



RAVENNA

RAVENNA (Part 2)

A New Framework for Audio-Over-IP

The first part of this article series explained the RAVENNA audio network distribution and how it is promoted and implemented. This article digs deeper into the technology. We look closer at the implications of the recent AES67-2013 standard on high-performance audio-over-IP (AoIP) interoperability, and the possibilities available with control protocols including the ongoing Open Control Architecture (OCA) Alliance effort. We also detail some recent examples of companies that decided to adopt this AES67-compatible, Layer-3 IP protocol.

By
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(Editor-in-Chief)

RAVENNA is a real-time distribution technology for audio and other media content in IP-based network environments using standardized network protocols and technologies. Designed to meet the strict requirements of the pro-audio market low latency, full-signal transparency, and high reliability, technology has been implemented in professional broadcast applications (e.g., radio and television) and recording environments.

In 2014, RAVENNA was introduced to new market segments, especially in the fixed installation/integrated AV sector and signal distribution in live events, while new companies



RAVENNA is being promoted at all major industry trade shows by a strong group of companies, with the technical implementation handled by ALC NetworX, which is based in Munich, Germany.



"Many of our members have not yet demonstrated or announced any RAVENNA products because they are looking for the right commercial opportunities," says Andreas Hildebrand, RAVENNA's Senior Project Manager at ALC NetworX. "Being an open and transparent standard is relevant to many decisions. We expect RAVENNA will have a significant push in activity."

joined the RAVENNA partnership and several key products were introduced. Among the new RAVENNA products is the Neumann DMI-8 digital microphone (AES42) interface with a dual-port RAVENNA option. Another one is a RAVENNA-to-MADI converter featuring four multichannel audio digital interface (MADI) and two RAVENNA ports from DirectOut. German company DirectOut is one of the founding companies that already offers several multichannel interface options.

Swiss company Merging Technologies launched Hapi, a new "small format" RAVENNA audio interface. It is based on the larger version Horus and provides the same RAVENNA/AES67 connectivity. Merging's Hapi is a primary interface for smaller systems that is able to carry the same AD8D/AD8DP and DA8/DA8P analog cards that fit in the Horus option slots. Using RAVENNA, Hapi provides flexible connectivity of every single input and output across standard networks with off-the-shelf network equipment and a web browser-based control interface that provides any web-enabled device to access all the parameters of each Hapi unit over the network.

Interestingly, Merging Technologies also announced new RAVENNA/AES67 drivers for digital audio workstation (DAW) software running on Mac or PC with support for both Horus and Hapi. A new CoreAudio Virtual Sound Driver joins the existing ASIO option. With a vast array of options, this high-quality recording interface will no doubt help promote the advantages of simply using a CAT5E/CAT6 cable in multichannel applications.

The diversity of new RAVENNA partners also reflects the industry appeal for this type of networking technology. New partners include Calrec, the British broadcast console manufacturer; Orban, a well-known audio processing company for radio, television, and streaming applications; and the German cable manufacturer Cordial, which is designing a special CAT5e cable for RAVENNA applications (basically enabling better identification).

It is clear the technology is gaining traction in the industry and there is a large application potential in areas where standard networks are not yet receiving enough attention (e.g., studio recording and broadcast production). In those environments, AES3 and MADI digital connectivity standards are still the norm, whereas some applications are still deeply rooted in the analog exchange.

Also, with the clear success of competing technologies (e.g., Dante) in the live sound market and the ever-pending promise of AVB, RAVENNA needs to get to market and get quickly noticed by production professionals, to succeed.

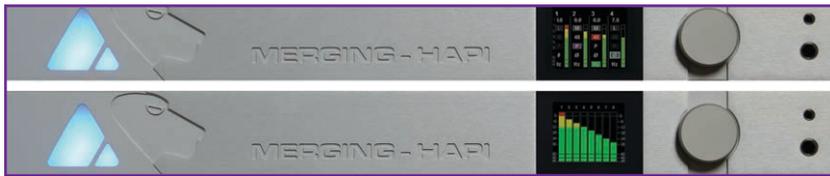


Although they previously used different sync methods, the Axia Livewire XNodes interfaces became RAVENNA compatible with relatively minor changes in field-programmable gate array (FPGA) design and software drivers.

This master card brought RAVENNA network technology to Lawo's mc² consoles and Nova73 HD routers, offering extremely low latency and 128 channels with cost-effective CAT cables or optical connections.



The Neumann DMI-8, an eight-channel AES42 digital microphone interface, will be available with a dual-port RAVENNA interface option. This is effectively the first completely networked audio signal chain from the acoustic sound source.



