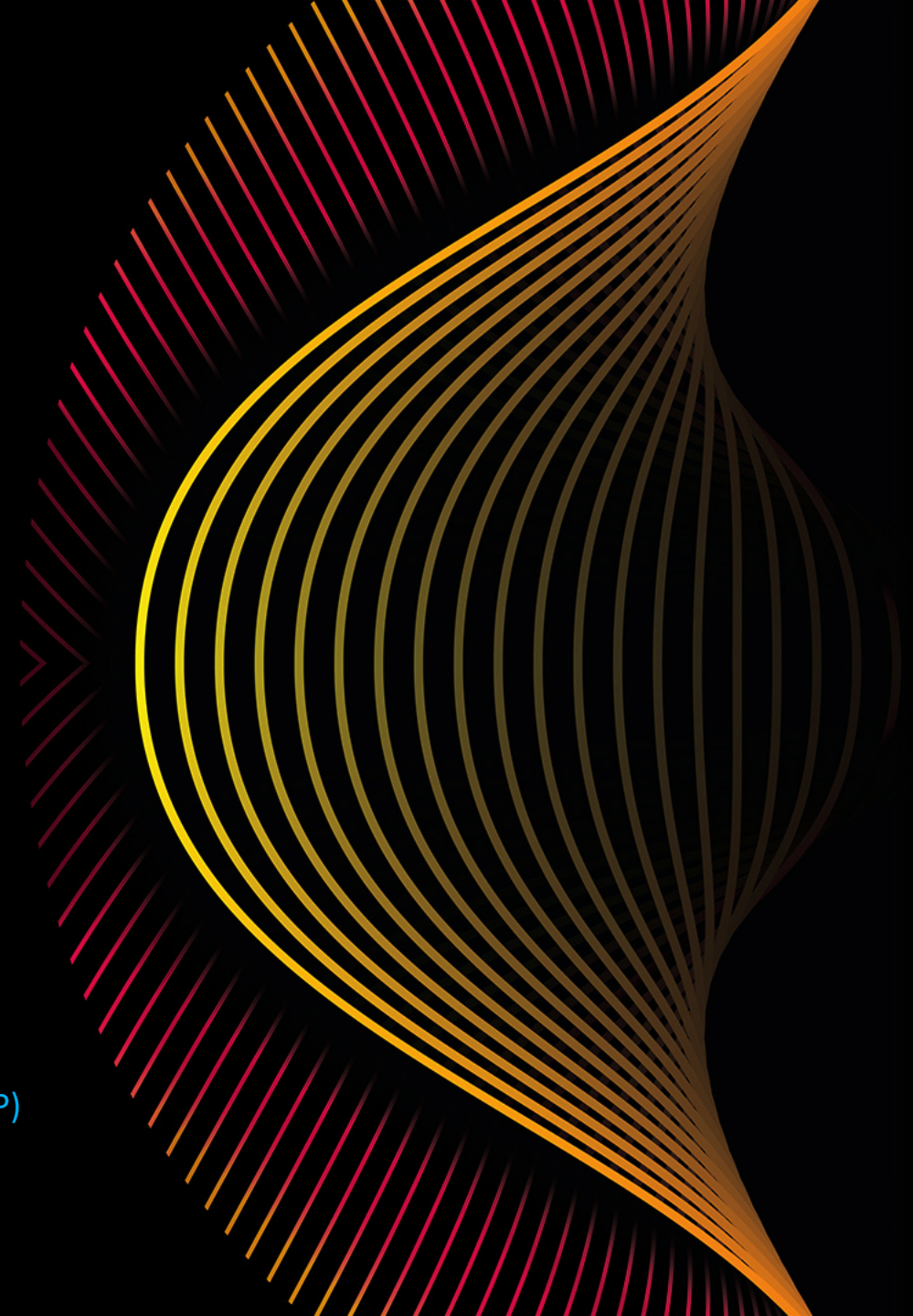# Audio Metadata Transport

AES New York 2019
AVoIP Pavilion - Session AIP22

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Task Group Leader, AES SC-02-12-R (Task group on Streaming audio metadata over IP)

