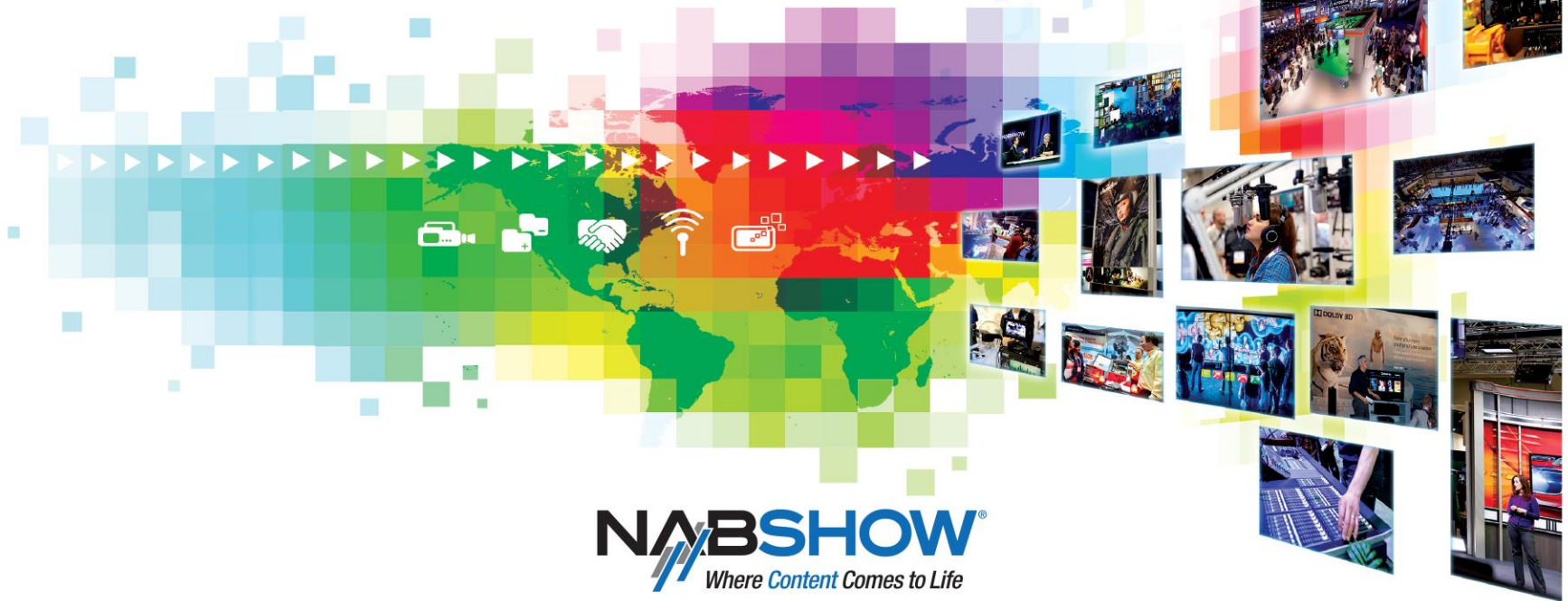


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AES67

&

beyond

**AES67-2013 Standard for
audio applications of networks:**

***High-performance streaming audio-
over-IP interoperability***

published on September, 11th, 2013

Andreas Hildebrand, Senior Product Manager
ALC NetworX GmbH, Munich



Scope:


- Interoperability guidelines for professional, low-latency audio over campus and local area IP networks using **existing** protocols wherever possible.

Justification:

- Recent generation of networked audio technology uses a diversity of proprietary and standard protocols
- Despite a common basis in IP, **none of the systems were interoperable.**
- The latest crop of networking technology has not yet reached a level of maturity precluding changes to improve interoperability.



