



SMPTE ST2110 & NMOS IS-08: Audio Transport and Routing

- Andreas Hildebrand –
RAVENNA Technology Evangelist
ALC NetworX, Munich



IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019
A. Hildebrand: SMPTE ST2110 & NMOS IS-08 – Audio Transport & Routing



Andreas Hildebrand, RAVENNA Technology Evangelist

- more than 25 years in the professional audio / broadcasting industry
- graduate diploma in computer science
- R&D, project & product management experience
- member of AES67 TG and ST2110 DG



ALC NetworX GmbH, Munich / Germany

- established 2008
- R&D center
- developing & promoting RAVENNA
- Partnerships with > 40 manufacturers



RAVENNA

- IP media networking technology
- designed to meet requirements of professional audio / broadcasting applications
- open technology approach, license-free
- fully AES67-compliant (*built-in*)



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SMPTE 2110 - Professional Media over Managed IP Networks

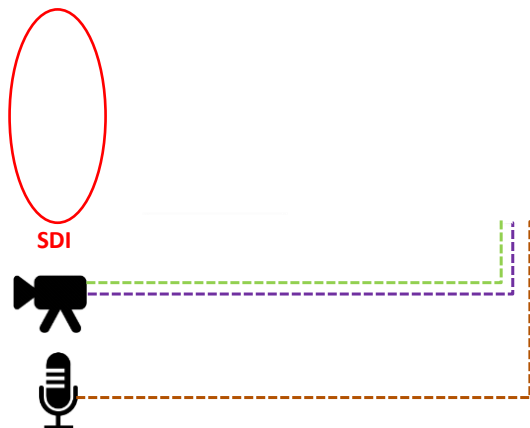
- Defines transport and synchronization of elementary essence streams (video, audio, ancillary data)
- Primarily targeting at live production applications
- References / builds on existing standards:
 - Timing: SMPTE 2059 (SMPTE PTP Profile)
 - Video: RFC 4175 (RTP Payload Format for Uncompressed Video)
 - Audio: AES67 & RAVENNA
 - Ancillary data: RFC 8331 (RTP Payload for SMPTE ST 291-1 Ancillary Data)



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SMPTE 2110



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Document structure:

- 2110-10: System Timing & Definitions
 - defines transport layer and synchronization (SMPTE2059, clocks, RTP, SDP etc.)
- 2110-20: Uncompressed Active Video
 - defines payload format for raw video (RFC4175, RTP, SDP, constraints)
- 2110-21: Traffic Shaping and Delivery Timing for Uncompressed Active Video
 - defines timing model for senders and receivers (traffic shaping requirements)



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Document structure:

- 2110-30: PCM Digital Audio
 - defines payload format for linear audio (AES67, constraints)
- 2110-31: AES3 Transparent Transport
 - defines payload format for non-linear audio (RAVENNA AM824)
- 2110-40: Transport of SMPTE Ancillary Data
 - defines RTP payload format for SDI ancillary data (new IETF draft)
- ... more in the works ...



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SMPTTE 2110 - Professional Media over Managed IP Networks

Document structure (audio):

- **2110-10:** System Timing & Definitions
 - defines transport layer and synchronization (SMPTTE2059, clocks, RTP, SDP etc.)
- **2110-30:** PCM Digital Audio
 - defines payload format for linear audio (AES67, constraints)
- **2110-31:** AES3 Transparent Transport
 - defines payload format for non-linear audio (RAVENNA AM824)



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SMPTTE 2110 - Professional Media over Managed IP Networks

Document structure (linear PCM audio):

- **2110-10:** System Timing & Definitions
 - defines transport layer and synchronization (SMPTTE2059, clocks, RTP, SDP etc.)
- **2110-30:** PCM Digital Audio
 - defines payload format for linear audio (AES67, constraints)