Audio Metadata for Real Time Interfaces and Live Workflows

Audio Metadata

- All information about an audio program other than the PCM waveforms
- Many coded signals include at least some metadata in the bitstream

Static Metadata (per program/stream)

- Number of channels, sample rate, program title, channel labels, …
- Transmission timing variable; some per stream setup (e.g. sample rate)

Dynamic (time-varying) Metadata

- Loudness, spatial location, dialog levels, …
- **Timing required, potentially "sample accurate"**

Optional vs. Required

- **In current channel based practice metadata can be "optional" (e.g. fixed # channels, channel assignments, …)**
- **Object based methods and other Next Generation Audio applications "require" metadata**
  - **i.e. not possible to accurately reproduce intended audio**

"Microphone to Speaker" metadata

mixing
console

emission
coder
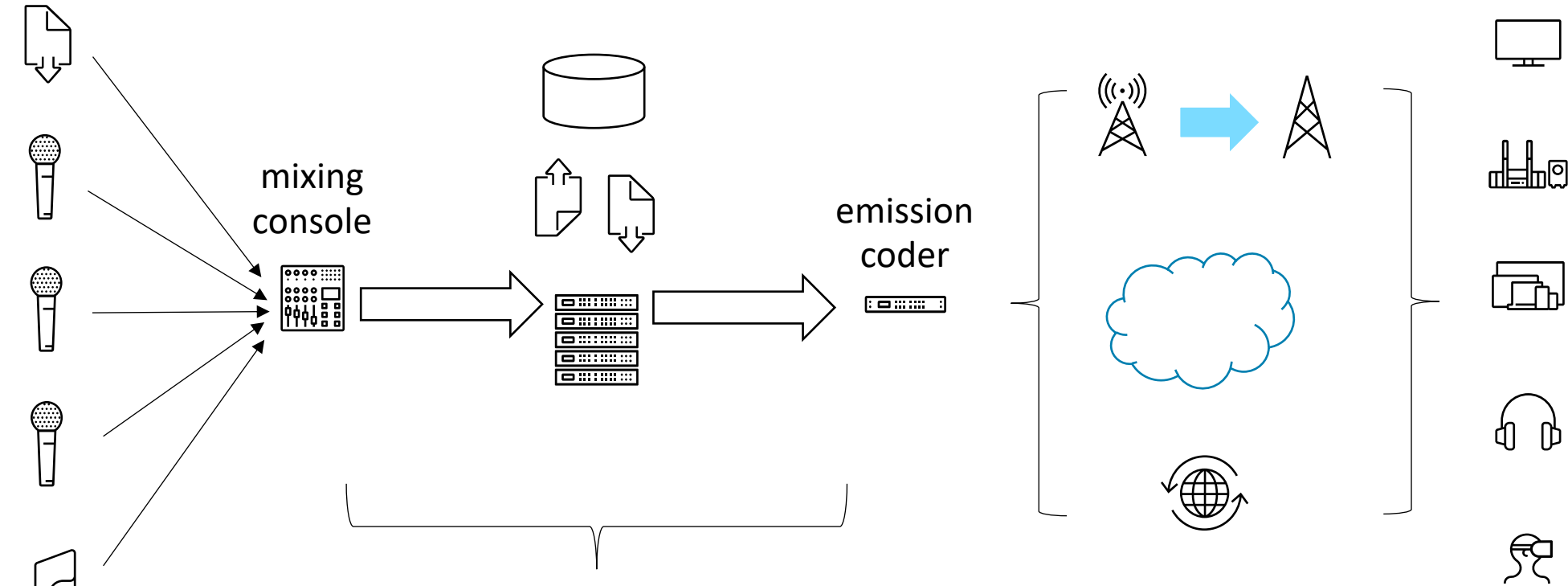
Audio Metadata in Live IP Streams

