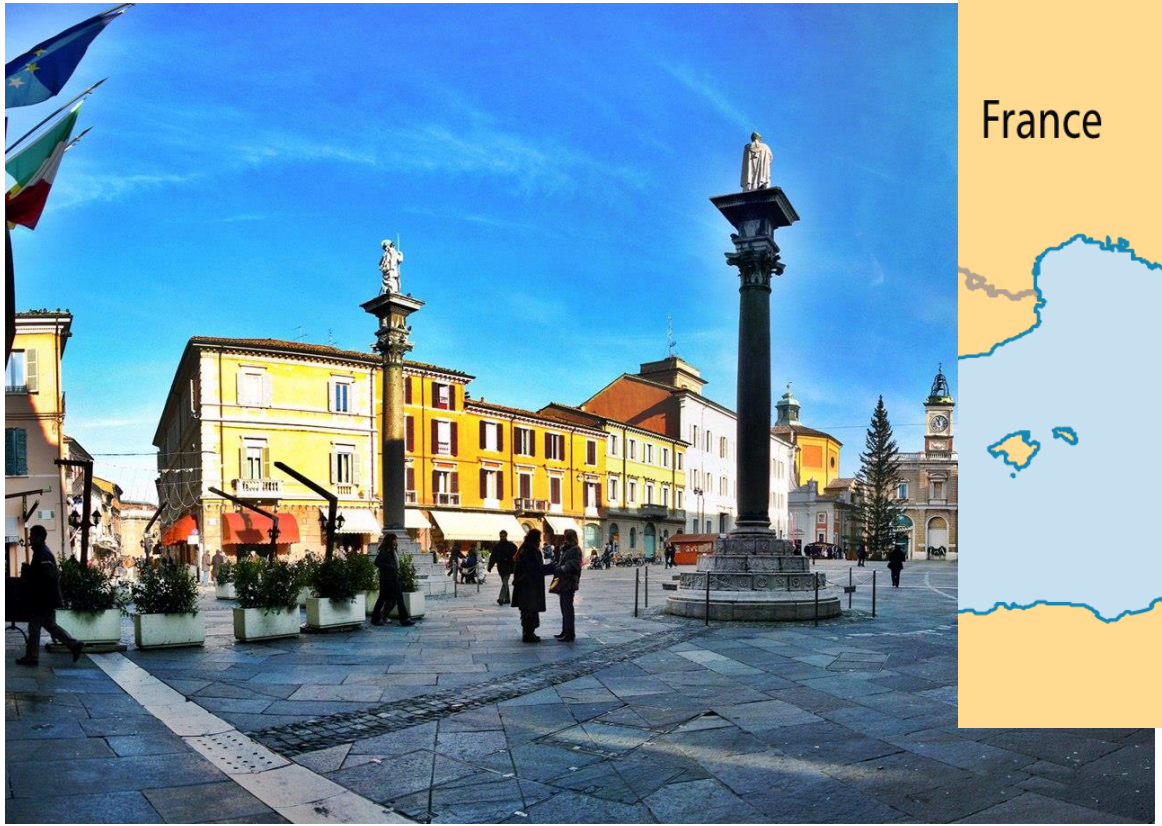
AES67 & SMPT ST 2110

- The Vulcan Nerve Pinch to RAVENNA ?

What is RAVENNA?



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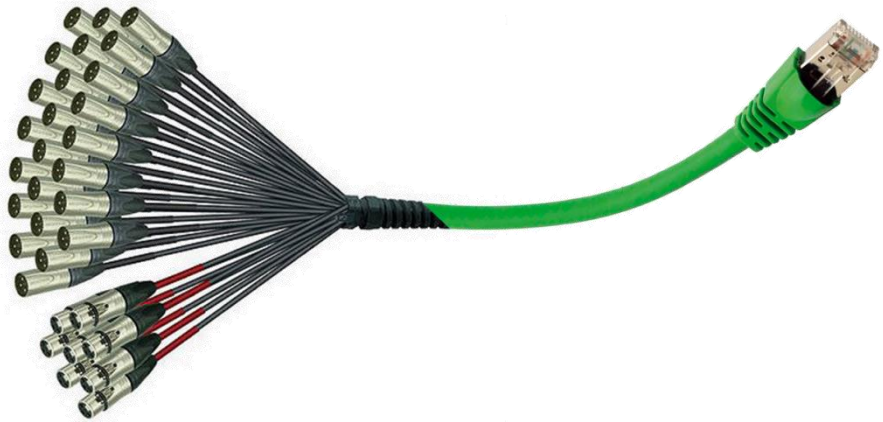


What is RAVENNA?