Merging Technologies unveiled its new Hapi networked audio converter at the Frankfurt Prolight+Sound 2014. Hapi uses RAVENNA audio-over-IP (AoIP) networking technology as does the larger and firmly established Horus interface.



French company Digigram introduced the LX-IP RAVENNA PCIe sound card, its first RAVENNA/AES67-enabled product, supporting a latency down to one audio sample per IP packet and up to 256 RAVENNA I/O channels from multiple RAVENNA streams. It is ideal for high-density audio production or automation applications in radio and TV broadcast studios.

Orban—the company known for the Optimod audio processors for television, radio, and Internet broadcasting—was one of the most recent companies to sign a RAVENNA technology partnership.



RAVENNA's Current Status

During our conversation with Andreas Hildebrand, RAVENNA's Senior Project Manager at ALC NetworX, we learned RAVENNA partnerships have been established based on the open technology approach, promoted without a proprietary licensing policy, and use a series of different Operational Profiles, including the now crucial AES67 interoperability profile. The RAVENNA consortium is promoting the fact that RAVENNA now meets the AES67 standard (the interoperability standard for high-performance professional digital audio IP networking). RAVENNA is the first compatible solution available in the market and it benefits from the pioneering work done within the former Audio Engineering Society (AES) X192 Task Group, with which ALC NetworX and Telos/Axia were heavily involved.

But the question remains. When will a client buying RAVENNA products from different brands be certain that the products will work seamlessly without the intervention of ALC NetworX or the manufacturers?

Hildebrand recognizes that “the topic is more difficult for RAVENNA than Dante, for instance, because the Dante networks are all single source—meaning the whole boards originate from one source—so by design, they interoperate.”

He added, “With AVB, they have a different approach as well, because they tried to define a standard extension and they set a very complicated, very complex certification mechanism.”

“We could have done it one or the other way. But it was clear we did not want to be the sole source of technology. We could have done it also the harder way, like AVB did, with an official independent certification process, but that would have taken too much time and it would be too complicated. We build our strategy on the notion that people join RAVENNA because they want to make their devices interoperable with other RAVENNA devices. So, what we do, are regular ‘plug-fests’ where we check the interoperability between devices. Overtime, we developed guidelines that are available to manufacturers where they can self-test their compliance. And we are also getting RAVENNA devices from other manufacturers in their labs and doing cross-testing. In other words, we bet on the fact that RAVENNA partners have the interest to make their devices as interoperable as possible. It’s in their interest to identify any flaws in their design and communicate that back to the group. With this, a product with a RAVENNA label on it will also need to identify all the operational profiles supported within the RAVENNA framework. So, as long as the other device supports the same operational



profile, they should be able to interoperate. But 100% certification or assurance is very difficult," Hildebrand said.

Transmitting Audio Over WAN

One of the main differences in the RAVENNA proposals demonstrated so far is the use in audio distribution within facilities and contribution or remote production. Lawo has a key interest in this area and it is already implementing RAVENNA solutions (e.g., with its own Commentary System or its Nova routing systems).

WorldCast Systems is also an important RAVENNA member in this area, specifically its audio codec division, APT, which is well-known for its world-class IP codecs. WorldCast Systems is one of the major companies engaged in the IP-based signal distribution field. WorldCast Systems CTO Nicolas Boulay says that "based on our market knowledge we believe that RAVENNA has significant potential to become the audio standard not only for in-house audio distribution but also for transmitting audio over wide area networks. RAVENNA's ability to provide multi-channel audio on a single network connection combined with its real-time capabilities and inherent time synchronization is of great interest to us as a manufacturer of multi-channel AoIP codecs."

Hildebrand adds, "WorldCast Systems is one of the most renowned manufacturers of advanced configuration and power interface (ACIP)-compatible codec devices. The massive interest of companies providing ACIP-compatible codec products comes naturally as both protocols are based on IPs using similar transport techniques. While RAVENNA is designed for synchronized, uncompressed, and fully bit-transparent signal transport with emphasis on lowest latencies in demanding applications environments, ACIP devices can cover the domain of content transport under unreliable network conditions like the Internet. Thus, RAVENNA and ACIP devices complement each other by expanding the reach of IP-based media transport from in-house to any destination in the world, and WorldCast Systems devices will provide perfect bridging between both domains."

Control Considerations

Complementing the interoperability discussions in terms of signal exchange, the audio industry is also targeting control and monitoring on audio networks. One such effort is ongoing under the auspices of the OCA Alliance initiative (www.oca-alliance.com), something that the RAVENNA technology doesn't intend to cover, as Hildebrand explains.