Audio Metadata in Legacy/"Non-IP" Live Production

Live production currently channel based in practice

- 2.0 or 5.1 most common

Limited support for audio metadata, especially dynamic (time varying) metadata

- But generally "sufficient" for current production practices

Lack of standards defining audio metadata and transport of metadata for live production

- Very limited support for dynamic audio metadata

SMPTE ST 337 – "Non-PCM data in AES3" in common use

- Includes formats for compressed audio with included metadata (e.g. Dolby E)

Very limited support for > 5.1 and new immersive formats (e.g. object based audio)

- Dolby ED2 for production/distribution

SMPTE ST 337 Data Types for Audio Metadata over AES3

SMPTE ST 2109 – "Audio Metadata over AES3"

- Defines general framework for transport of audio metadata in AES3 via ST337

- Payload based model

- Defines transport only - open to any metadata format

- SMPTE RDD 49 (PMD) defines a payload based audio metadata format optimized for ST 2109

SMPTE ST 2116 – "Serial ADM over AES3"

- Transport of ITU-R BS.2125 audio metadata in AES3 via ST 337

- Audio Definition Model (ADM) BS.2076 data formatted for serial interchange

- Currently SMPTE Draft Publication

Both support sample accurate transport of live dynamic audio metadata

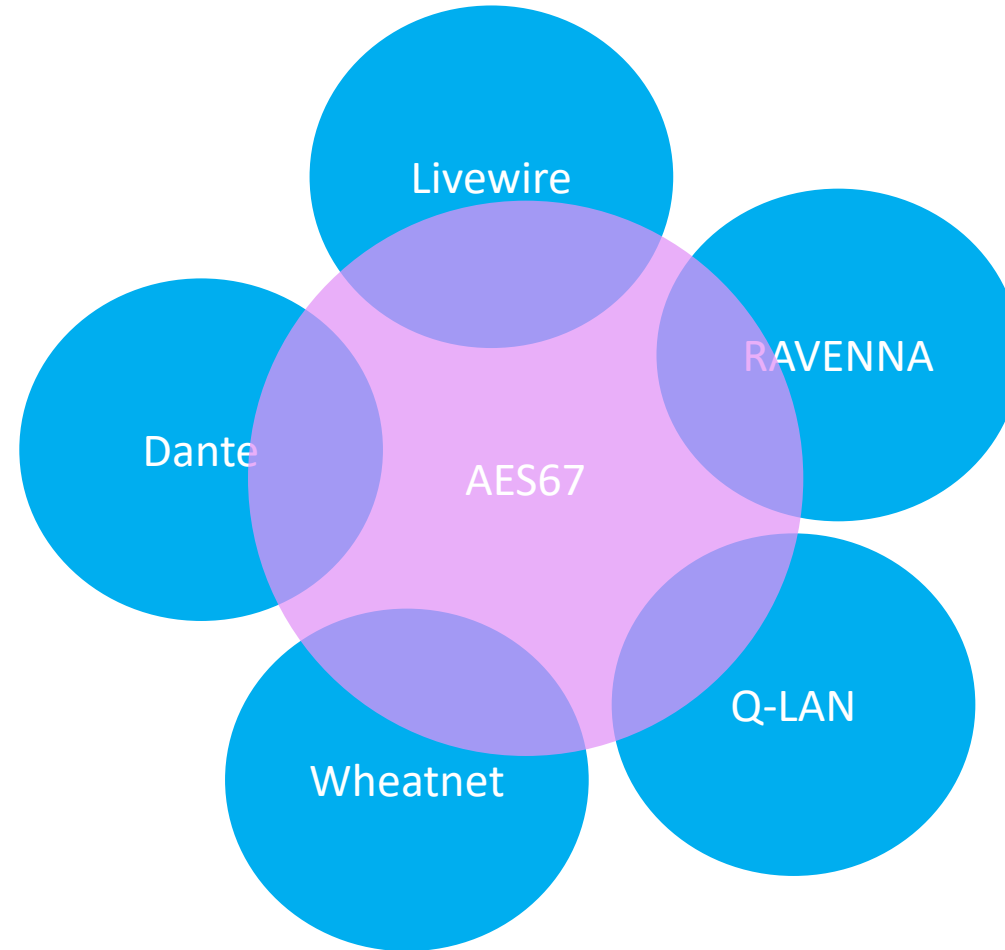# Audio Metadata in Legacy/"Non-IP" Interfaces
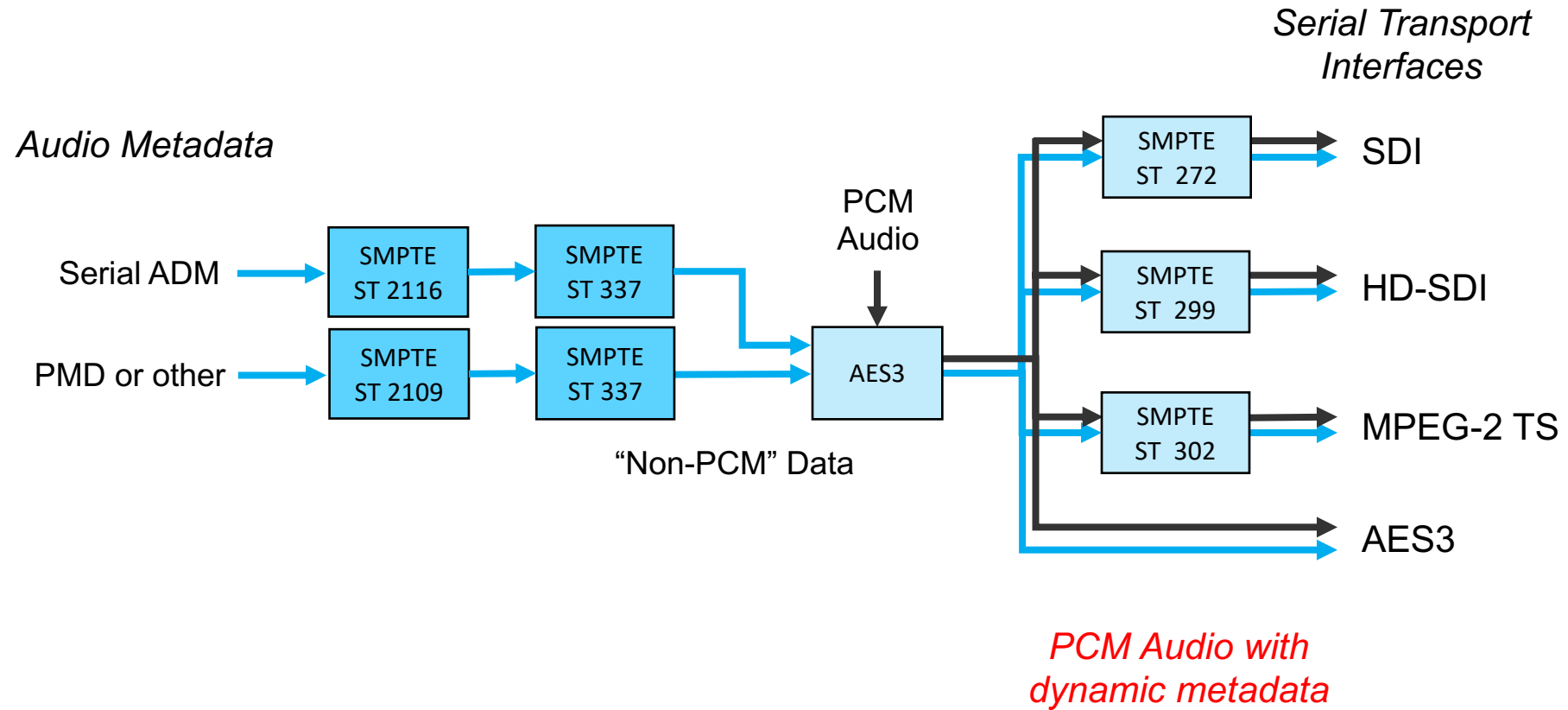
Audio over IP (AoIP)

AES67 - streaming audio-over-IP *interoperability*

A single standard for interchange

AES67 is "PCM Audio" only with limited signaling metadata

Metadata interchange?

