Audio/Video Bridging and the AVnu Alliance

By: Mel Lambert

A proven solution for the live AV industry is here

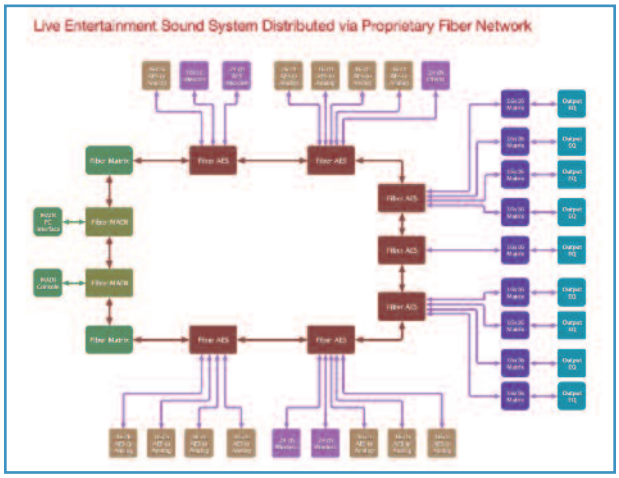
There have been several attempts at developing audio/video network topologies that provide time-synchronized, low-latency delivery of multichannel audio, HD digital video, and bidirectional control signals. Until the advent of AVB—Audio/Video Bridging—such schemes have provided partial solutions; for consistent, on-time delivery of high-data-rate bitstreams, we must look further than conventional Ethernet-based networks. And, with the recently formed AVnu Alliance supporting the new IEEE-devised implementation, AVB looks to be a sought-after solution for the live-performance audio and video industry.

The AVnu Alliance is dedicated to the advancement of professional-quality audio video transport via the adoption of the IEEE 802.1 Audio Video Bridging (AVB), and the related IEEE 1722 and IEEE 1733 standards over various networking link-layers. It includes prominent members of the pro-audio community, notably Meyer Sound, Harman International, and Avid, together with a number of familiar chip manufacturers, including Intel, Marvell, and Xilinx, and connectivity gurus like Broadcom Corporation and Cisco Systems, the engineering design firm Lab X Technologies, and the consumer electronics heavyweight Samsung.

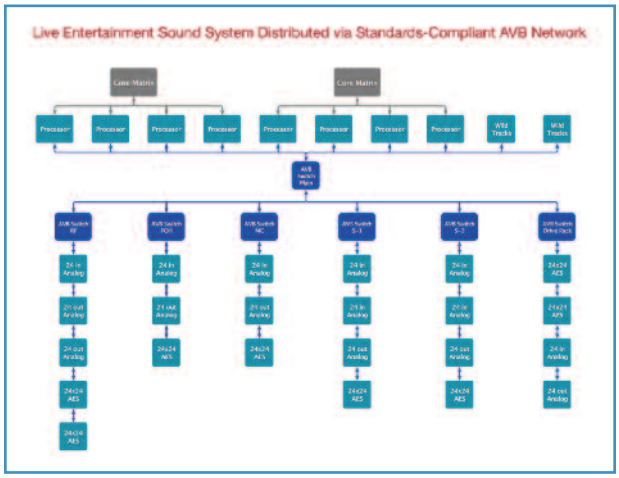
These IEEE standards cover the low-level details of transporting and synchronizing audio and video over global Ethernet. AVB expands the original IEEE 802 format to include core technologies that ensure reliable, robust, and low-latency transmission. John McMahon, Meyer Sound's executive director of digital products, says, "Our industry is too small to support proprietary networking solutions. By leveraging the ubiquity of mainstream Ethernet and fully supporting it today, we have an open, non-proprietary standard that benefits both end-users and hardware manufacturers. With silicon makers as part of AVnu Alliance, we are assured that AVB will be both inexpensive to implement and accessible at all levels of the professional AV industry. AVnu Alliance will ensure interoperability of AVB-enabled devices."

Because AVB embraces system control data and digital bitstreams, a one-stop solution is available via single CAT-5/6 connections. "AVB can reserve up to 75% of the network for audio and video streams," McMahon says, "with any remaining unreserved capacity available for data—there is no need for a separate data network."

