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 media transport 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.

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 of RAVENNA, now adopted by nearly 50 manufacturers, means it will be used when sound really matters.
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

- Suitable for audio, video and other media data as well as for control protocols
- 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 - signals are not changed by the transport mechanism (e.g. even Dolby® E signals stay intact)
- Definition of a fully bit-transparent AES3 signal format - preserving all meta data bits
- Low latency - depending on network infrastructure, traffic patterns and stream configuration, a sub-milliseconds latency is achievable
- QoS support based on widely deployed DiffServ scheme allows resource sharing with other traffic
- Full redundancy optionally supported through integrated support 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
- Operation on existing networks and in shared traffic environment possible
- Fully AES67-compatible - all fundamental operating principles and protocols of AES67 natively supported
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 across WAN connections, when GPS is used as a common time domain.

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, 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.
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:
“Achieving the quality and robustness necessary to approach 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.”

Aki Mäkivirta, 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.”

Philippe Delacroix, Président, Digigram:
“The RAVENNA protocol offers a host of neat features for synchronous Audio-over-IP distribution based on open, existing standards, particularly for large-scale broadcast production facilities. It was therefore a logical step for Digigram and entirely in keeping with our own in-house IP audio developments to offer bridges to/from the RAVENNA ecosystem.”

Patrick Warrington, Technical Director, Calrec:
“The excellent work by the AES’s X192 committee in its publication of AES67 has given the AoIP landscape a huge boost, allowing different manufacturers to design interfaces that they are confident will work with other manufacturers’ equipment. ALC NetworX’s strong involvement in drafting AES67 means RAVENNA interfaces are directly compatible with other AES67 equipment.”

Jürgen Breitlow, Director R&D, Neumann:
“The integration of audio networks with our Solution-D digital microphone technology is a basic requirement to be successful in the future. We are pleased to have found in RAVENNA an open and IP-based network technology. By integrating remote control through the same network we can provide solutions for simpler workflows. We believe that RAVENNA, with its growing number of participating companies, will find rapid diffusion and acceptance, in the studios, broadcast environment as well as in the recording world.”

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 NetworX is teaming-up with a growing number of renowned companies from the pro audio market to present a variety of RAVENNA-powered products.

About ALC NetworX

ALC NetworX 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 NetworX will continue to lead the role in the RAVENNA technology development and ensures that RAVENNA technology evolves in full compliance with existing and emerging international standards.