Audio/Video over IP (AVoIP)

SMPTE ST 2022-6 - Transport of High Bit Rate Media Signals over IP Networks (HBRMT)

- Includes SDI audio (embedded in ancillary space)

SMPTE ST 2110 Series - Professional Media Over Managed IP Networks
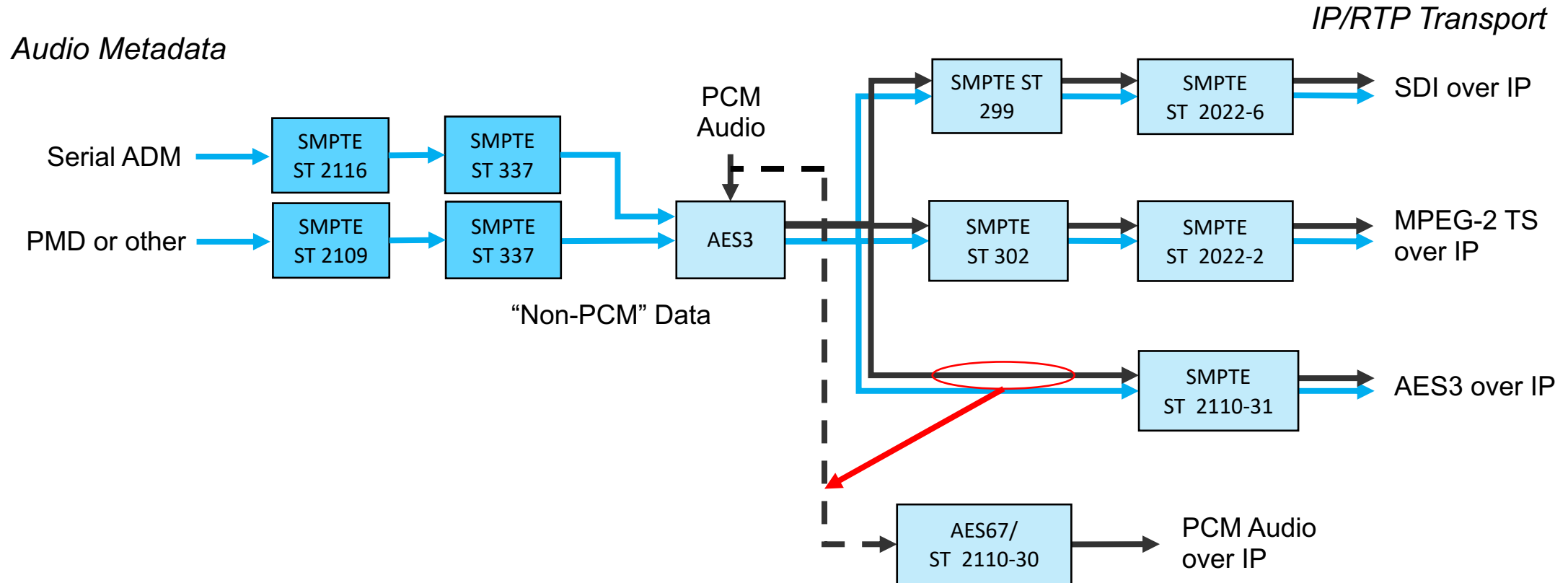
SMPTE ST 2110-30 - PCM Digital Audio

