A NEW ERA FOR AV:

HOW AVB IS CHANGING THE INDUSTRY

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S Y S T E M S

OVERVIEW In the last decade, the audio/visual (AV) industry was eclipsed by rapid technological advancements in the IT industry and adoption of industry standards. This is about to change. The IEEE task group has approved a set of audio/video bridging (AVB) standards for transporting audio and video over Ethernet networks, an advancement that bridges the divide between AV and IT systems.

This white paper takes a close look at AVB technology and the advantages it promises to AV integrators. Understanding the new AVB protocols gives AV integrators the background they need to design and implement networked AV with a price and performance level that was previously unachievable.

INTRODUCTION

It's not an overstatement to describe the emergence of AVB as a new era for the audio/visual industry. It is, in fact, where the AV industry is heading. End-to-end digital networks are simpler, easier to manage, and eliminate challenges presented by distance. However, up to now the lack of an industry-accepted network standard created a void that many manufacturers tried to fill with proprietary solutions. The result—a number of good solutions that don't easily integrate with existing or future systems—makes it clear that a standard networking protocol will go a long way in moving the industry forward.

To date, CobraNet is widely acknowledged as the "granddaddy" of all networked audio technologies. It's known as an effective audio protocol and continues to serve the industry well. But despite being buoyed by more than 50 manufacturers creating CobraNet-based products, CobraNet hasn't become the standard. The reality is that the size of the AV industry is small compared to the IT industry. Without joining forces, we're unlikely to create a vast ecosystem of compatible products that lower prices, drive innovation, and secure future investment.

Enter AVB. With huge consumer electronics companies such as Apple and Samsung—and IT giants Cisco and Intel backing the effort—AVB is poised to overcome the challenges that plague proprietary networking protocols. With AVB, it appears the AV industry will finally have a standard.

THE PATH **TO AVB**

Creating a technology standard for transporting audio and video over the network has been a goal of the AV industry for the last couple of decades. Because no one organization was driving the effort, manufacturers developed their own AV network technology—each believing their technology could become the industry standard.

Despite these attempts, a single technology could not address all the challenges of digital audio/video networking. Instead, almost a dozen good technologies that relied on proprietary systems were developed. These types of solutions suffer from interoperability challenges. And non proprietary, IT network-based solutions are difficult to configure for the necessary quality of service (QoS).

Several years ago, the IEEE 802.1 Audio/Video Bridging Task Group took up the cause. Their objective was to create a set of standards for audio and video bridging that addressed the following problems:

- **Synchronizing multiple streams of audio and video**. AVB allows synchronization of video and audio streams—even if they travel on different network paths with different sample rates.
- **Eliminating the buffering delay through the network**. IT networks were built to move data when reliability took precedence over timing. Delay is acceptable in data transfer but not audio and video transfer.
- **Creating resource reservation.** Network resources need to be available to AV applications and remain available for as long as they are needed.

The resulting AVB standard solves these problems with the following enhancements:

- **Timing and clocks that support accurate synchronization of multiple AV streams.** All AV devices reference a common time-base allowing aligned playback. This remains true even if the audio and video travel different paths with different sample rates or the playback devices are a different network distance away from the source.[i]

- **Stream reservation protocol (SRP)** that locks down bandwidth and ensures QoS.

- **Queuing and forwarding rules** that ensure AV streams pass through the network with the delay specified.

- **Identification of non-AVB devices.** As of early 2011, all standards are written except 1722.1, which will be responsible for device discovery, enumeration, connection management, and control protocol for 1722-based devices.

AVB BASICS

AVB leverages existing Ethernet technology, which has accelerated its development. Because the AVB standards are developed through the IEEE, they benefit from ever-increasing speeds and other options and features. In other words, the standards are future proofed and continue to improve as new Ethernet technologies are implemented.

AVB is not AV industry-specific. It is being developed with an eye towards the consumer and automotive markets. These applications have generated support of AVB from major Silicon Valley companies, which will enable the AV industry to benefit from solutions aimed at the mass market.

In addition, AVB standards are open, which means there are no royalties. Having a single standard also means manufacturers can focus their energy on developing products for this standard, and this advantage brings economies of scale. As a result, AVB solutions are expected to have the pricing required to bring networking to the vast pool of smaller AV projects. It has the scalability required by many AV projects.

"OUR INDUSTRY IS TOO SMALL TO SUPPORT PROPRIETARY NETWORKING SOLUTIONS. BY LEVERAGING THE UBIQUITY OF MAINSTREAM ETHERNET, WE HAVE AN OPEN, NON PROPRIETARY STANDARD THAT BENEFITS BOTH END USERS AND HARDWARE MANUFACTURERS."