AES67



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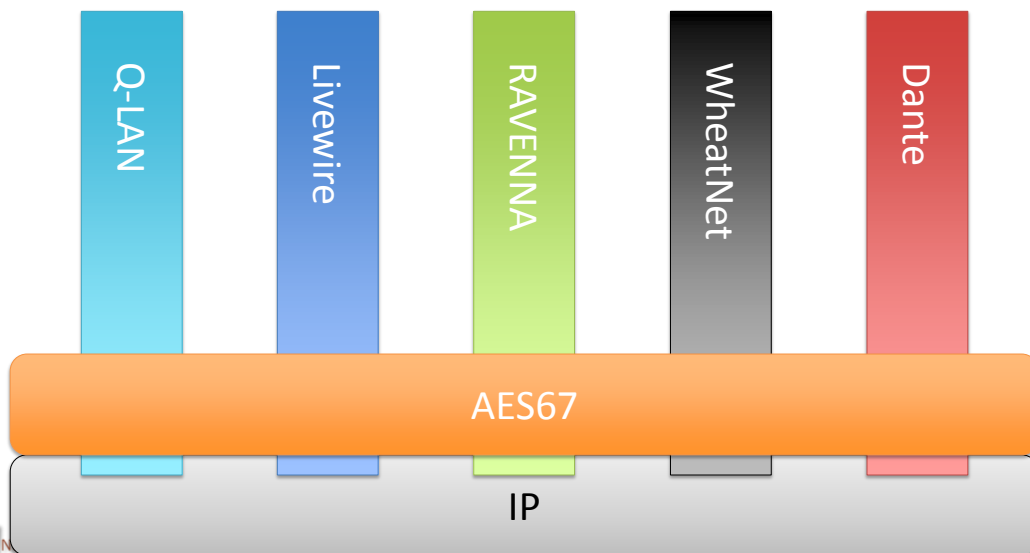
AES67

AES67-~~2013~~ Standard for Audio Applications of Networks: *High-performance Streaming Audio- over-IP Interoperability*

published on September, 11th, 2013



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AES67 technology components

Discovery	Not specified (NMOS IS-04/05)
Connection Management	SIP (unicast), IGMP (multicast)
Session Description	SDP (RFC4566, RFC7273)
Encoding	L16/L24, 1..8 ch, 48 samples
QoS	Differentiated Services (DiffServ w/ 3 CoS)
Transport	RTP / UDP / IP, unicast & multicast
Media Clock	48 kHz
Synchronisation	IEEE 1588-2008 (PTPv2)



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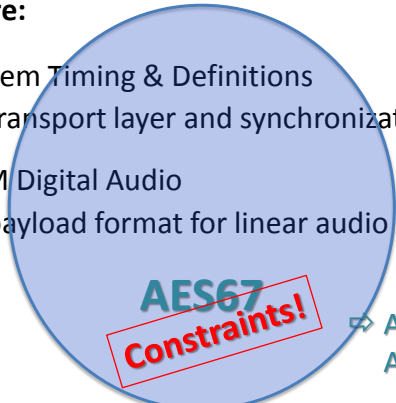
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⇒ AIMS WP on AES67 / ST2110 Commonalities & Constraints



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2110-31 – transparent transport of AES3 audio data

- Can transport any format which can be encapsulated in AES3
 - L24 PCM w/ AES3 subframe meta data (PCUV bits)
 - non-PCM audio and data formats as defined by SMPTE ST 337 / 338 (i.e. Dolby®E etc.)



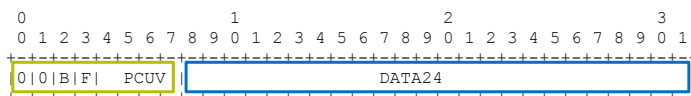
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2110-31 – transparent transport of AES3 audio data

- Builds on RAVENNA’s AM824 (IEC 61883-6) payload definition:
 - retains AES67 definitions for synchronization and RTP usage
 - uses 3 bytes for PCM24 + 1 byte for AES3 meta data