- Based on AES67
- As with AES67 transports PCM Audio only; no support for "non-PCM" data
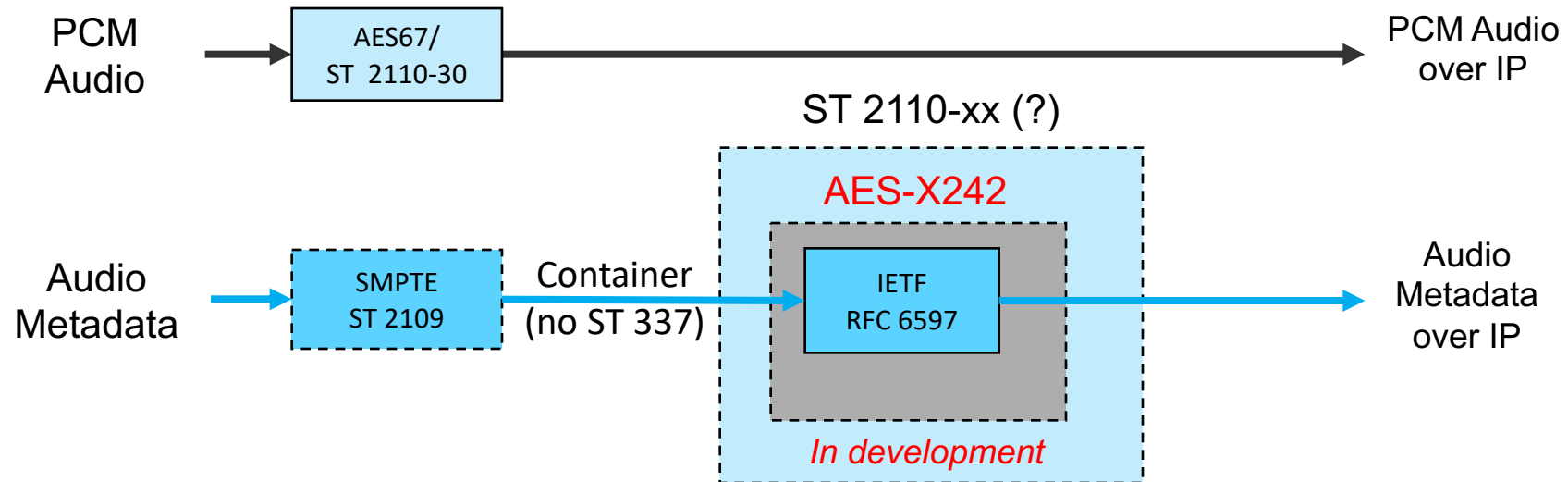
SMPTE ST 2110-31 - AES3 Transparent Transport

- Based on RAVENNA AM824
- Carries full AES3 signal with channel status/user data
- Supports "non-PCM" data; carriage of coded audio a primary application

Audio Metadata over IP (current)

IP Audio with Native Metadata (as proposed)

- Map ST 2109 containers *directly* to RTP
- Free of legacy constraints with AES3/ST337 tunneling
- Full metadata support for NGA and advanced audio applications