JOHN MCMAHON
MEYER SOUND

SMART SWITCHES

The most important enabler for AVB technology is the AVB switch. Unlike current Ethernet switches, AVB switches play a significant role in guaranteeing delivery of real-time audio/video traffic.

"This standard allows bridges to provide guarantees for time-sensitive (i.e., bounded latency and delivery variation), loss-sensitive real-time audio video (AV) data transmission (AV traffic). It specifies per priority ingress metering, priority regeneration, and timing-aware queue draining algorithms. This standard uses the timing derived from IEEE 802.1AS. Virtual Local Area Network (VLAN) tag-encoded priority values are allocated, in aggregate, to segregate frames among controlled and non controlled queues, allowing simultaneous support of both AV traffic and other bridged traffic over and between wired and wireless Local Area Networks (LANs)."[ii]

Fortunately, you won't need to read the full IEEE standard. What you need to know is that the job of implementing many of these changes is handled by AVB-enabled Ethernet switches rather than integrator programming. Yes, customers still need to invest in AVB switches, but the switches do all the hard work.

These intelligent switches allow data, audio, and video to share the same network. With AVB, VLANs and separate physical networks are options instead of necessity.

While current protocols deal with network endpoints, AVB also deals with the network itself. This is a significant shift in perspective and is what allows AVB to fully address the shortcomings in networked AV. Highly flexible, affordable networking of professional AV products using the Ethernet is now a reality.

COMPATIBILITY STANDARDS

AVB standards also benefit from the AVnu Alliance, whose mission is to promote the use of AVB and ensure compatibility between AVB devices. The AVnu Alliance is an industry consortium dedicated to the advancement of professional-quality audio/video transport by promoting the adoption of the IEEE 802.1 AVB and related standards. The organization creates compliance test procedures and processes that help ensure AVB interoperability of networked AV devices, helping to provide a high-quality streaming AV experience.[iii]

AUDIO/VIDEO BRIDGING (AVB):	A suite of IEEE standard protocols responsible for specifying methods for low-delay, synchronized, audio and video transport over IEEE 802 (e.g., Ethernet) networks.
STREAM:	A virtual container, identified by a unique 64-bit value, of one or more AVB audio or video channels.
AVB ENDPOINT:	A device capable of transmitting and receiving AVB streams.
TALKER:	An AVB endpoint capable of transmitting one or more streams to the network.
LISTENER:	An AVB endpoint capable of receiving one or more streams from the network.
PRECISION TIME PROTOCOL (PTP):	Common name for the AVB time synchronization protocol defined by IEEE 802.1AS. Its purpose is to deliver a precise representation of time across a network, enabling tight synchronization of the networked equipment.

ADVANTAGES TO AV INTEGRATORS

PERSPECTIVES FROM THE FIELD
Jay Paul, VP Engineering/QA, AVI-SPL

What benefits will AVB provide?
There are several that are very compelling: Access to more discreet channels of bidirectional audio, the ability to transmit video, lower latency, and standard cables and AVB network switches. Today you really have to dedicate quite a bit of time and hardware to planning to maximize network efficiency. AVB is going to make it easier for us to configure audio systems.

What about CobraNet?
CobraNet was a good thing at the right time and we have a lot of networks built on CobraNet. It's just time to go to the next thing. The CobraNet systems that are out right now will still be utilized. I think AVB and CobraNet are going to coexist for the time being.

How will AVB change the AV industry?
We will see less proprietary networking. AVB should make it easy to take one manufacturer's products, plug them in, and use them with another manufacturer's products on the network. This will be a big change that benefits everyone.

The primary advantage for AV integrators is simplicity. Current networking technologies require a high degree of skill with the various protocols. AVB makes networked audio as easy as analog. Additional benefits include:

- IEEE standard
- Cheaper to implement
- Off-the-shelf hardware
- Larger channel capacity
- Switches do the thinking

What does this mean for you? No longer do you need to engineer networks with multiple VLANs and hand tune network parameters to get the performance required for professional AV. And, with AVB, delay is significantly reduced—2ms over seven hops in a 100-MB Ethernet network.

And this is over a 100Mbps network. When you move to gigabit Ethernet (as many companies are), latency may be further reduced.