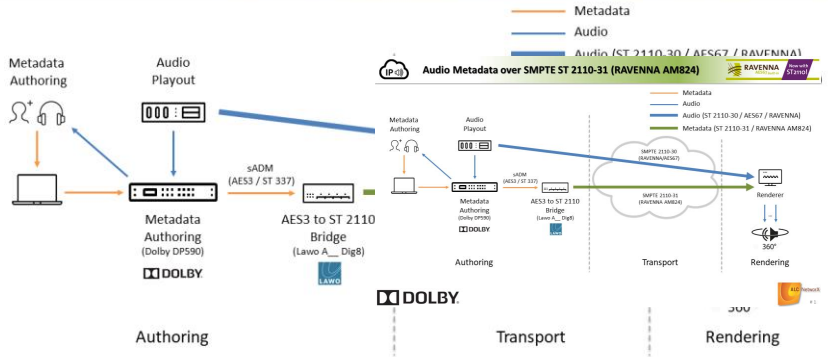
- RTP payload format signaled in SDP:
 - a=rtmpmap:<pt> AM824/48000/<nchan> - with <nchan> always being an equal number (stereo channels)
- retains all other SDP parms



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Audio Metadata over SMPTE ST 2110-31 (RAVENNA AM824)



⇒ Demo @ RAVENNA booth #8.F57



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SMPTE 2110 - Professional Media over Managed IP Networks

What else is required for a working system?

- ⇒ Establishing connections!
 - Not covered by SMPTE 2110



- AMWA: Advanced Media Workflow Association
- NMOS: "A growing family of specifications [...] which are complementary to and co-exist with industry specifications like ST2110 and AES67"



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AMWA NMOS - Networked Media Open Specifications

NMOS specifications:

- IS-04: Discovery & Registration
 - enumeration and registration of available system resources
- IS-05: Connection Management
 - connecting receivers to available streams
- IS-08: Audio Channel Mapping
 - patching flow channels to inputs / outputs



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AMWA NMOS - Networked Media Open Specifications

Key elements

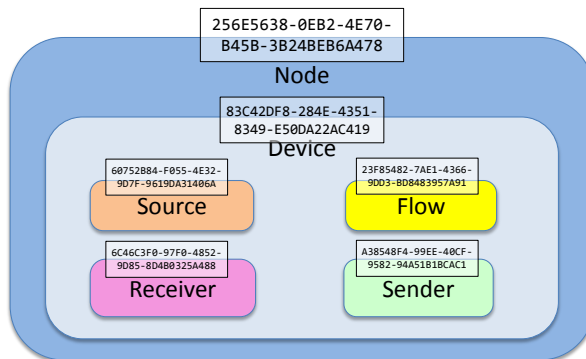


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Identity



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IS-04 Discovery & Registration

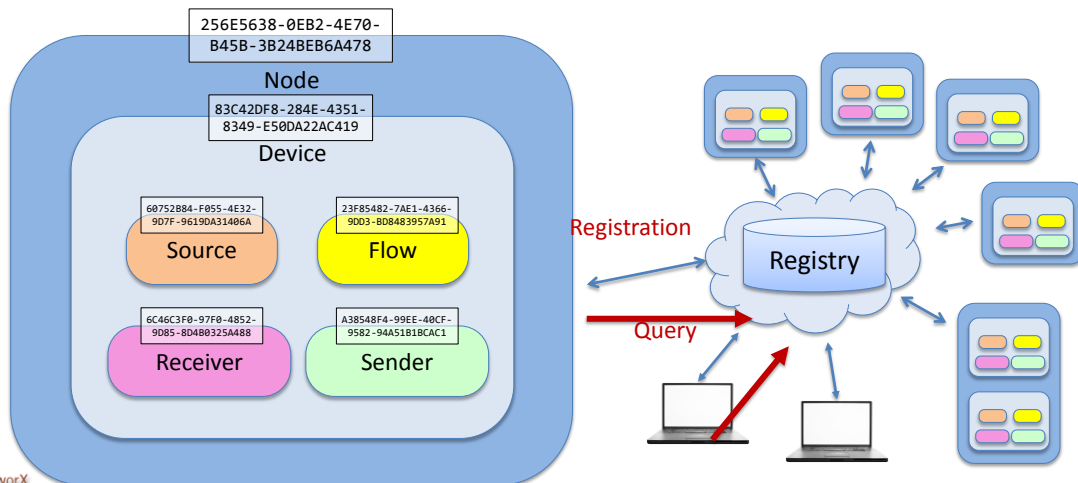
Ensure that parts of a networked media system can find each other

