".sdp".
  - Import this SDP file using the AVT MAGIC PC software.

Tested with Axia xNode firmware version 2.2.2.

## **Interworking AES67 – Livewire+**



Interworking Dante – RAVENNA



- Audio stream Dante  $\rightarrow$  RAVENNA:
  - Set the AES67 MULTICAST ADDRESS PREFIX in the Dante module via the Dante Controller software. Ravenna streams and AES67 streams must use the same multicast address prefix otherwise audio will not come through. The multicast address prefix must not be 0.
  - Create AES67 TX audio streams via Dante Controller software.
  - Subscribe to these audio streams via RAVENNA web interface.
- Audio stream RAVENNA  $\rightarrow$  Dante:
  - Create AES67 SAP audio streams via RAVENNA web interface.
  - Connect these streams to Dante receivers via Dante Controller software.

## **Interworking Dante – RAVENNA**



Interworking Dante – Livewire+



- Audio stream Dante → Livewire+:
  - Create AES67 TX audio streams using the Dante Controller software.
  - Enter the streams details into the Axia xNode web interface.
- Audio stream Livewire+  $\rightarrow$  Dante:
  - Create AES67 audio streams with 2 channels (stereo 1ms (AES67)) via the Axia xNode web interface.
  - Switch the ENABLE SAP ANNOUNCEMENTS setting to YES in the web interface of the Axia xNode under SNYCHRONIZATION AND QOS.
  - Connect these streams to the Dante receivers using the Dante Controller software.

Tested with Axia xNode firmware version 2.2.2.

### **Interworking Dante – Livewire+**



# Web: <u>www.avt-nbg.de</u> Email: <u>support@avt-nbg.de</u>

### Helpdesk: avt-nbg.zammad.com

Phone: +49 911 5271-110

### Support

