



RAVENNA

AES67 *built-in*

RAVENNA is a solution for real-time distribution of audio and other media content in IP-based network environments. Utilizing standardized network protocols and technologies, **RAVENNA** can integrate and operate on existing network infrastructures. Performance and capacity are scaling with the capabilities of the underlying network architecture. **RAVENNA** is designed to meet the strict requirements of the pro audio market featuring low latency, full signal transparency and high reliability. **RAVENNA** is fully compatible with AES67 and the SMPTE ST2110 standards.

WHY AUDIO-OVER-IP?

The tremendous scale of manufacturing in the data network world ensures large cost-savings on equipment. In addition, using network-based solutions for media transport enables broadcasters to leverage their existing infrastructure and achieve greater flexibility in content sharing and networking configuration. Since IP technology was originally designed to forward a large number of data packets without constraints towards real-time, it bears some handicaps for media transport applications compared to traditional technology. Despite this handicap, the benefits of using IP for mediatransport are increasingly too persuasive for broadcasters and service providers to be ignored.

OPEN TECHNOLOGY

In the past, the pro audio market has seen numerous technological innovations created or invented by some of the most ingenious minds of our industry. Unfortunately, most of this valuable intellectual property ended up in being used as proprietary or patented technology. It was apparent that a new audio distribution technology will not gain significant market acceptance if it would not be supported by an ample number of different companies. Thus, ALC NetworX decided to make the underlying technology and mechanisms used in **RAVENNA** publicly available.

MARKETS & APPLICATIONS

While primarily targeting the professional broadcast market, **RAVENNA** is also suitable for deployment in other pro audio market segments like live sound, install market and recording. Possible fields of application include (but are not limited to) in-house signal distribution in broadcasting houses, theaters, concert halls and other fixed installations, flexible setups at venues and live events, OB van support, inter-facility links across WAN connections and in production & recording applications.

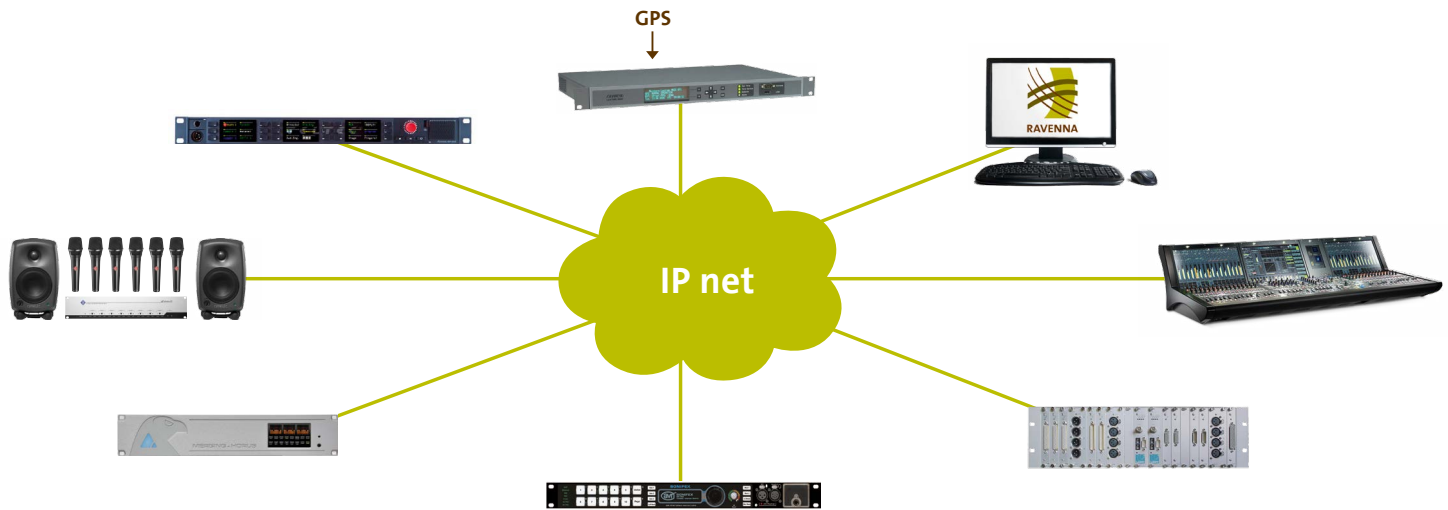
STANDARDIZATION: RAVENNA & AES67

While **RAVENNA** is already based on existing standards from the audio and IT industry, the goal was to create a new standard with **RAVENNA** itself. In September 2013, the AES released the AES67 standard on high-performance streaming audio-over-IP interoperability, which is built on the same fundamental principles as **RAVENNA**. Consequently, **RAVENNA** fully supports AES67-based stream exchange with other networking systems, but provides superior functionality in terms of control, performance, flexibility and applicability. **RAVENNA** is fully in-line with SMPTE ST2110-30/-31.