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IS-05 Connection Management

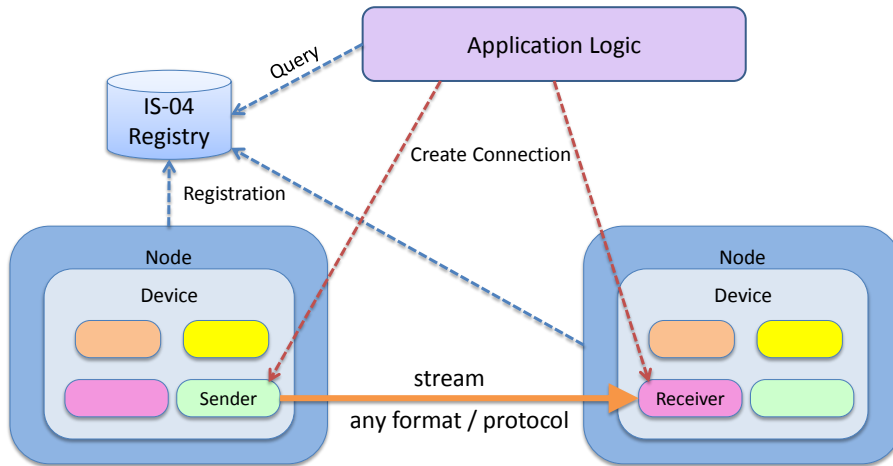
Make it simple for applications
to (dis)connect flows



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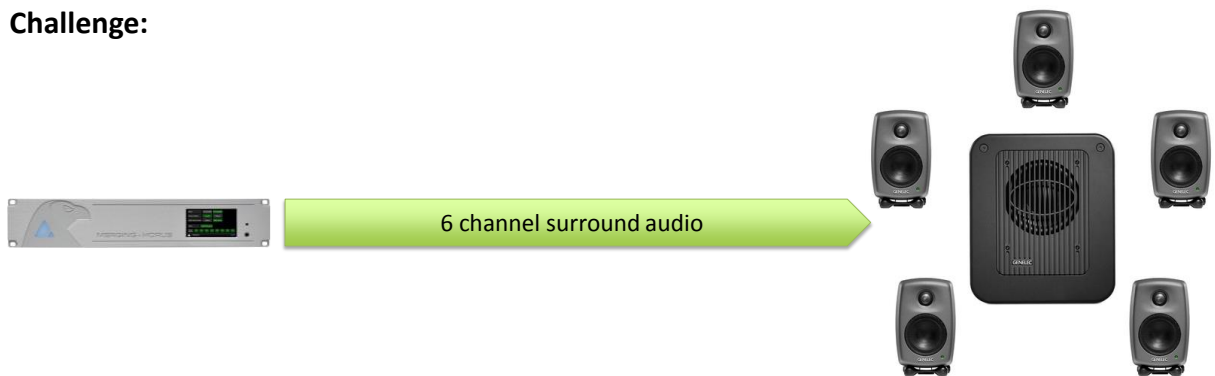


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Challenge:

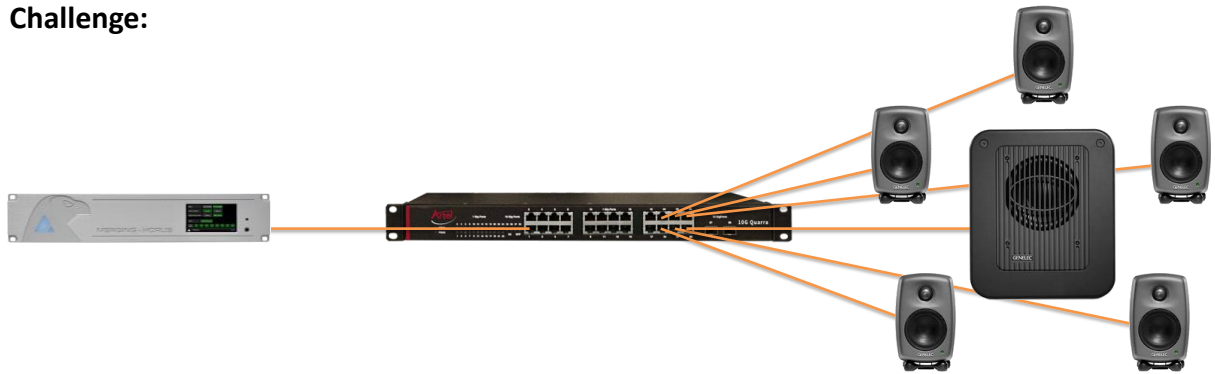


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Challenge:

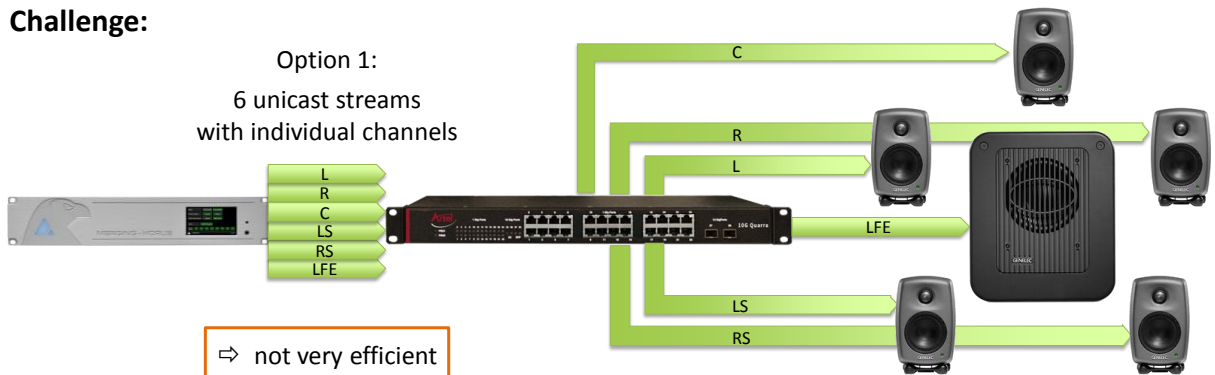


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Challenge:



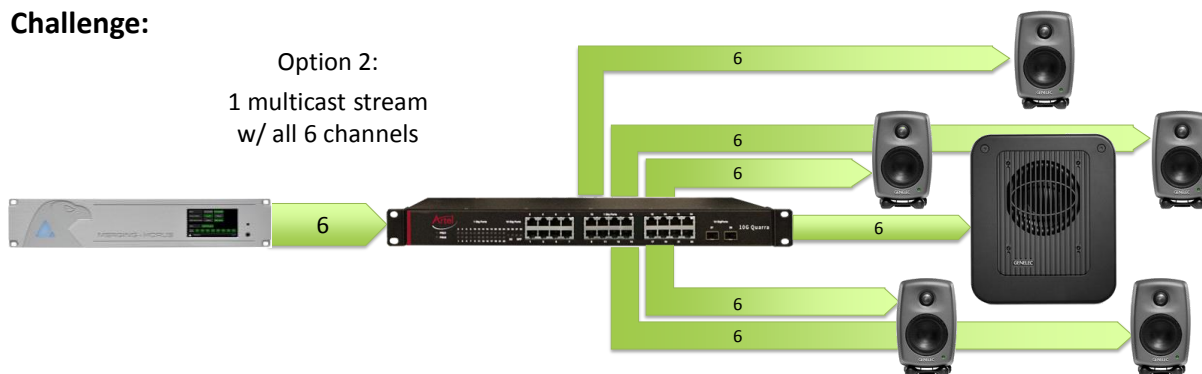
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Challenge:

Option 2:
1 multicast stream
w/ all 6 channels



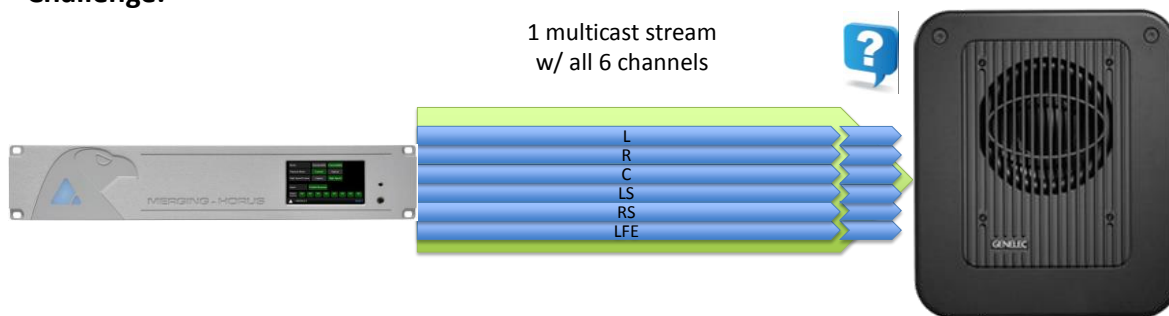
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IS-08 Audio Channel Mapping

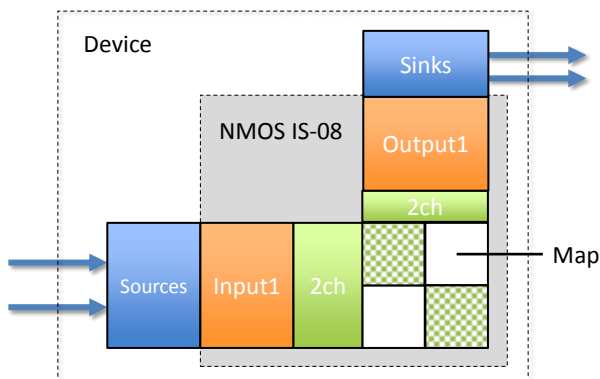
Map flow channels (tracks) to device I/O channels



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AMWA NMOS IS-08 - Audio Channel Mapping



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AMWA NMOS IS-08 - Audio Channel Mapping

- Interaction with NMOS IS-05 – connecting incoming stream channels to device output channels



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AMWA NMOS IS-08 - Audio Channel Mapping