Project AES-X242, Streaming audio metadata over IP networks

http://www.aes.org/standards/meetings/init-projects/aes-x242-init.cfm

- To define a standardized method for transporting metadata associated with audio in an AES67 stream. The audio metadata shall be transported in a separate stream that is sent in parallel to AES67 streams rather than part of the AES67 stream. The standard shall define synchronization between the audio metadata transport and the associated AES67 transport. The transmission method shall be low latency and have a level of network performance equivalent to AES67. Within the scope is formatting of the streaming audio metadata for transport. Suggested is an open standards based framework that supports both static and dynamic, time synchronous metadata that is optimized for live workflow applications. The standard shall consider all use cases for metadata associated with AES67, support existing AES audio metadata standards, and be extensible for future metadata requirements. The standard will consider binding between the audio metadata transport and the associated AES67 transport.
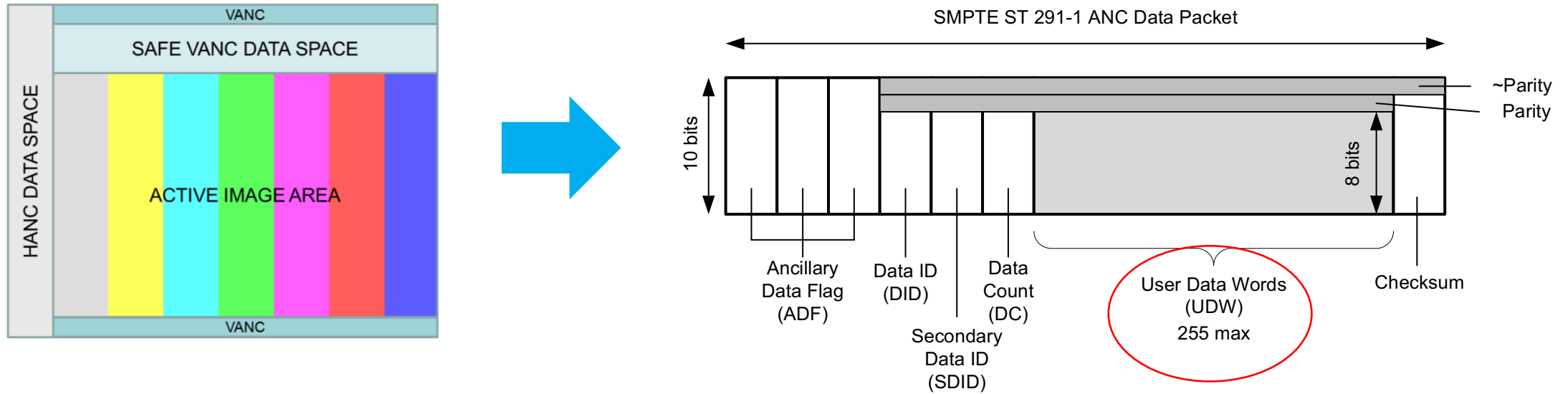
Audio metadata for AES67

- Separate RTP stream for metadata associated with PCM essence in AES67

- Intended to support broader AES67 user base, not just broadcast applications

- Format agnostic, open to any kind of audio metadata

Work started in AES SC-02-12-R in 2017

- Currently in draft state

- Publication targeted for 2020

SMPTE ST 2110-40 – Ancillary Data over IP

References IETF RFC 8331 *RTP Payload for SMPTE ST 291-1 Ancillary Data*

Specific for transport of ST 291-1 ANC data packets

Open to arbitrary data but subject to restrictions of ANC packet structure

32NF-60 Studio Video over IP (SVIP): ST 2110-41 "Fast Metadata"

https://kws.smpte.org/higherlogic/ws/public/projects/558/details

- Problem to be solved:: In the ST 2110 suite, there is provision for carriage of legacy ST 291 ANC metadata. This legacy SDI-centric method is described in ST 2110-40 and provides an excellent bridge to IP for SDI services. In the IP-centric future, there will undoubtedly be new metadata requirements which will have no relevance or application in the SDI domain and additionally may not be appropriate for efficiently wrapping in legacy ST 291 SDI ANC packets for IP transport with 2110-40. This project will create a new transport method for arbitrary metadata using RTP packets in the same manner as the other 2110 standards. This method will not be strictly tied to any type or form of metadata. Use of the 2110 synchronization mechanism will permit transmission in association with a 2110 essence stream…