RAVENNA

The IP-based Real-Time Media Network

Real-time **A**udio & **V**ideo **E**nhanced

Next-Generation **N**etwork **A**rchitecture

Skip history

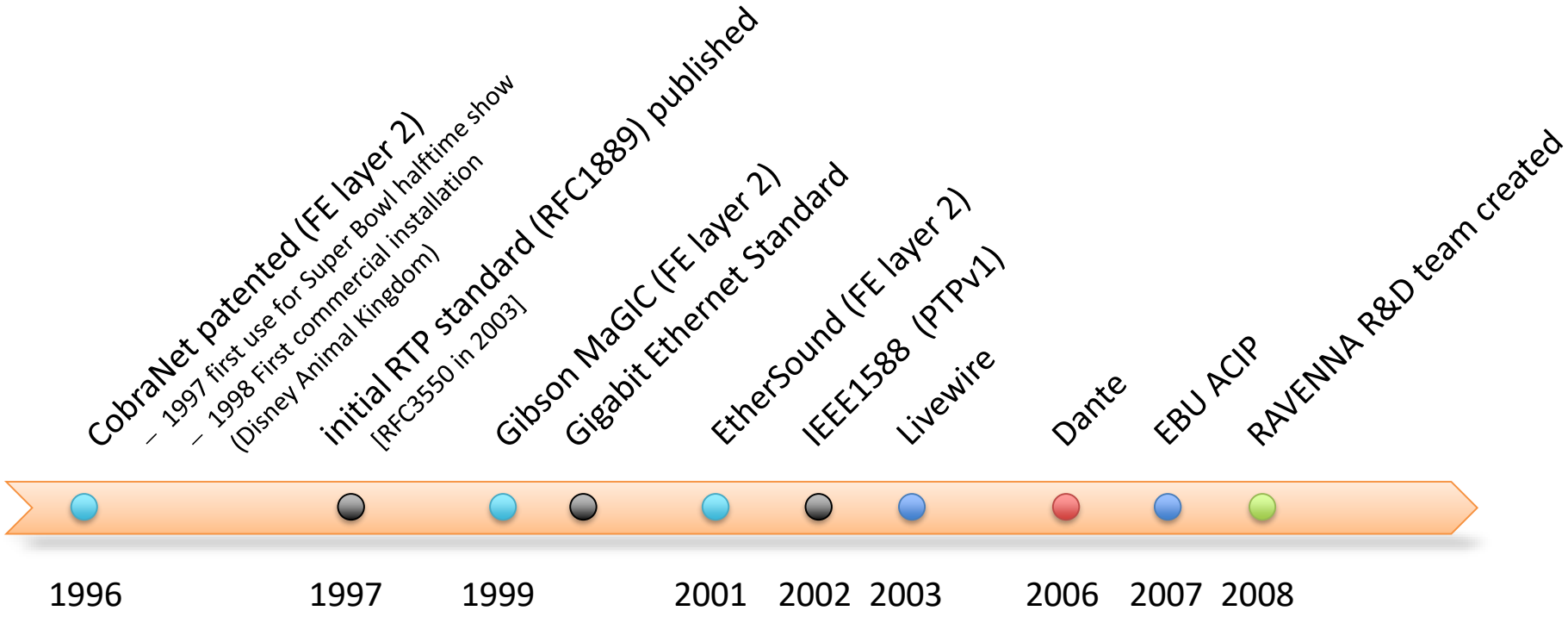
Why RAVENNA?

RAVENNA

The IP-based Real-Time Media Network

Skip why

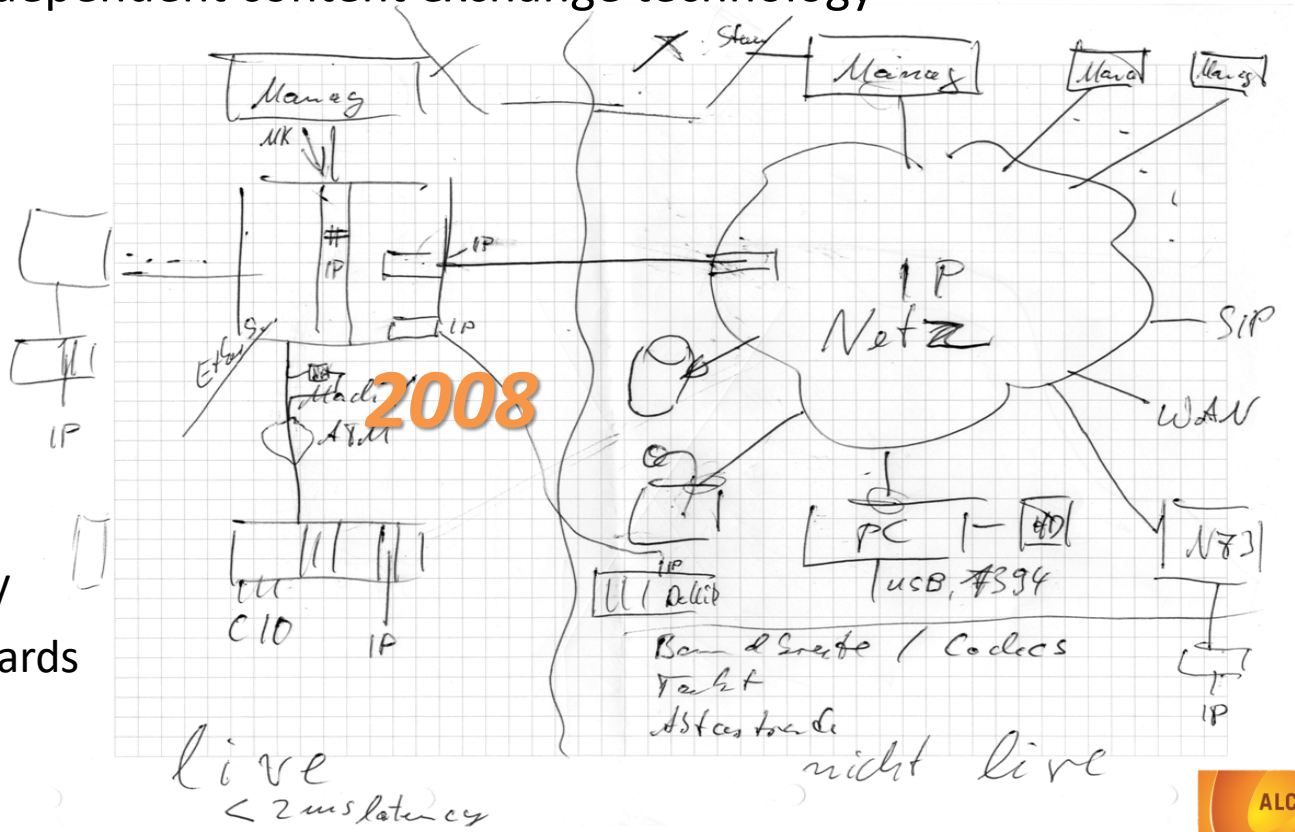
Networked audio timeline



Vision: a platform-independent content exchange technology

Requirements:

- scalable
- fast
- shareable
- flexible
- reliable
- routable
- non-proprietary
- based on standards



Why Networking?