"RAVENNA, being fully based on IP can have any other types of IP communications on the same network on the side. And through a clever QoS mechanism it is made sure that the RAVENNA traffic always receives highest priority against other IP based traffic. Usually control is very short datagrams and not large bulky traffic and so it can live in harmony with each other. In the same network interface anybody could use the same network for his dedicated control, monitoring or whatever purposes as well. That's also the reason why we didn't include specifically control mechanisms inside the RAVENNA specification. Because there are so many control protocols."

For more information, visit ALC NetworX at <http://ravenna.alcnetworx.com>. 

British company Calrec Audio joined the RAVENNA community, integrating the network technology with its Hydra2 network and broadcast digital consoles. Patrick Warrington, Calrec's Technical Director, says, "RAVENNA interfaces will be directly compatible with AES67 equipment. While MADi continues to serve the industry extremely well, we expect to see AoIP interconnections providing a more flexible and elegant replacement in the near future, offering greater capacity, flexibility and multicast possibilities, all on an infrastructure shared with other services."

Resources

Audio Engineering Society (AES), "AES42-2010: AES Standard for Acoustics—Digital Interface for Microphones," www.aes.org/publications/standards/search.cfm?docID=38.

Axia Audio, "Livewire and RAVENNA: Why Are RAVENNA and Livewire Becoming Partners?" <http://axiaaudio.com/Ravenna>.

—, Technical Papers and Presentations from Axia, www.axiaaudio.com/tech.

OCA Alliance, www.oca-alliance.com.

Ravena, "Technological Overview AES67 now!," <http://ravenna.alcnetworx.com/technology/technology-overview.html>.



An Interview with Andreas Hildebrand

Andreas Hildebrand, RAVENNA's Senior Product Manager at ALC NetworX, responds to audioXpress questions about the RAVENNA technology and ongoing industry efforts.

audioXpress: If we define the operational profile as AES67 (the AES standard for audio applications of networks—high-performance streaming audio-over-IP interoperability) within the RAVENNA framework, will it make it more transparent?

Andreas Hildebrand: AES67 implementation faces exactly the same problems as we do with RAVENNA. Maybe on a lesser level, because AES67 is just a small subset of what RAVENNA can offer. But basically, it faces the same difficulties. There needs to be some kind of interoperability “plug-fest” and self-testing guidelines.

Within the AES67 working group, we already have this custom of hosting “plug-fests” and checking for interoperability. Luckily for us, we are the first who are actually doing AES67 so everything we’ve done within RAVENNA already makes sure that the AES67 interoperability is inherently given. Since nobody else yet has, we have not been able to proof the interoperability.

We are going to test interoperability with QSC and its Q-Sys platform, and we also invited Audinate to join us for some interoperability tests.

Nevertheless, I don’t see that AES67 will make the individual solutions—Dante, RAVENNA, or Q-LAN—disappear because they each have their own advantages. Hopefully, we will reach a point where we can use gear from different manufacturers and get at least some basic interoperability.

We have an interest to demonstrate AES67 compatibility with equipment working with others, which are not RAVENNA. The benefit is that, instead of just adopting AES67, they could go one step further and adopt RAVENNA with its enhanced possibilities. Because once they are AES67, it’s not a big step to adopt the full framework, in fact. Specifically because there are no legal or license issues involved with that.

audioXpress: Wouldn’t it be important for the RAVENNA set of specifications to be submitted to a higher standards body, such as The Institute of Electrical and Electronics Engineers (IEEE)?

Andreas: Standardization organizations such as the IEEE, which focuses on the Ethernet, or the Internet Engineering Task Force (IETF), which focuses on IP-based protocols, don’t care about certification. That is something the Audio Video Bridging (AVB) members have identified in the early days and that is why they created the AVnu Alliance as an interest/peer group—similar to the Wi-Fi Alliance—that can be the gatekeepers of establishing how AVB technology needs to be set up and interoperate. The AVB standard is much

more than the AVnu required certification, but AVnu took the relevant parts from the application markets and they defined how to get the certification based on certain requirements. However, the complexity is very, high. And, I am still not convinced that even with an AVnu-type of certification you can assure there will not be any flaws between devices of different manufacturers.

audioXpress: Assuming a certain level of industry acceptance, do you think there will be a role for the silicon industry to implement this type of audio-over-IP (AoIP) solution? Would that make it more transparent and universal?

