THE THREE PILLARS OF AUDIO NETWORKING

The critical components of a complete, interoperable audio networking solution

DEFINING INTEROPERABILITY

INTRODUCTION: CONNECTING AUDIO NETWORKS IN THE REAL WORLD

In the world of professional, installed and commercial audio, interoperability is what allows designers and users to freely choose the brands and devices they wish to use, and to easily connect, configure and manage them in practical settings. When interoperability is compromised, systems are cobbled together with fragile and complex workarounds, leading to increased costs and errors.

This paper examines what constitutes and drives useful interoperability in audio networks, and examines the state of the audio industry from this perspective.

Inter-Operable vs. Intra-Operable

What kind of "interoperability" is important to the audio industry?

For installers, designers and system users, full interoperability means audio connectivity that "just works" with the equipment they prefer. It is the ability to create complete workable systems that are easy to use, maintain and understand. It means having a consistent, intuitive set of tools to operate the assembled system, regardless of the mix of manufacturers and products deployed. It means that the solution is well supported, well known, and trusted.

Many types of partial interoperability are possible with combinations of format convertors and careful design workarounds. While useful and at times necessary, this method requires expertise in several types of transport to implement and maintain a system, and is far more cumbersome, costly and error-prone than a completely interoperable solution

Audio equipment makers know that their customers want reliable, complete solutions. Some have developed network solutions that provide a high level of consistency and functionality, but that only work within their own product lines. This exchanges the broad "inter-operability" outlined above for a brand-centric "intra-operability", reducing component choices to a single vendor. These bespoke systems are of limited appeal, as users generally choose equipment for many reasons beyond network connectivity.

What are the properties of a solution that achieves the complete interoperability that users desire?

THE 3 PILLARS OF AUDIO NETWORKING

Successfully adopted technologies stand upon three key attributes:

- They deliver complete toolsets - not simply parts - that solve real problems for users
- They are developed and supported by trusted organizations
- They are widely distributed with a goal of fostering ecosystem growth

In audio networking, these three attributes are: the solution itself, the organization that supports it, and the implementation of the solution in many products that customers actually use together. These "pillars" stand upon the foundation layer of existing networks and network standards.

Audio Networking Foundations

The foundations of modern audio networking come directly from computer networking; specifically, switched TCP/IP over wired Ethernet and its associated standards. This technology has evolved to achieve massive data throughput with unprecedented reliability. While it was not developed with audio specifically in mind, it is an ideal platform upon which to develop solutions that transport time-critical data between many devices.

COMPLETE SET OF TOOLS

DEVELOPMENT AND SUPPORT

BROAD PRODUCT ECOSYSTEM

EXISTING NETWORKS AND STANDARDS

PILLAR 1: A COMPLETE SET OF TOOLS

People don't buy or use technical ideas alone; they use products that assemble those ideas into a coherent whole. Without thoughtful design that allows users to grasp possibilities and achieve goals, technologies will fail to achieve the critical mass necessary to become widely accepted.

The Audio Networking Toolset

A well-designed product identifies and solves problems for users, providing tools that are easy, intuitive, and right for the job. In audio networking, a fully developed product should provide:

- Easy to use software for control and management
- Reliable, automatic discovery of network devices
- Defaults that permit operation in a wide range of environments
- Emphasis on plain language with user-assignable names (instead of bundles, IP addresses, or other magic numbers)
- Simple visual management of audio routes
- Easily understood control of device settings
- Actionable diagnostics that allow users to easily understand system status and performance

To an audio professional, this list appears obvious and clear. From an interoperability standpoint, difficulties arise when multiple audio equipment manufacturers attempt to solve these problems individually: each develops a unique set of tools that works only within a single brand. The operations, while based upon underlying standards, are sufficiently complex that unprecedented cooperation between manufacturers would be required create to a shared toolset.

The dilemma is solved when the audio networking solution is delivered as a product to all manufacturers by an independent third party. This third party is the one responsible for producing the shared tools, ensuring interoperability without "plug-fests" or workarounds. This is especially critical for an industry in which computer networking is still relatively unfamiliar.

A complete toolset addresses the needs of both end-users and manufacturers, providing the front-end tools that users require, plus the back-end support needed by manufacturers to build successful, useful products. These back-end tools and features must include:

- Complete documentation of all features and capacities
- Full API for integration of manufacturer's tools with the interoperable solution
- Developer kits for prototyping
- Hardware modules for rapid product deployment
- Development support

A toolset that is shared by manufacturers is an effective way to enforce the consistency that users demand, creating interoperability by definition at low cost. It is simple for manufacturers to incorporate this into their products, leaving them free to differentiate in areas that do not impair their ability to work with others.

UNDER IT ALL:
EXTENDING FOUNDATIONS

The three pillars rest upon a foundation of standards, equipment and expertise. These are not static, and new standards can enhance the value of solutions that build upon them.

AES67 is the type of building block that a standard provides. It does not attempt to define an entire solution, but is a practical agreement that makes limited interoperability possible.

AES67 defines low-level functionality that permits manufacturers to achieve basic interoperability across different compliant audio network implementations. Quite properly, AES67 says nothing about the higher layer features required for a complete network solution, such as discovery and device control.