- Availability – increase of network-based services (VoIP / NGN, IPTV, WAN distribution via “codecs” etc.) & performance of infrastructure (Ethernet / Gigabit, fiber, switches / routers etc.)
- Cost efficiency – equipment, cabling, planning, installation
- Flexibility – fast re-configuration / re-routing w/o change in cabling
- Scalability –performance scales w/ capabilities of network infrastructure
- Versatility – add’l services on same network (e.g. control signal, communication, “office” traffic etc.)
- Convergence – direct integration w/ PCs
- Resource efficiency – consolidation of maintenance efforts for engineering & service departments

Layer 1

Layer 2

AVB

Audio over IP

EtherSound

Layer 3

ACIP

TCP

Livewire

Audio over Ethernet

Confusion

Market Evaluation

Technology Assessment

A-Net

unicast

RTP

AES50

UDP

MADI

multicast

CobraNet

Media streaming

Dante

⇨ IP!

Why IP-based Networking?

- General advantages of networking: Reliability, flexibility, versatility, accessibility, scalability, cost advantage, maintenance efficiency, …
- Availability: IP-capable network equipment and infrastructure readily available and widely deployed
- Based on standards: IP standard protocols (the “internet protocols”) are widely supported (e.g. RTP/RTCP, RTSP, IGMP, SDP, DHCP, DNS etc.)
- Routing capability: content can be routed across campus networks and WAN connections without technology change
- Convergence: PCs can participate on the network without dedicated hardware
- Future-proof: IP-based services are growing into all areas of communication

Layer 1

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Take or Make?

RTP

A-Net

unicast

AES50

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multicast

CobraNet

Media streaming

Dante

⇨ IP!

Existing Audio-over-IP solutions / technologies / initiatives:

Technology	Purveyor	Date introduced	Technical requirements matched?	Open technology?
Livewire	Telos/Axia	2003	😐	😐
Wheatnet-IP	Wheatstone	2005	☹	☹
Dante	Audinate	2006	☺	☹
N/ACIP	EBU	2007	☹	☺
AVB	IEEE, AVnu	2005	☺😐☹	☺

Layer 1

ACIP

RTP

Media streaming

Layer 2

AVB

Audio over IP

EtherSound

Confusion

TCP

Livewire

Layer 3

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MAKE!

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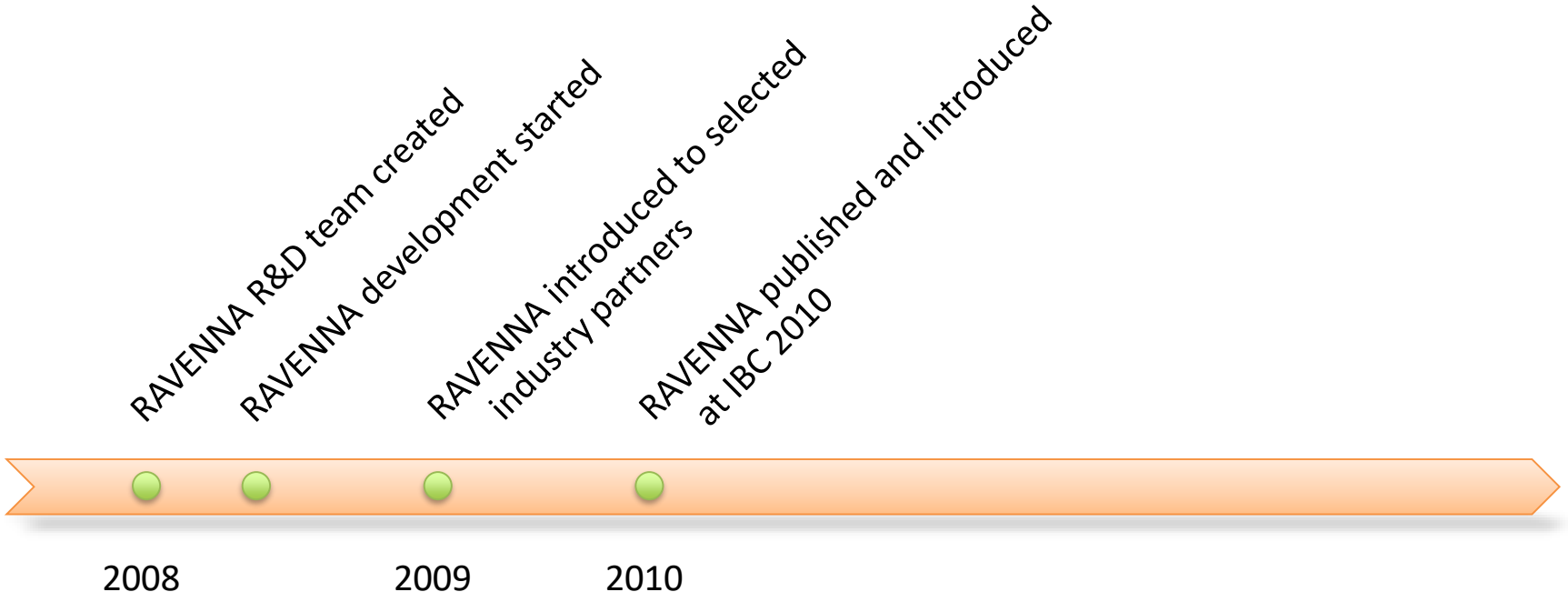
⇨ IP!

Networked audio timeline



An "Open Technology" platform:

- Based on **technology** publicly **available**
  - ⇨ *No proprietary "black box" design*
- Utilizes **standard protocols**
  - ⇨ *Proven technology, widely supported*
- Designed to work on **existing networks**
  - ⇨ *No new network equipment required*
- **No** proprietary **licensing** policy
  - ⇨ No cost per channel, suits all performance needs

- Draft on operating principles **published** since June 10th, 2011

*What is **RAVENNA**?*

RAVENNA Draft on Operational Principles

Ingredients:

20 ml PTPv2
500 g RTP
1 pkt multicast
1 pinch of Bonjour

Cooking order:

1. Stew PTP to order
2. Add RTP
3. Mingle with multicast
4. Add Bonjour on top

Serve hot and Enjoy!