X-nmos/channelmapping/v1.0/io

```

{
  "inputs": {
    "c200c6d3-e4fa-4170-9f46-d1eecca23173b": {
      "caps": {
        "block_size": 1,
        "reordering": true
      },
      "channels": [
        {
          "label": "input channel 1"
        },
        {
          "label": "input channel 2"
        }
      ],
      "parent": {
        "id": "1153f888-7a09-4783-838b-b00b77d3af85",
        "type": "receiver"
      },
      "properties": {
        "description": "AES67 Audio Input",
        "name": "AES67"
      }
    }
  },
  "outputs": {
    "ee0b65be-ed0c-40b5-affe-9deebe2e383d": {
      "caps": {
        "routable_inputs": [
          "c200c6d3-e4fa-4170-9f46-d1eecca23173b"
        ]
      },
      "channels": [
        {
          "label": "Out-000"
        },
        {
          "label": "Out-001"
        }
      ],
      "properties": {
        "description": "ALSA dmix (2ch)",
        "name": "dmix",
        "source_id": "00000000-0000-0000-0000-000000000000"
      }
    }
  }
}

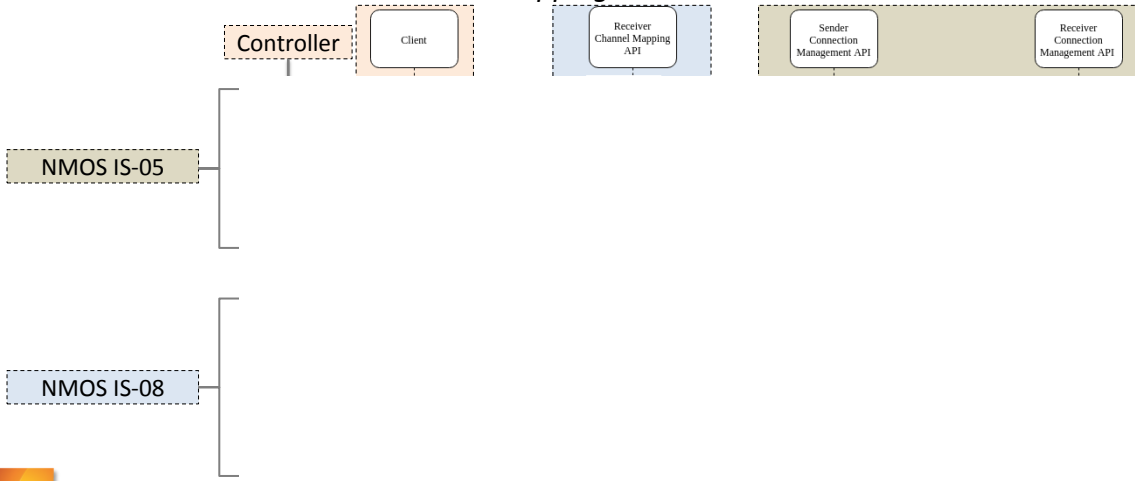
```



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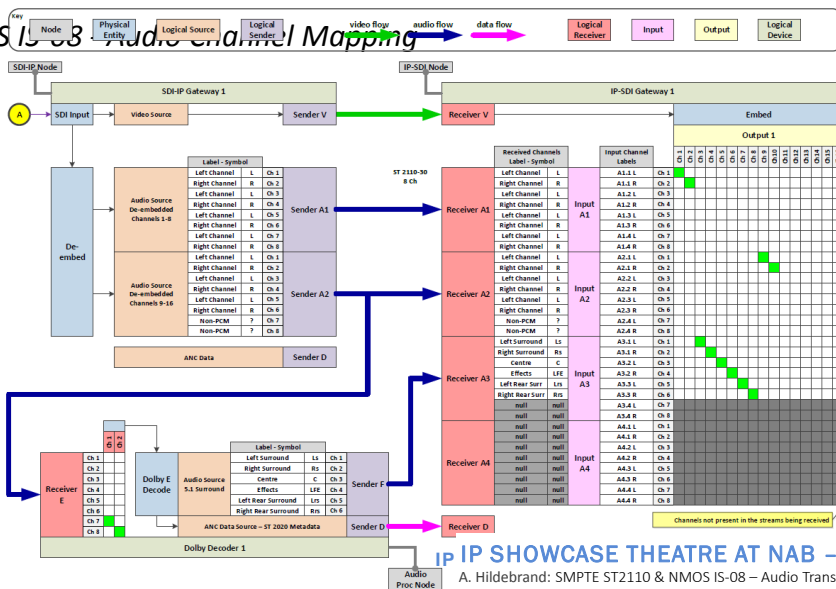


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AMWA NMOS IS-08 Audio Channel Mapping

IP-SDI Gateway



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AMWA NMOS - Networked Media Open Specifications

More information on NMOS wiki on Github:

<https://github.com/AMWA-TV/nmos/wiki>



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Thank you for your attention!

RAVENNA booth Hall 8
#8.F57

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