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

Technology	Purveyor	Date introduced	Synchronization	Transport
Livewire	Telos/Axia	2003	Proprietary	RTP
Wheatnet-IP	Wheatstone	2005	Proprietary	RTP
Dante	Audinate	2006	IEEE 1588-2002	UDP
N/ACIP	EBU	2007	Adaptive (per stream)	RTP
Q-LAN	QSC Audio Products	2009	IEEE 1588-2002	UDP
 RAVENNA	ALC NetworX	2010	IEEE 1588-2008	RTP
AVB	IEEE, AVnu	2011	IEEE 802.1AS	Ethernet, RTP

TG Work:

- AES Task Group X192 initiated late 2010
- Task Group Leader: Kevin Gross, AVA Networks, Boulder, CO.
- Members:
 - ~ 100 experts from the professional audio community
 - manufacturers, system architects, consultants, professional end users
 - US / Canada, Europe (+ South Africa, South America, Australia)
- Main contributors: ALC NetworX, Axia, QSC, Wheatstone, Nine Tiles, BBC, SR, Clair Brothers, ...
- Bi-weekly web conferences & several F2F meetings
- Standard published on September, 11th, 2013



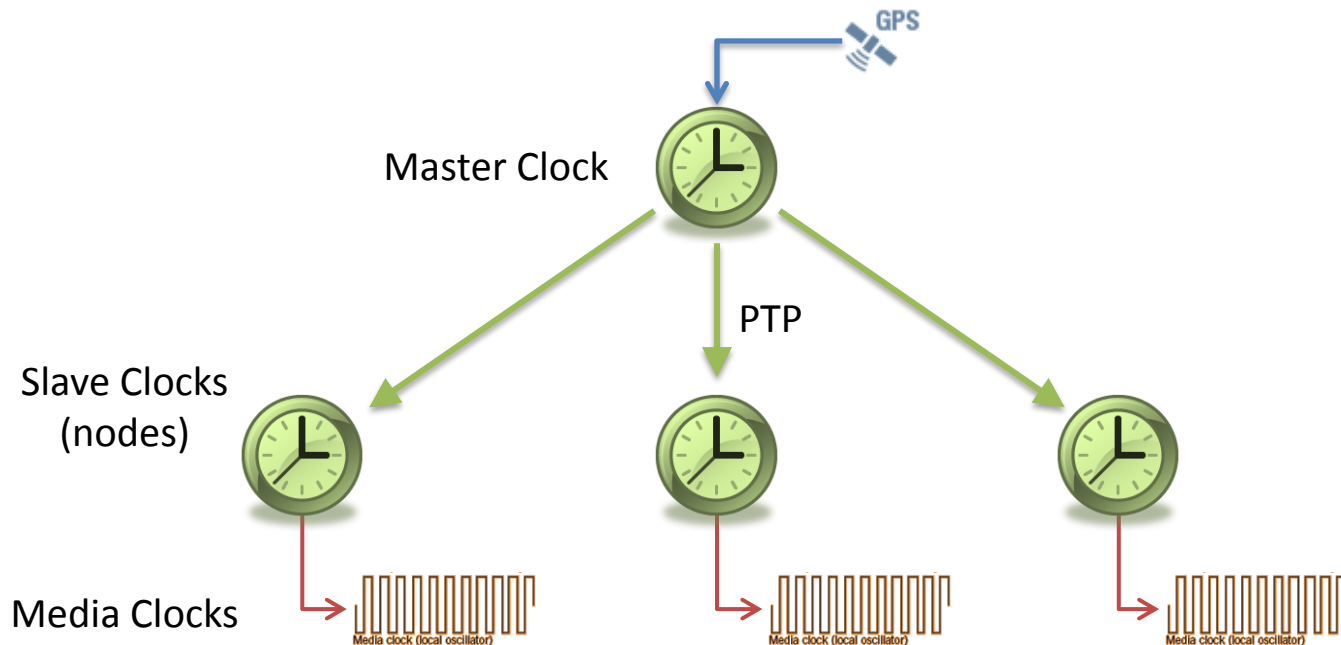
AES67 technology components:

- **Synchronization:** IEEE 1588-2008, default profile (media profile suggested)
- **local media clock generation**



AES67 technology components

– time synch & media clock generation:



AES67 technology components:

- **Synchronization:** IEEE 1588-2008, default profile (media profile suggested)
- **local media clock generation**
- **Network:** IPv4 (IPv6), unicast / multicast & IGMPv2
- **Transport:** RTP/AVC (RFC 3550 & 3551) / UDP / IP



Selected solutions / technologies compared to OSI layer model:

OSI Layer	A-Net	EtherSound	CobraNet	Livewire, Dante & ...	AVB	AES67 & RAVENNA
Application						
Presentation						
Session				RTP		RTP
Transport				UDP		UDP
Network				IP		IP
Data Link		Ethernet	Ethernet	Ethernet	Ethernet	Ethernet
Physical	Copper	Copper / Fiber	Copper / Fiber	Copper / Fiber	Copper / Fiber	Copper / Fiber

AES67 technology components:

- **Synchronization:** IEEE 1588-2008, default profile (media profile suggested)
- **local media clock generation**
- **Network:** IPv4 (IPv6), unicast / multicast & IGMPv2
- **Transport:** RTP/AVC (RFC 3550 & 3551) / UDP / IP
- **Encoding:** 16 / 24 bit linear, 48 (44.1 / 96) kHz, channel count: 1..8
- **Packet Setup:** 48 samples (6 / 12 / 16 / 192), max. payload size: 1440 bytes
- **Quality of service:** DiffServ w/ 3 suggested traffic classes (DSCP)
- **Connection management:** SDP (dependency on *draft-ietf-avtcore-clksrc*), SIP (unicast)
- **Discovery:** excluded, but several recommendations given (i.e. ZeroConf, SAP and others)

Applications:

- Commercial audio applications:
 - Installed sound: theaters, stadiums, theme parks, cruise ships
 - Live sound (fixed and touring)
- Professional broadcast
 - In-house distribution
 - Inter-facility links on corporate networks
 - OB vans
- Music production
- Post-production



AES67 – the “O negative” of audio networking

*(Roland Hemming,
Independent Audio Consultant)*





AES67



AES67

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*AES67 – the “O negative”
of audio networking*



ACIP

RAVENNA



AES67




AES67 – the “O negative” of audio networking

When will it be available?



AES67 compliant technologies / solutions:

Technology	AES67 support	Comment
 RAVENNA	yes	Full support through operational profiles (Generic Profile covers most mandatory requirements)
Livewire	Yes (no)	Livewire “new”: yes (→ RAVENNA) Livewire “legacy”: no, but technology bridging possible
Q-LAN	announced for next fw version	Requires some protocol & packetization adaption
Dante Wheatstone	“within 12 month” ?	Depends on company strategy, modifications required (synchronization & transport)
N/ACIP	(no)	ACIP2 working on extensions for limited stream exchange
AVB	(no)	AVB devices may use gPTP, but need to add layer 3 transport

