Who is AIMS and What is ST 2110?

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What is AIMS?

- Not for profit trade alliance
- Open to all
- Funded by members
- Common Goal
Building on a Strong Foundation for Market Adoption

One common goal… Distinct roles… Powerful Partnership
Open Standard?

Open [oh-puh n]
Anyone can build any product from the standard

Standard [stan-derd]
An engineer can build a “correct” product (conforms to the standard)
The Nice Things Open Standards Bring Us

**Dilemma**
- Closed proprietary technologies
- Open standard approach

**Open standards**
- Addresses current needs
- Future advancements

**Scalability**
- Agility and Flexibility
- Add capabilities without workflow rebuild
- Best-of-breed
What is Meant by AV over IP?

- Move streams (audio, video, ancillary, control) through an IP network
- Synchronized (A <-> V and also different sources)
- Low-Latency (<1 Frame)
- Publish, Discover, Subscribe, Stream and Control

AV over IP is...

Could be used in place of HDMI or DisplayPort
ST 2110 and NMOS

• SMPTE ST 2110 - Transport
  • Essence Streams
  • Timing
  • Description

• NMOS
  (Networked Media Open Specification)
  • Registration
  • Discovery
  • Subscribe
  • Control
Two Fundamental Approaches to IP Transport

- **Bundled** (Audio, Video, Metadata together)
  - Audio/Video/Metadata/Sync travel *coherently*
  - Requires extra work to “unpack” separate essences

- **Essence-based** (Audio, Video, Metadata separate)
  - Ideal for *dedicated endpoint devices*
  - Individual essence kept in sync using PTP timing
The Essence-based Approach: SMPTE ST 2110

Published beginning in 2017
System Timing and Definitions: SMPTE ST 2110-10
- Covers the system as a whole, the timing model, and common requirements across all essence types

Uncompressed Active Video: SMPTE ST 2110-20
- Documents the IP transport of uncompressed active video using an RTP format based on IETF RFC 4175

PCM Digital Audio: SMPTE ST 2110-30
- Documents and constrains the use of IP-encapsulated PCM audio in a manner based on and compatible with AES67
Ancillary Data: SMPTE ST 2110-40
- Documents the IP transport of SMPTE ST 291 ancillary data using an RTP mapping based on IETF RFC 8331

Traffic Shaping and Delivery Timing for Uncompressed Active Video: SMPTE ST 2110-21
- Specifies the traffic shaping model for senders and corresponding requirements on receivers of SMPTE ST 2110-20 (video) streams

AES3 Transparent Transport: SMPTE ST 2110-31
- Specifies the real-time, RTP-based transport of AES3 signals over IP networks, referenced to a network reference clock.
Constant Bit-Rate Compressed Video: SMPTE ST 2110-22
• Specifies parameters for the real-time, RTP-based transport of constant bit-rate compressed video over IP networks, referenced to a common reference clock. It also defines a SMPTE Registry for the approved compressed video payloads

Payload-agnostic metadata: SMPTE ST 2110-41
• Documents a payload-agnostic method for carriage of various types of metadata that can be synchronized with an ST 2110 essence stream through the same mechanisms as other 2110 streams
Synchronization and Alignment in ST 2110

- **Precision Time Protocol**
- A *proven* technology used in multiple industries (IEEE 1588)
- A method for distributing precise, GPS referenced time stamps over an IP network for *synchronization* and *alignment* of signals

*Both AES67 and SMPTE ST 2110 use PTP*
## SMPTE ST 2110 Suite

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Status</th>
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<tbody>
<tr>
<td>SMPTE ST 2110 - 10</td>
<td>System - RTP, PTP and SDP</td>
<td>Approved</td>
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<td>SMPTE ST 2110 - 20</td>
<td>Video - Uncompressed</td>
<td>Approved</td>
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<td>SMPTE ST 2110 - 21</td>
<td>Video - Performance of Transmitters (Packet Pacing, Bursts and Gaps)</td>
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<td>SMPTE ST 2110 - 22</td>
<td>Video - Compressed</td>
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<td>SMPTE ST 2110 - 30</td>
<td>Audio - Uncompressed (PCM)</td>
<td>Approved</td>
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<tr>
<td>SMPTE ST 2110 - 31</td>
<td>Audio - Compressed (non-PCM, AES3, Guard-band aware and Stereo)</td>
<td>Approved</td>
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<td>SMPTE ST 2110 - 40</td>
<td>Data - Ancillary</td>
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<td>SMPTE ST 2110 - 41</td>
<td>Payload-agnostic metadata</td>
<td>In Progress</td>
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## Standards?
### Technical Recommendations

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<td>NMOS IS - xy</td>
<td>Flow Grouping, ID &amp; Timing, Scalability, Security &amp; more (future Specification by AMWA)</td>
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<td>SMPTE ST RDD 34</td>
<td>Sony LLVC compression (Registered Disclosure Document by SMPTE)</td>
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<td>SMPTE ST RDD 35</td>
<td>IntoPIX TICO compression (Registered Disclosure Document by SMPTE)</td>
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<tr>
<td>JT-NM TR-1001-1</td>
<td>System Environment and Device Behaviors for SMPTE ST 2110 Media Nodes in Engineered Networks (Technical Recommendation by JT-NM)</td>
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</table>
ST-2110 in action
ST 2110 / NMOS in Pro AV

• How Can we continue to evolve for Pro AV?

Pro AV Working group

• security
• HDCP
• compression
• IO expansion
• etc..

• Seamless transport of Video, Audio, and Data
• Compressed and uncompressed streams
• Control, management, and real-time applications
• Secure and ultra-low latency
Our Goal

High Quality

SMPTE ST-2110

Open

NMOS

Proven

adoption
Thank you