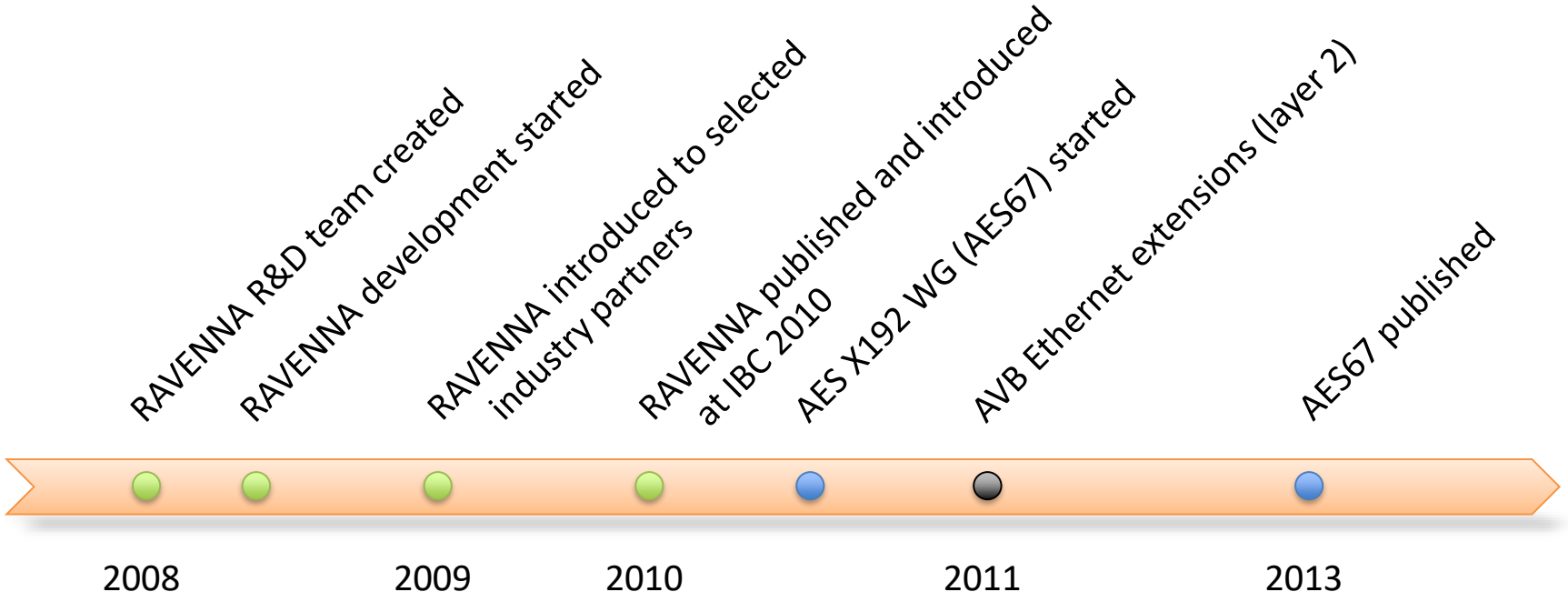
An "Open Technology" platform:

- Based on **technology** publicly **available**
  - ⇨ *No proprietary "black box" design*
- Utilizes **standard protocols**
  - ⇨ *Proven technology, widely supported*
- Designed to work on **existing networks**
  - ⇨ *No new network equipment required*
- **No** proprietary **licensing** policy
  - ⇨ No cost per channel, suits all performance needs

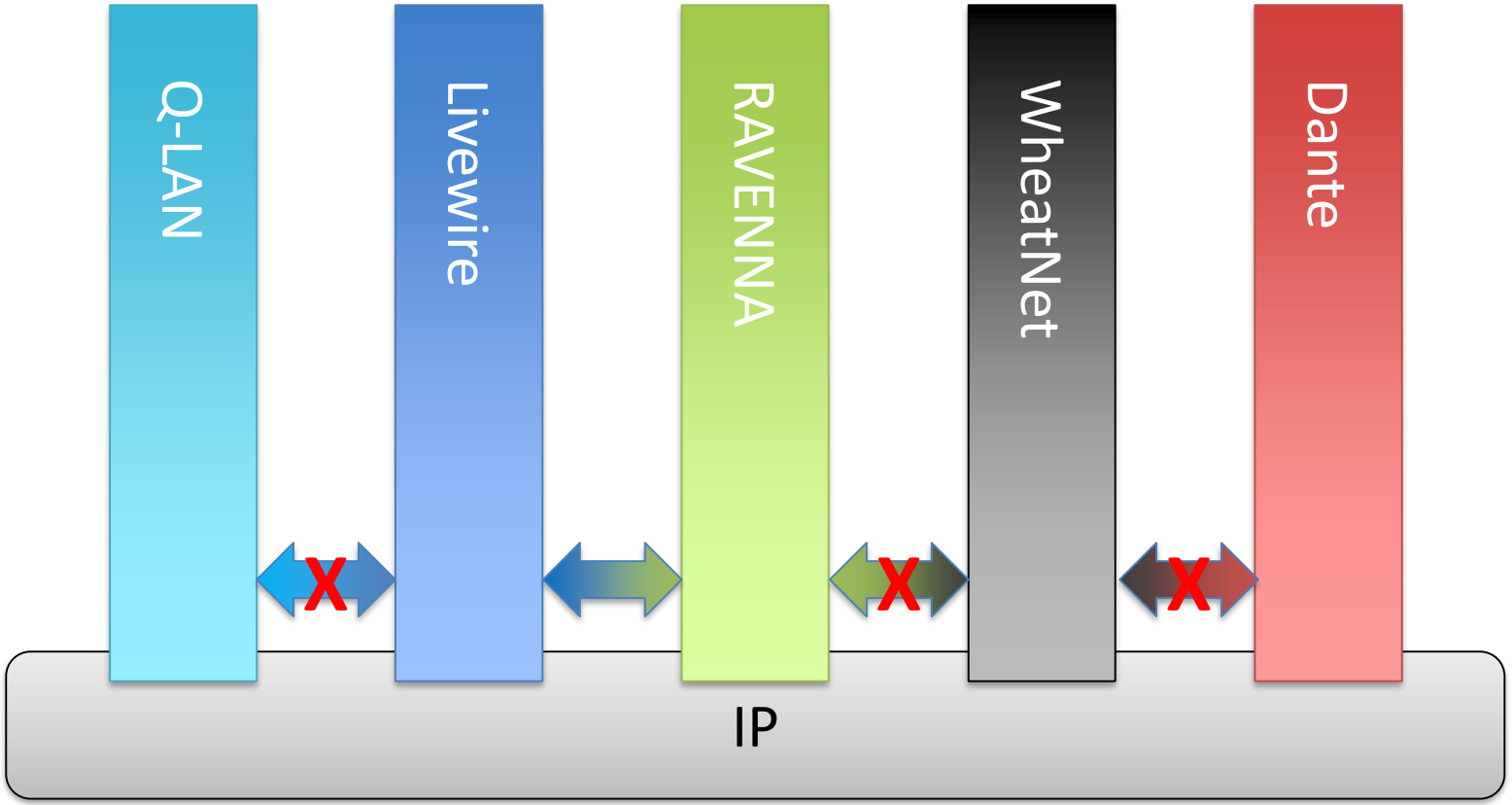
- Draft on operating principles **published** since June 10th, 2011
  - ⇨ *Anybody can implement / support RAVENNA technology*
- **Supported** by renowned companies from the ProAudio industry
  - ⇨ *Broad market acceptance*