AES67 – the “O negative” of audio networking

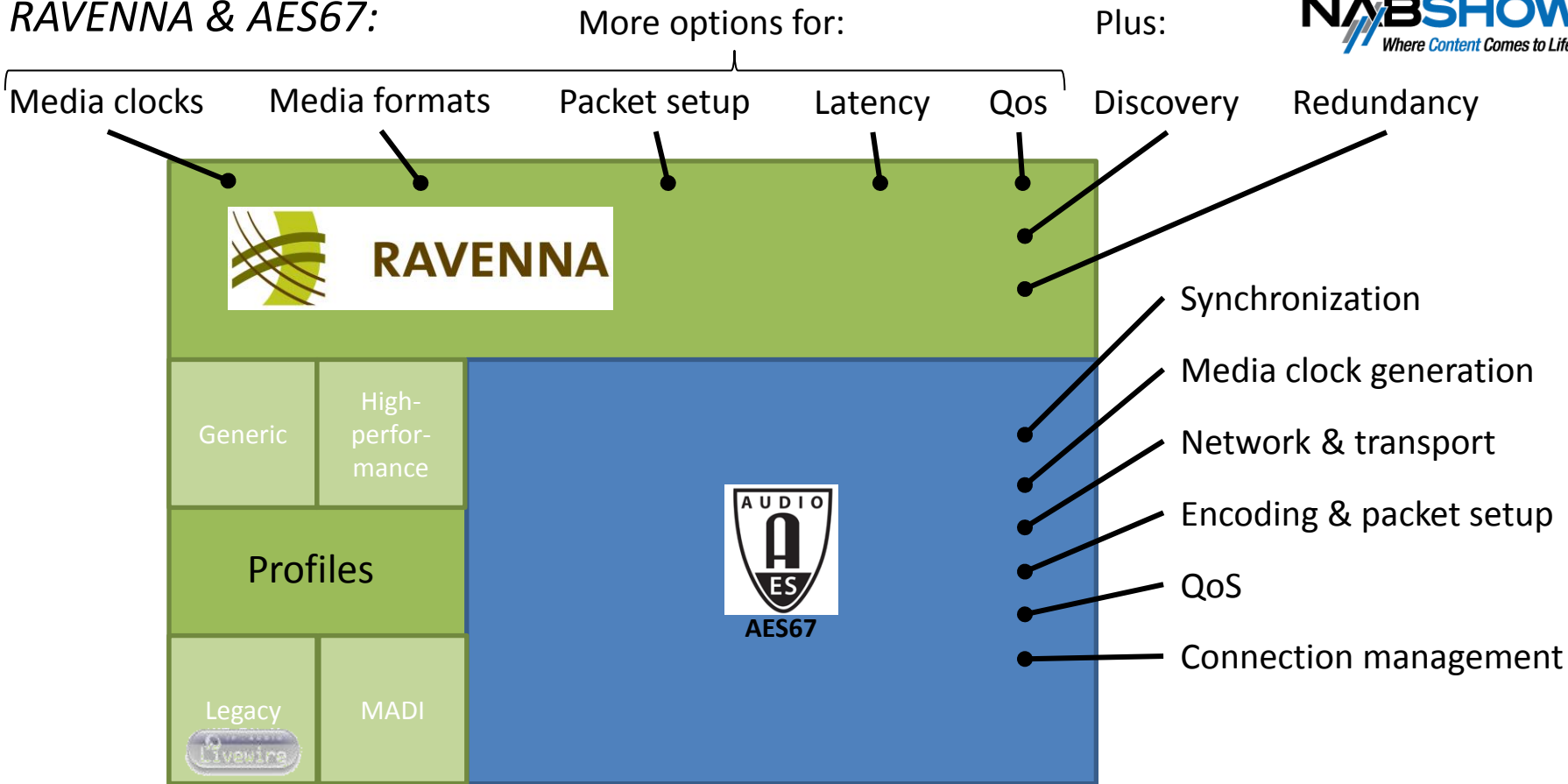
When will it be available?



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*
- Active participation in AES X192 standardization TG
 - ⇒ **RAVENNA supports AES67 standard**

RAVENNA & AES67:



RAVENNA & AES67:

More options for:

Plus:

Media clocks

Media formats

Packet setup

Latency

Qos

Discovery

Redundancy



Generic

High-
performance

Profiles

Legacy



MADI



Synchronization

Media clock generation

Network & transport

Encoding & packet setup

QoS

Connection management

SIP (w/ unicast)

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!

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Beyond?!

AES TG SC-02-12-M: AES67 Develeopment

- Outlining AES67 compliance test guidelines
- Specifying and engineering the compliance tests
- Planning and organizing plug-fests
- Improving the standard specification where necessary
- Participants:
 - anyone implementing AES67
 - parties / individuals with strong interest in AES67 interoperability



Questions?



Thank you for your attention!

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