"Existing networking schemes do not incorporate timing data," says Robert Boatright, director of research of Harman International's corporate technology group. "With AVB, each data packet is time-stamped by each input port—this data follows the digitized AV material through the network to its assigned delivery point," where the timing data ensures low latency and accurately synchronized playback. Boatright is chairman of IEEE 1722, which has developed the transport



Audio-video connections without AVB networking



Audio-video connections with AVB networking

Upper system configuration diagrams courtesy of Meyer Sound.

infrastructure for AVB. "With 10Gbit Ethernet just around the corner," he says, "end users can develop reliable networks with data bandwidth necessary to handle on-demand multichannel audio channels, HD video signals, and complex control data." Harman plans to introduce AVB-enabled products from dbx, BSS Audio, and Crown.

While implementation of an AVB-compliant network requires newer-generation Ethernet switches and bridges, many of those currently available already have AVB capability built in, and only need a firmware upgrade. AVB accommodates existing non-timed audio-transfer protocols, including CobraNet, EtherSound, Dante, AES50, and Q-LAN, albeit without timing references. McMahon says, "AVB users can continue to use legacy products within a mixed network environment, although AVB obviously offers a lot more" than older-generation networking schemes.

"Existing non-timed networks lack the robust, plug-and-play networked connectivity needed for complex production environments," says Rob Silfvast, Avid's principal system architect, live systems. "AVB, with its ability to carry audio, video, and control signals over a standard Ethernet network, has exciting possibilities for many of Avid's product lines. The AVnu Alliance is being driven by companies that are relevant in the industry and provides regular contact between these organizations in a cooperative forum."

"The AVnu Alliance will drive a compliance program to ensure AVB-equipped devices easily connect and interoperate," says Sheldon Radford, Avid's senior product manager, live systems. "The Alliance provides a forum for manufacturers to work together to drive the adoption and acceptance of a single open standard, rather than continuing to support a variety of different proprietary protocols that do not talk to each other." And, unlike proprietary protocols that involve a royalty fee or other costs, AVB can be implemented with minimal cost across a broad range of products.

"For Meyer Sound users," McMahon continues, "AVB will mean increased networking capabilities with a standards-based infrastructure." The firm's D-Mitri system is a "network-based digital-audio-processing-and-distribution platform, whose audio transport relies on the technology in AVB-compliant network switches manufactured by third-parties adhering to guidelines monitored by the IEEE," he explains. "Adopting the AVB open standard eliminates a range of challenges inherent to using proprietary systems, allowing us to focus on the development of digital audio technologies rather than how to make transportation of data work."

At the recent CES Convention in Las Vegas, chipmaker Broadcom Corporation organized a demonstration spotlighting the use of Audio/Video Bridging in a real-world application. Digitized audio was sent from a dbx SC32 digital matrix processor chassis through two BSS/NetGear AVB-compliant Ethernet switches to a pair of Crown CTS600 power amplifiers. Harman Professional's System Architect and HiQnet command protocol handled system configuration and control. Broadcom Hawkeye 53314 ICs provided AVB interfacing and the generation of timing reference signals to ensure low-latency, on-demand delivery of multichannel digital audio. Despite a dramatic difference in Ethernet path lengths and switcher port connections, the source signal arrived in perfect synchronism at the two playback devices, thanks to AVB's time-stamping and guaranteed bandwidth from source to destination on an AVB-compliant network.

The AVnu Alliance will play a critical role in the adoption of an AVB standard. "The IEEE does not provide compliance or interoperability testing for any of its work," says Rick Kreifeldt, VP systems architect with Harman International's corporate technology group, and the AVnu Alliance's chairman/president. "AVnu will develop the various compliance-test procedures and processes that will ensure full AVB interoperability of networked A/V devices." AVB compliance testing is expected to begin early this year.

"Developed by the networking community, AVB's openness already has led to the announcements of AVB silicon," Kreifeldt says. "Previous niche technologies did not offer the same large market potential; AVB extends the performance for professional A/V and is cost-effective for large-scale use."

For more information about the Alliance, go to www.avnu.org.