RAVENNA Partners (& AES67 Supporters):

Networked audio timeline



AES standard for audio applications of networks - High-performance streaming audio-over-IP interoperability



AES standard for audio applications of networks - High-performance streaming audio-over-IP interoperability

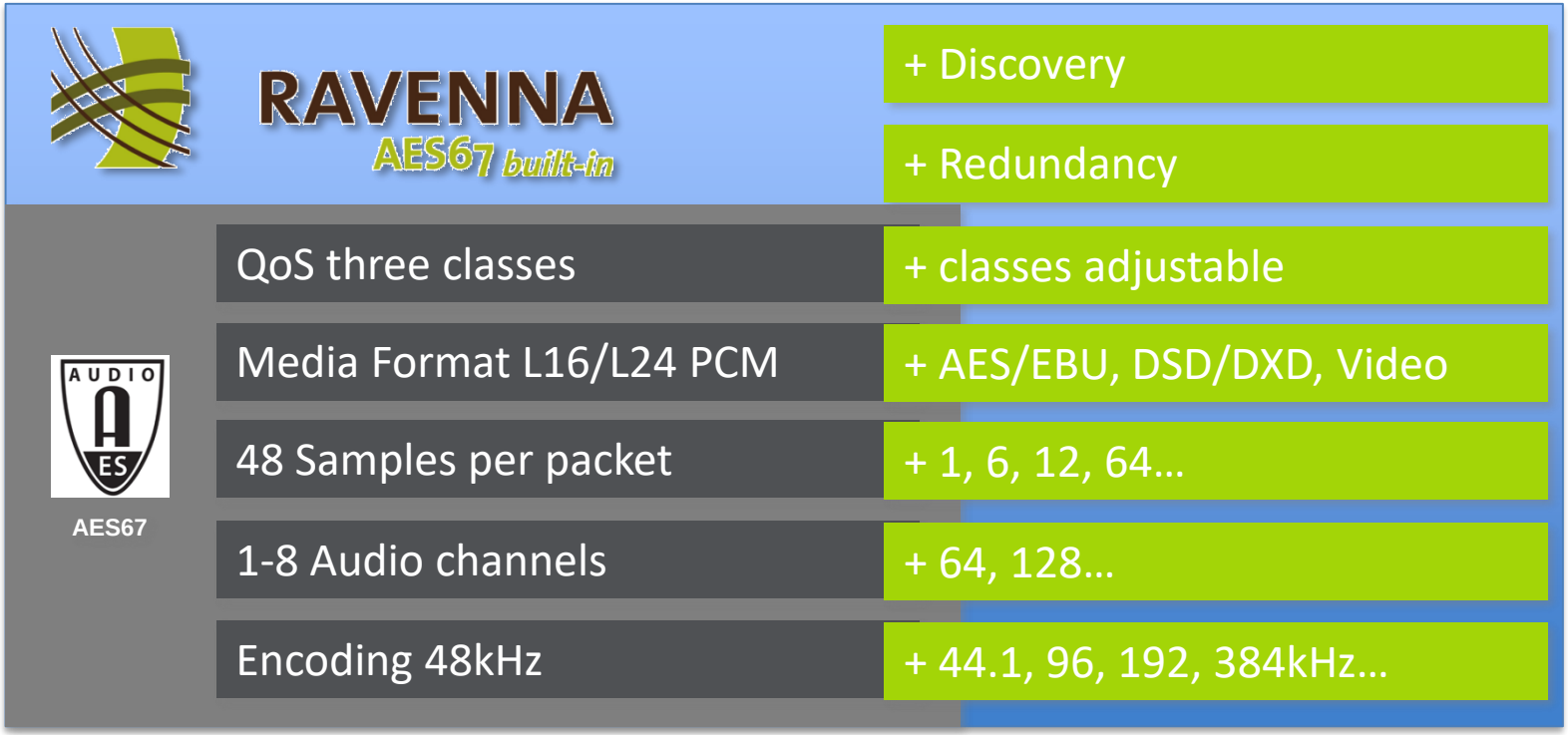
AES67

RAVENNA

AES67

RAVENNA

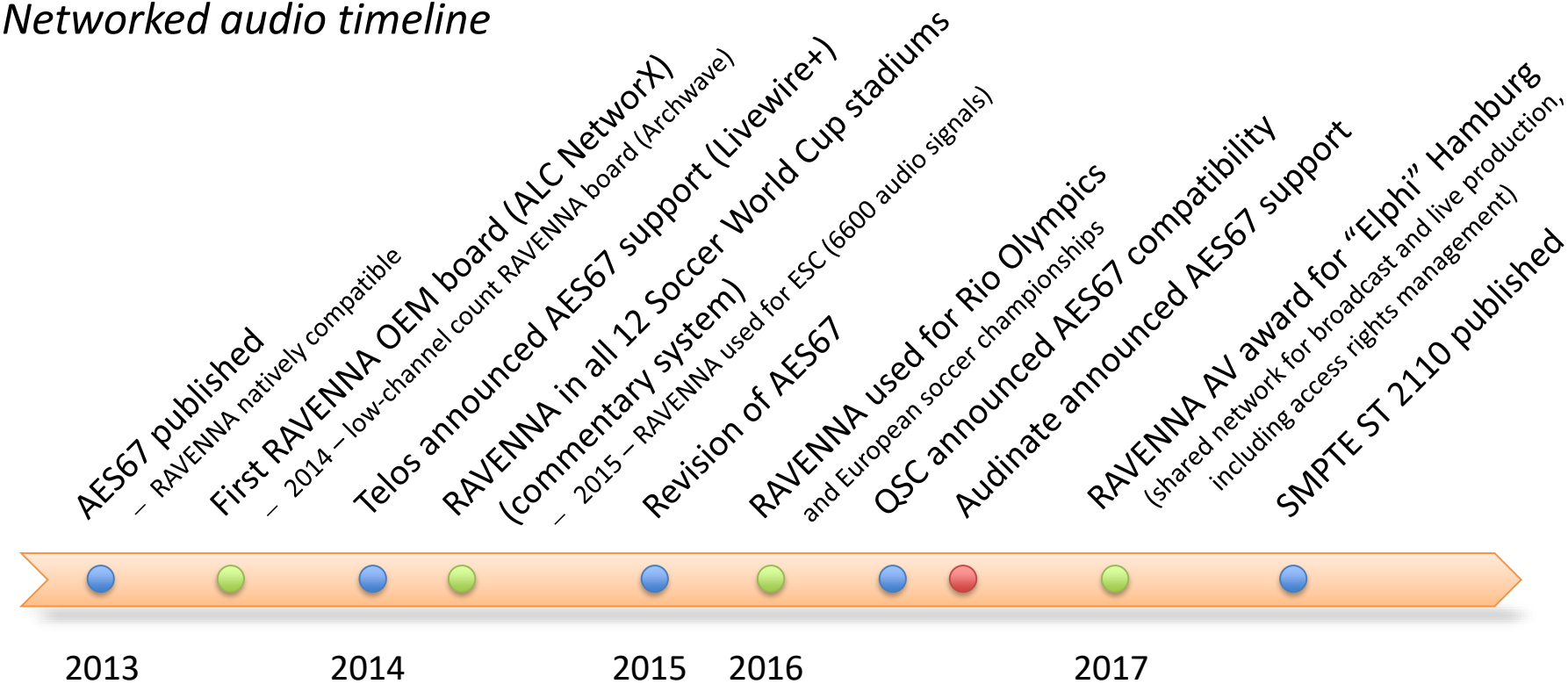
AES67	RAVENNA
	+ Discovery
	+ Redundancy
QoS three classes	+ classes adjustable
Media Format L16/L24 PCM	+ AES/EBU, DSD/DXD, Video
48 Samples per packet	+ 1, 6, 12, 64…
1-8 Audio channels	+ 64, 128…
Encoding 48kHz	+ 44.1, 96, 192, 384kHz…