WHEN THE WORLD IS LISTENING ...

Here's an interesting fact that you probably didn't know – over the last few years, many of the world's biggest and most important sporting and cultural events would simply not have been broadcast without **RAVENNA** audio networking. Broadcasters use **RAVENNA** audio networking every day, and praise its endless flexibility and ability to work in complex IT setups alongside other IP technology. These are the features that make **RAVENNA** the preferred technology for the most demanding audio requirements, where it is crucial that the audio performs flawlessly. The openness





THE ADVANTAGE OF IP

- The IP protocol is based on and works in conjunction with a number of widely deployed standards.
- IP as a transport protocol can operate on many different network infrastructures and virtually any existing network equipment; it is not bound to a specific technology or topology.
- Since IP traffic is not bound to the underlying physical transport layer, performance and capacity numbers scale directly with the capabilities of the network infrastructure.
- The IP protocol can co-exist with other network protocols; thus, different services can share a common network infrastructure concurrently.
- In order to minimize potential negative effects from rivaling bandwidth requirements of other shared services on the network, effective Quality of Service mechanisms like DiffServ and VLAN are available, which are supported in most network environments.
- Since IP traffic can be routed across LAN boundaries, the A/V data streams can be accessed from within different subnets.
- Even distribution across WAN connections can be made possible without leaving the IP domain.
- By using IP as a protocol basis, the convergence between the A/V and the IT world is accelerated. For example, PCs may participate in the A/V stream exchange and concurrently use other services - all through the same network connector.

RAVENNA FEATURES

- Precise media clock distribution - no requirement for a separate house clock distribution
- Sample-accurate play-out alignment across all nodes on the network
- Concurrent support of multiple media clocks and data formats - streams with different sample rates and / or data formats may travel across the network without sample rate conversion
- Full bit transparency for 16 and 24-bit PCM data
- Fully bit-transparent AES3 signal format - preserving all meta data bits (e.g. even Dolby® E signals stay intact)
- Low latency - depending on network infrastructure, traffic patterns and stream configuration, sub-milliseconds latency is achievable
- Operation on existing networks and in shared traffic environment possible
- QoS support based on widely deployed DiffServ scheme allows prioritization in shared traffic environments
- SMPTE ST2022-7 redundancy optionally supported through use of dual network interfaces
- Flexible configuration - streams may be individually configured in terms of data format, number of channels and bandwidth utilization
- Unicast and multicast mode supported on a per-stream basis
- Fully AES67-compatible - all fundamental operating principles and protocols of AES67 natively supported
- Fully in-line with SMPTE ST2110-30/-31 standard



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Now with
ST2110!

TECHNOLOGY OVERVIEW

STANDARD PROTOCOLS

All protocols and mechanisms used within RAVENNA are based on widely deployed and established methods from the IT and audio industry or comply with standards as defined and maintained by international standardization organizations like IEEE, IETF, AES and others.

IP

RAVENNA is an IP-based solution. As such it is based on protocol levels on or above layer 3 of the OSI reference model. IP can be transported by virtually any LAN and is used as the base layer for communication across WAN connections. Although Ethernet will be deployed in most cases as underlying data link layer, IP is in general infrastructure-agnostic and can be used on virtually any network technology and topology.

STREAMING

As IP has been chosen as a basis, it's only natural to use RTP for streaming of media content. RTP is widely used and supported by numerous applications and comes with a large number of standardized payload formats. This would even allow standard media player applications to potentially subscribe to RAVENNA streams.

Streaming is supported both in unicast and multicast mode providing the highest flexibility to match the distinct requirements of different applications.

A receiver can subscribe to any existing RAVENNA stream through RTSP / SDP protocol, which is also supported by most common media players.

SYNCHRONIZATION

While simple streaming across a network can be achieved without any synchronization at all, in pro audio applications a tight synchronization between all devices and streams is absolutely mandatory. While playback synchronization in most applications requires sample accuracy, it has been the goal for RAVENNA to optionally provide superior performance by providing phase-accurate synchronization; this would render the separate distribution of a reference word clock throughout a facility or venue obsolete.

In RAVENNA, synchronization across all nodes is achieved through IEEE1588-2008 (PTPv2 Precision Time Protocol), another standard protocol which can be operated on IP. PTPv2 provides means for synchronizing local clocks to a precision as defined in AES-11. Accurate synchronization can even be reached between remote locations, when GPS is used as a common time reference.

QOS

As different services can co-exist with RAVENNA on the same network, it has to be ensured that RAVENNA streams will be expedited with priority.

For IP-based traffic, several QoS schemes have been defined as standards over time. For RAVENNA, DiffServ has been selected as QoS mechanism as it is widely supported by most modern managed network equipment.