Andreas: That’s certainly a very interesting point. We have seen that, within AVB, chip manufacturers have jumped on board and are working on chips capable of supporting the AVB standard. Whatever the audio visual (AV) industry does, even if the Audio Engineering Society (AES) comes into game, you don’t ever get enough manufacturers taking responsibility. So whatever you do, you have to do it on your own and make it for a certain platform, whether it be a field-programmable gate array (FPGA) or some other.

You have to make it from an AV manufacturer side and make it available to others. That’s exactly what we are doing. We have implemented the RAVENNA functionality in a Xilinx Spartan FPGA and others are porting it for an Altera FPGA. We also have made that development available to others—not for free obviously, because that is a large amount of work. That is exactly what Digigram is doing. The company has announced it is taking our design and IP core, putting it onto basically the same platform, and tailoring it to Digigram’s individual needs on the peripheral component interconnect (PCI) board.

Other companies are in the process of doing the same. I don’t know if we will ever get silicon manufacturers on-board unless the quantities reach the hundreds of thousands. Dante faces the same problem. Audinate certainly ships a lot of modules, and even a lot of chips. The company has done the math before it decided to make its Ultimo chip. Still, Audinate is the driving force and not a chip manufacturer. The same happened with Cobranet. There must be thousands of Cobranet chips out there and still for Cirrus Logic that business has never reached a serious level. So at some point Cirrus Logic lost its interest in that development.

And Cobranet was widespread. It would be interesting to see if and when silicon companies will jump on it again. The most important things is that, for now, at least we can offer matching IP for the most interesting platforms.

audioXpress: In your opinion, why would we need the Open Control Architecture (OCA) Alliance? And, what is your standing on the OCA efforts?

Andreas: OCA originates from the roots of AES24 [a standard application protocol interface (API) for communicating with audio devices on a network] actually. AES24 tried to harmonize not just the way things are controlled but also what specific parameters should be controlled. In other words, it tried to define how an equalizer should work, what parameters an equalizer has to support, and I guess that's a total fail. Because any manufacturer has its own ideas on specific parameters, what the benefits are over the products from other manufacturers. And you don't want the other manufacturers having your parameters, but you also don't want to lose your capabilities just because they are not defined in the standard.

We still don't know to what extent OCA has given up this approach but as far as I understand they are also trying to define some minimum set of parameters of control. We cannot yet comment on how useful that is or not.

Livewire also uses its own control parameters and it can continue to use those even when it switches to RAVENNA streaming, because we don't impose our own stream for control proposes. RAVENNA does not cover the area of control.

We have so many standardization groups and approaches for control that I see that certainly needs to be covered by a separate standard. We should be leaving streaming and control separate. If any of our partners want to support OCA because they think it will be more relevant to their market, they can do so and still use the RAVENNA streaming.

It's only small control packs anyway. The whole RAVENNA suite is a modular approach. We always said we wanted to cover everything that was required for device management in terms of stream setups and stream configurations to have a full complete solution. In terms of controlling the device functionalities, that needs to be covered by a different protocol.

We fully understand the dream of the users who want to control all the microphones that are out there, whether they are Shure, Sennheiser, Schoeps or whatever. They want to control all their amplifiers, regardless of whether they are QSC, Lab-Gruppen, or any others. They want to control it by central means. And there are people in the industry, such as the mixing console manufacturers, who have the interest of being able to offer as much control capabilities to the user in front of the desk. But that will require the initiative of the desk manufacturers and the device manufacturers to agree on something.

audioXpress: Is AES42 (the AES standard for acoustics—digital interface for microphones) something that might be of value here?

Andreas: From my perspective I would certainly say that integrating AES42 would be an interesting approach if there is enough interest from the industry peers and end users. There is no reason why we cannot have AES42 in harmony with RAVENNA. But that needs to be initiated by those peer groups. I know some of the RAVENNA partners are highly involved.

The end user does not care if they are using RAVENNA, Dante or whatever. We will still see different technologies and different solutions, even proprietary schemes, seating next to each other in islands and that's the big benefit of such an initiative such as AES67, because it opens a channel between all these different solutions and devices to at least interoperate to a certain selected level. 

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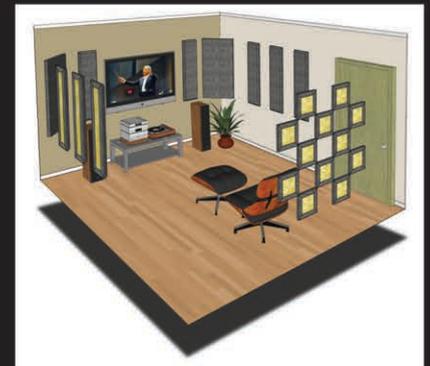
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