RAVENNA

AES67 *built-in*

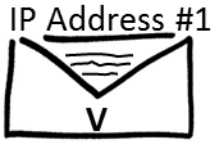
Networked audio timeline



The Essence-based Approach: SMPTE ST 2110

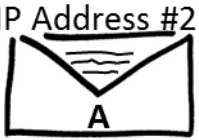
Active Video

IP Packetization of Active Video
Method: **SMPTE ST 2110-20**



Audio

IP Packetization of Audio Channels
Method: **SMPTE ST 2110-30**



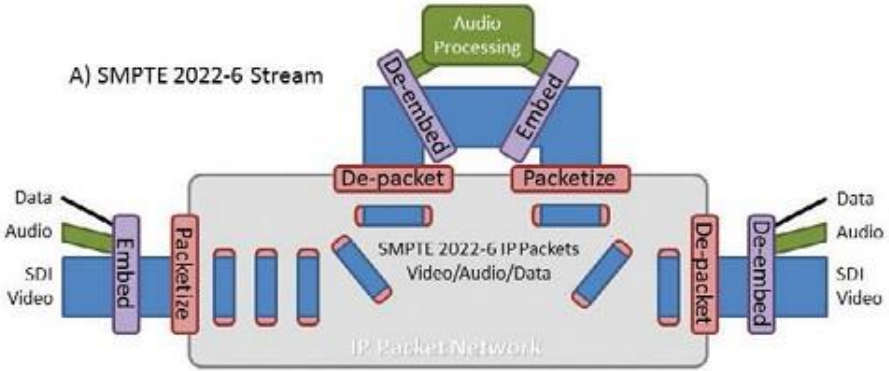
Metadata

IP Packetization of ANC Data
Method: **SMPTE ST 2110-40**

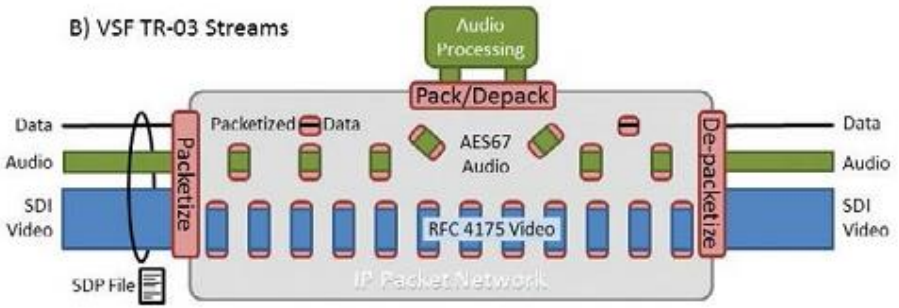
Published beginning in 2017

Bundled vs. Essence-based Approach

ST 2022-6



ST 2110



SMPTE 2110 - Professional Media over Managed IP Networks

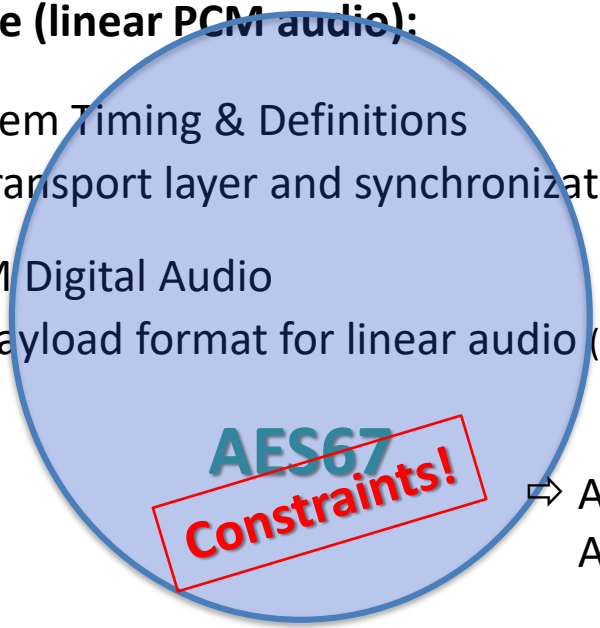
Document structure (audio):

- 2110-**10**: System Timing & Definitions
  - defines transport layer and synchronization (SMPTE2059, 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)