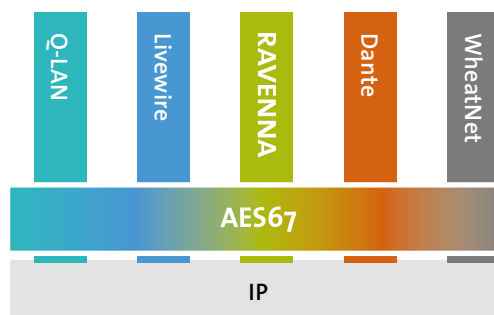
FULL NETWORK REDUNDANCY

Although a modern network infrastructure can be configured to guarantee a high level of transport security and reliable 24/7 operation, a RAVENNA device can optionally support full network redundancy by exhibiting two independent network interfaces which can be connected to independent physical networks. By duplicating any outgoing stream to both network links as defined in SMPTE ST2022-7, play-out at the receiver will continue flawlessly and uninterrupted as long as data packets are received on any one link.

RAVENNA & AES67

Since all relevant standard ingredients of AES67 are either identical or very close to RAVENNA's operating principles, RAVENNA can naturally fully support interoperability as defined within AES67. While RAVENNA and AES67 share the same principles for synchronization and transport, AES67 packet setup and payload formats are functional subsets of RAVENNA. Since the RAVENNA technology framework offers performance and functionality beyond the AES67 interoperability guidelines, AES67 can be seen as one of many possible operational profiles for RAVENNA. Other RAVENNA profiles offer faster performance and lower latency capabilities, higher channel counts, better applicability to routed network environments or means of transporting different types of media.

Full compatibility with AES67 provides also for compliance with the SMPTE ST2110 standard for Studio Video over IP.





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OPEN TECHNOLOGY PARTNERSHIPS

Unlike most other existing networking solutions, RAVENNA is an open technology standard without a proprietary licensing policy. In order to emphasize this open approach, ALC NetworkX is teaming-up with a growing number of renowned companies from the pro audio market to present a variety of RAVENNA-powered products.

PARTNER STATEMENTS ABOUT RAVENNA

Thomas Riedel, CEO, Riedel Communications:

"As a stand-alone technology, the RAVENNA framework provides an efficient and flexible solution for audio over IP transport. Its full AES67 compliance is an important fact for us and our customers. By extending our products' format support to include RAVENNA and thus AES67, we take a key step forward in delivering the many benefits of standards-based communications and signal-transport solutions."

Claude Cellier, CEO, Merging Technologies:

"RAVENNA most certainly has all the right ingredients to become the dominant IP standard in the Broadcasting and Recording industries. We are incredibly excited about the release of HAPI, our new family member of RAVENNA-enabled products, broadening the world of ideas on workflow possibilities with our other RAVENNA partners even further."

Arie van den Broek, CEO, Archwave:

"After careful consideration we came to the conclusion that RAVENNA's foundation on open technologies, its strong user-base in the most demanding markets and its future vision, were the deciding factors for choosing a state-of-the-art technology platform. We are excited about the cooperation with ALC NetworkX to drive RAVENNA technology to a broad market acceptance."

Aki Mäkitvirta, Manager of R&D, Genelec:

"Genelec believes that IP audio networking fully compatible with standards is the right, reliable and robust way of approaching the needs of the professional audio market. RAVENNA offers the path forward to open standards-based end-to-end IP solutions with quality acceptable to the professional audio world."

Philipp Lawo, CEO, Lawo:

"Within the last years, IP-based solutions have become a serious option for the transfer of control and audio signals. RAVENNA opens new horizons for stretching out Lawo's networking technology for mixing consoles and routing systems onto an IP-based platform."

Marcus Brooke, General Manager, Sonifex:

"We'd been looking for an open standard for IP audio connectivity for quite some time. Its bit-transparency and sub-sample accuracy, combined with its open nature, RAVENNA is the perfect technology for us. I'd like to think that one day, quite soon, all broadcast products will be able to talk to each other using RAVENNA."

Kevin Lyver, President, Ward-Beck:

"AoIP is the way of the future. We conducted extensive research on the different available technologies and found RAVENNA/AES67 suited our needs and the needs of our clients best. We look forward to a long and mutually beneficial relationship with our partners at ALC NetworkX and the growing RAVENNA partner community."

Stephan Flock, CEO, DirectOut:

"In professional audio, MADI has been the most important multichannel digital audio format for many years. However, as MADI only allows for point-to-point connections, the move towards network-based solutions is inevitable. RAVENNA is our first choice, as it is based on open protocols and offers outstanding features in terms of timing accuracy and scalability."

About ALC NetworkX

ALC NetworkX is a competence center with its own R&D department in Munich, Germany. A team of experts with excellent reputation from the pro audio industry and in-depth knowledge in networking technologies has developed the RAVENNA technology platform. Although product implementations will be executed by individual partner companies, ALC NetworkX will continue to keep the lead role in the RAVENNA technology development and ensures that RAVENNA technology evolves in full compliance with existing and emerging international standards.

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