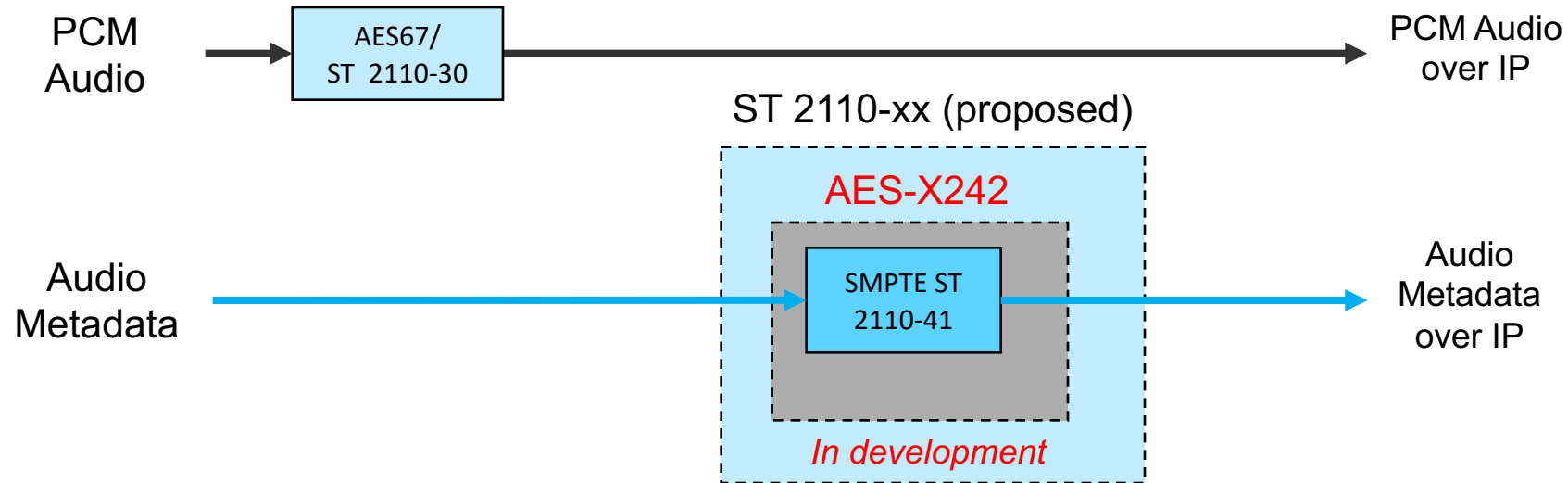- Similar application in legacy vs. IP metadata transport

Transmission of arbitrary metadata with limitations of ANC packet structure

Shares many common requirements with AES-X242 project

AES-X242 limited to audio metadata

ST 2110-41 open to "any" metadata

IP Audio with Native Metadata (revised)

PCM
Audio → | AES67/
ST 2110-30 | → PCM Audio
over IP

ST 2110-xx (proposed)

AES-X242

Audio
Metadata → | SMPTE ST
2110-41 | → Audio
Metadata
over IP

In development

- AES/SMPTE liaison to investigate "harmonization" of AES-X242 and ST 2110-41
  - i.e. share common RTP streaming format
- Still free of legacy constraints with AES3/ST337 tunneling
- *Both standards under active development – participation encouraged!*

AES-X242 Use Cases and Requirements

Live Broadcast

- RDD 49 (PMD) and Serial ADM

Music and Film Production

- MIDI, OSC-like protocols

Live Sound

Radio

Audio Streaming

General Transport

…

AES SC-02-12-R – Task group on Streaming audio metadata over IP

Task group to develop AES-X242 standard

SC-02-12-R seeking user input on AES-X242 use cases and requirements

AES-X242 development and interop testing needed

Input and participation encouraged!

See RAVENNA/Dolby demo of AES-X242 in Lawo Booth

Standards relevant to Audio Metadata over IP

SMPTE

- ST 2109 – Audio Metadata in AES3
- RDD 49 – Professional Metadata (PMD)
- ST 2116 – Serial ADM in AES3 (*Draft Publication*)
- ST 2110-30 – PCM Audio over IP
- ST 2110-31 – AES3 over IP
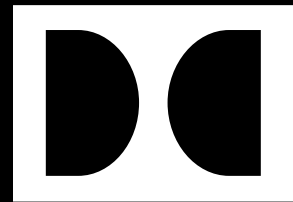- ST 2110-41 – Fast Metadata (*in development*)

AES

- AES67 – Audio over IP Interoperability
- AES-X242 – Audio Metadata over IP (*in development*)

ITU

- ITU-R BS.2125-0 – Serial ADM (Audio Definition Model)

Thank you

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