SMPTE 2110 - Professional Media over Managed IP Networks

Document structure (linear PCM audio):

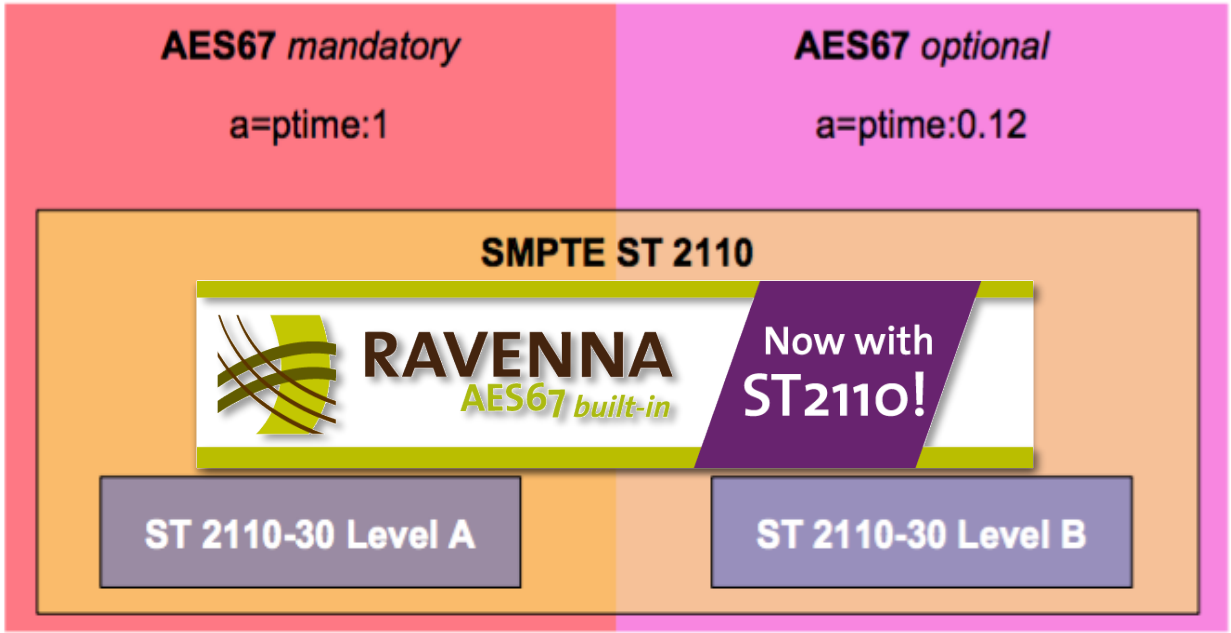
- 2110-10: System Timing & Definitions
  - defines transport layer and synchronization (SMPTE2059, clocks, RTP, SDP etc.)
- 2110-30: PCM Digital Audio
  - defines payload format for linear audio (AES67, constraints)



⇨ AIMS WP on
AES67 / ST2110 Commonalities & Constraints

SMPTE ST 2110-30 and AES67 Compatibility

SMPTE ST 2110-30 is a subset of AES67,
adding constraints to clocking and streaming



SMPTE 2110 - Professional Media over Managed IP Networks

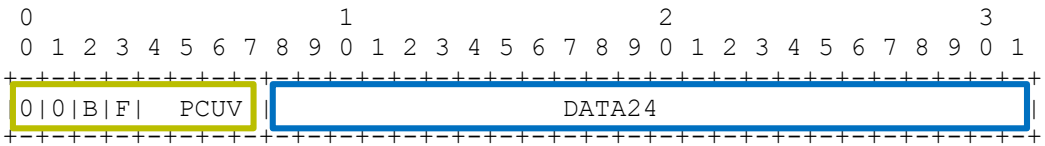
2110-31 – transparent transport of AES3 audio data

- 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.)