In addition, the ease of installation and lower cost mean high profits for integrators. Networked AV is also a great way to differentiate your firm from other integrators in the area who aren't ready to embrace the network.
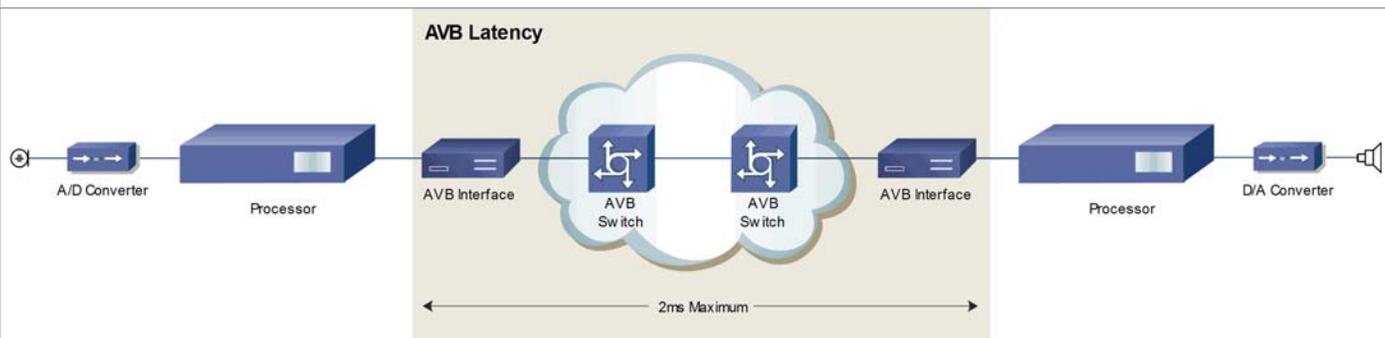
AVB Latency

A/D Converter · Processor · AVB Interface · AVB Switch · AVB Switch · AVB Interface · Processor · D/A Converter

2ms Maximum

FIGURE 1: WITH AVB, DELAY IS SIGNIFICANTLY REDUCED—2MS OVER SEVEN HOPS IN A 100-MB ETHERNET NETWORK.

As more and more AVB-based products come on the market, they will drive down hardware prices, creating opportunity for networked AV projects in smaller spaces. Using AVB is also a way to future proof your projects and protect your customers' investments. It will put an end to interoperability challenges and the cost and difficulty of expanding proprietary systems.

ADVANTAGES TO IT MANAGERS

Perhaps most important, AVB-based audio/visual systems deliver a number of valuable benefits to your customer, the IT manager. Since AVB is an IEEE standard, IT managers who are already familiar with the work of the IEEE 802.1 group will have a level of confidence and understanding. AVB provides the following advantages to IT managers:

- Easy to manage
- Built on same IEEE standards as other IT technology
- Affordable
- Ethernet-based
- Single network for all media

As more and more IT managers become responsible for managing their corporate AV systems, it is increasingly important to bridge the gap between IT technologies and AV technologies. AVB will go a long way in achieving this goal.

CHOOSING AVB **OR COBRANET**

Even with the release of AVB-based products, CobraNet continues to be a viable solution for a number of audio installations. AVB and CobraNet can be used for many of the same applications with a high degree of success. Indeed, not only will AVB and CobraNet coexist for several years, they will ideally be able to work together in the same system, giving integrators more flexibility when building on existing systems.

However, for practical purposes, here are a few guidelines for choosing AVB or CobraNet. Essentially, if you only need 32 channels of audio, CobraNet is a great option. If your application calls for more than 32 channels, consider AVB. And, if you want to ensure your system is future proof, then AVB is the answer.

WHICH TECHNOLOGY TO CHOOSE?

	AVB	CobraNet™
High Bandwidth Content (Video)	√	
Low Bandwidth Content	√	√
Large Venues	√	√
Corporate Offices	√	√
Video Conferencing	√	
Audio Conferencing	√	√
Limited Network Experience	√	
Low Latency Content	√	
Fewer than 32 Audio Channels	√	√
More than 32 Audio Channels	√	

ABOUT **BIAMP SYSTEMS**

Biamp Systems is a leading manufacturer of professional-quality AV and life safety systems and products. Through a worldwide network of systems integrators, distributors, and independent representative firms, Biamp delivers products that meet the audio requirements for a range of applications, including corporate boardrooms, conference centers, performing-arts venues, courtrooms, educational campuses, hospitals, stadiums, and recreational facilities.

Biamp is headquartered in Beaverton, Oregon (USA), its base of operation for more than 30 years. The company's innovation is reflected in systems that provide the greatest efficiencies to customers, and unmatched performance and cost savings to end users.

To speak to a Biamp representative, please call +1. 503. 641. 7287 or use the online contact form at www.biamp.com.

LEARN MORE

To continue learning about AVB, join us at an AVB training session. We'll dive deeper into AVB with examples and a discussion of how to make AVB work for you and your customers. Register now.

ADDITIONAL RESOURCES

www.ieee.org
www.avnu.org

REFERENCES

[i] AVB for Professional A/V Use, AVnu Alliance, July 2009.
[ii] www.ieee.org/1/pages/802.1av.html
[iii] AVnu Alliance mission statement. http://www.avnualliance.org.

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