PILLAR 2: DEVELOPMENT AND SUPPORT

When there is a problem, there needs to be somebody to call, as proper support is key to the success of any technology. The maker of a widely used audio networking solution is responsible for multiple types of support for different users.

SUPPORT FOR DEVELOPMENT

The creation of networking tools, mechanisms and hardware designs is accelerated when an accountable organization is dedicated to these tasks, focused upon the needs of manufacturers and end users. The organization is responsible for receiving and processing feedback, and continually improving the solution.

SUPPORT FOR TESTING

Users and manufacturers benefit when there is an organization aligned with their need for interoperable audio networking solutions, and they shouldn't be burdened with ad hoc testing. The organization behind the solution conducts all necessary tests as part of the design process.

SUPPORT FOR THE FUTURE

Network technology is rapidly advancing, expanding possibilities and driving increased expectations from customers. Any solution that cannot take advantage of these advancements is destined for abandonment at some point in the future, making large investments difficult to justify. A successful solution requires an organization that keeps up with these changes, ensuring enhanced performance and ongoing relevance for years to come.

PILLAR 3: A BROAD PRODUCT ECOSYSTEM

A single telephone by itself is not a very compelling device, but once many people have one, it becomes invaluable. Like the telephone, the value of an audio networking solution is directly proportional to the number of devices to which it can connect, and this too is the job of the solution maker.

FOSTERING CUSTOMER CHOICES

Rapid adoption of a solution or technology is rarely achieved accidentally. It is most often the result of concerted effort to get the solution into as many of the right products as possible, and to design it to work in the widest variety of real-world circumstances.

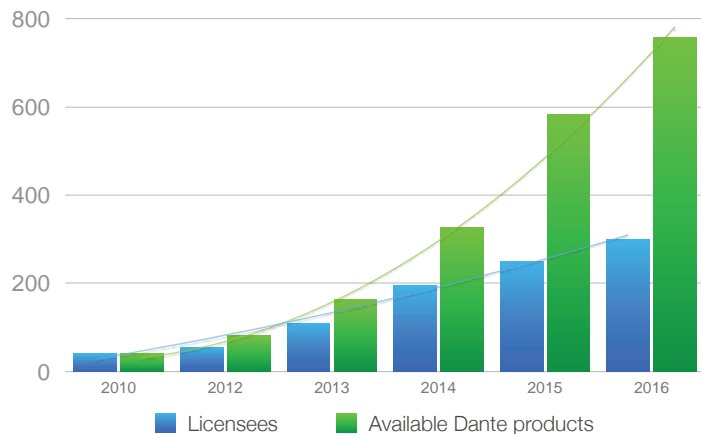Wide-scale adoption requires a solution that:

- Is actively marketed to key manufacturers in the industry
- Simplifies new product development
- Works on existing infrastructure and topologies, does not demand "special" treatment
- Has ongoing, active development to ensure continued value as the market and technology evolves, i.e., it is future-proof.

TCP/IP

The now ubiquitous TCP/IP networking standard did not succeed simply because it was a good idea. In 1993, Microsoft chose to integrate it into Windows networking products in an effort to compete with Novell. With the rise of Microsoft's influence, TCP/IP became the ubiquitous de facto standard. The successful integration with popular, easy-to-use, complete products demonstrated the value better than any paper or dissertation. The interoperability that TCP/IP enables is due to an historic synergy of robust standards, good design and market forces.

GOING FORWARD:
INTEROPERABLE BY DEFINITION

The audio networking market is following a path very similar to other new technologies; after an initial period of experimentation, it is coalescing around an integrated solution that provides real value to both manufacturers and end users.

Courtesy RH Consulting

With over 200 licensees from across the audio spectrum and growing rapidly, Dante by Audinate is fast becoming the de facto standard of audio networking. It is the only solution available to all manufacturers that builds upon standards-based protocols, providing a complete suite of well-designed tools and full technical support for both developers and users. Dante provides:

- Guaranteed interoperability across all manufacturers and products
- Powerful, easy-to-use tools for both end users and developers
- Complete compatibility with existing IT technology and standards
- Easy to integrate solutions for rapid deployment by manufacturers
- Full API for product integration by manufacturers
- Engineering support for manufacturers
- Software that connects computer audio directly to the network
- Standards-based support for interoperability with other AV network solutions

Dante is multichannel audio transport for the modern networking era, making full use of Layer-3 IP networks and direct integration with computers for processing, recording and control. Any combination of Dante devices can be used and controlled from a single application, allowing manufacturers to build great, differentiated products while preserving the functionality, ease of use and real-world usability that customers demand.

With Dante, true IP-based media networking is at last becoming mainstream, moving audio into a fully digital environment that everybody understands, and everybody can use.

About Audinate

Audinate revolutionizes AV systems to enable our customers to thrive in a networked world. Audinate's Dante media networking technology has been adopted by the leading OEM manufacturers and has become the standard and dominant networking technology in the professional audio/visual industry. Dante is used extensively for live performance events, commercial installation, broadcast, recording and production, and communications systems. Audinate offices are located in US, United Kingdom and Australia. Visit **www.audinate.com** for the latest news and information on the company. Dante is Digital Media Networking Perfected.

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