SMPTE 2110 - Professional Media over Managed IP Networks

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



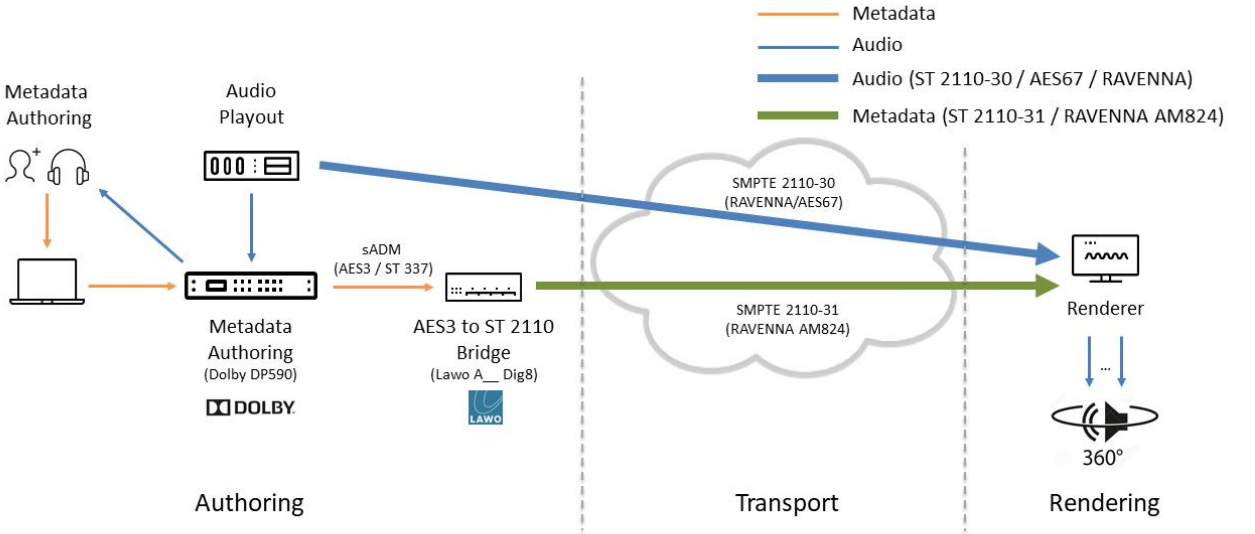
  - RTP payload format signaled in SDP:

    `a=rtpmap:<pt> AM824/48000/<nchan>` - with `<nchan>` always being an equal number (stereo channels)

  - retains all other SDP parms

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

RAVENNA AES67 built-in — Now with ST2110!



⇨ Demo @ RAVENNA booth @ AoIP Pavilion #963

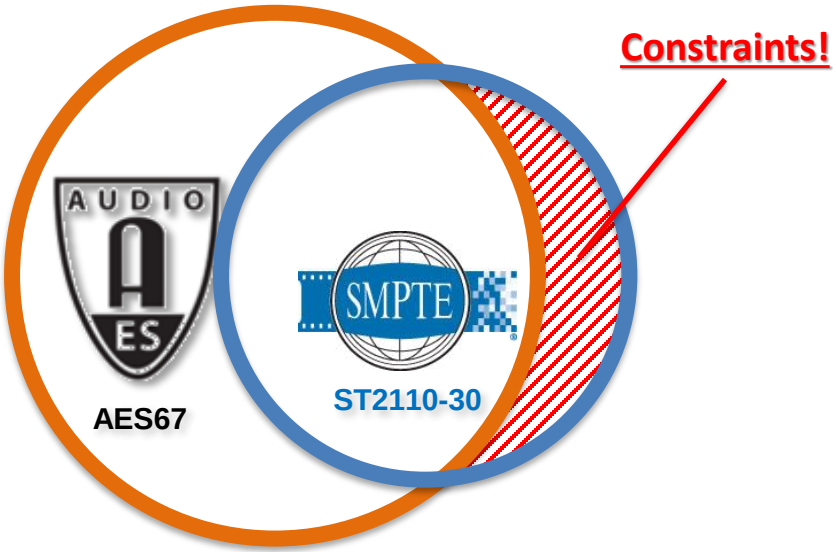
DOLBY

ALC NetworX # 1

SMPTE 2110 - Professional Media over Managed IP Networks

AES67 / ST2110 audio compatibility?

24-bit PCM audio



SMPTE 2110 - Professional Media over Managed IP Networks

AES67 / ST2110 audio compatibility?

AES3 audio

Summary (why RAVENNA?):

- Flexibility
  - Wide range of formats, sampling rates and packet times
  - Accommodates any channel bundles
- Performance
  - Full bit-transparency
  - Capacity scales w/ network speed
  - Ultra-low latency possible (“MADI-over-IP”)
- Open technology (can be enhanced / expanded)
  - No licensing, multiple adoptions & OEM provider
  - Based on existing standards
    - Operates on standard / managed IT networks (including routing)
  - Adaptable to emerging standards / technologies through layered approach
    - Fully compatible with AES67 / ST2110
    - SAP / SIP / ST 2059 / ST 2022-7 / NMOS
- Most prevalent technology in broadcast applications

AES67 & SMPT ST 2110

- The Vulcan Nerve Pinch to RAVENNA ?

Not at all!

AES67 & SMPT ST 2110

- The Vulcan Nerve Pinch to RAVENNA ?

Not at all!

Thank you for your attention!

RAVENNA booth @
AoIP Pavilion #963

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RAVENNA
AES67 built-in

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