

Milan White Paper

Milan: A Networked AV System Architecture

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Executive Summary

Industry-leading manufacturers in the Pro AV market have worked together to develop Milan: a network protocol built on top of IEEE AVB open standards with added technical requirements to provide a solution that guarantees interoperable, reliable, deterministic and future-proof media networking.

The philosophy behind the Milan Networking Protocol:

Everything will be networked. Data and network connections are growing rapidly. At the same time, the expectations for audio and video continue to grow and evolve, demanding more from audio/video networks -- including connecting more devices. With AV increasingly residing on the network, it becomes part of the larger IT ecosystem. The next natural step of the communications evolution is for Pro AV to become part of the IoT. The network, which provides connectivity for individual components to work together, becomes the grid that defines system architectures.

However, interoperability between devices is a necessary element of the AV industry value proposition today, decreasing the value of isolated individual products and focusing more on an integrated system. The future of AV requires more than just connecting individual products and components together – it requires value and functionality that can only come from deep system integration. Yet today, planning and handling of AV networks also requires strong IT management skills. Products and systems are becoming increasingly involved, interoperability is not a guarantee, and users are overwhelmed with the network's complexity.

Audio and systems engineers expect more. They should be able to realize the functionalities in their system; their network should always work – it should be easy, reliable and future-proof. What's more, as consumer technology continues to advance, audiences expect a richer experience for live sound and other commercial AV applications.

Networking is just the enabling technology that allows us to deliver those experiences.

The network must now become part of the value proposition for manufacturers; it must be open for creativity to enable bringing truly valuable products to market. For this to happen, manufacturers must work together with others like them, openly sharing information on technology and products, and together defining the requirements for greater

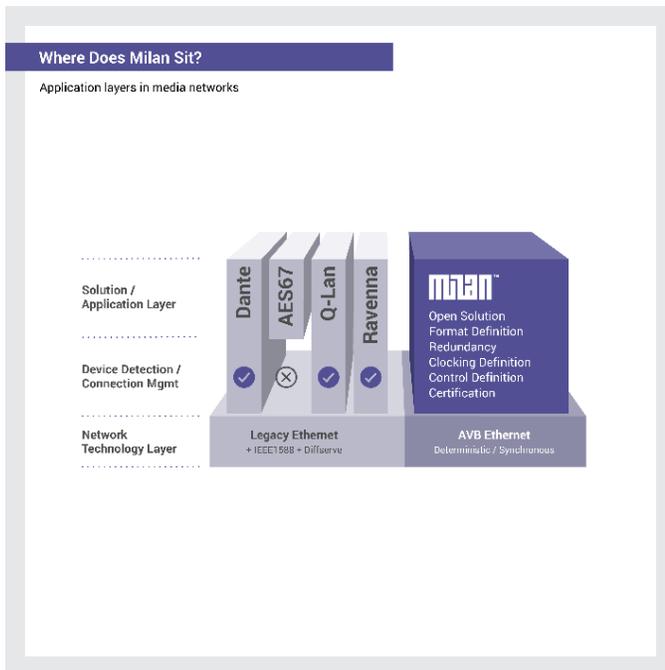
network interoperability. This vision for networking should encompass the ease of the analog XLR connector and transform it into full media and data interoperability.

The industry needs to refocus on delivering a future-proof audio solution that can scale.

When it comes to networked audio platforms, the professional media industry has two major requirements. At the most basic level, it requires guaranteed delivery of high-quality audio, not subject to dropouts, phase shifts, or comb filter effects on line arrays. However, the industry needs to solve this with a long-term, stable and viable platform that evolves with the market's requirements. When making decisions on networking infrastructure, end users need to be confident that they've chosen an enduring standard and a network that can provide support as their media and data needs scale — today, tomorrow, and even years from now.

Many of today's solutions have been knit together using proprietary networking solutions, requiring extensive design, installation and support work from industry professionals and creating risky propositions that are not guaranteed for long-term viability. As the network has evolved and continues to scale, so has the opportunity for the industry. **The network should not be a competitive market on its own or a bottleneck for innovation.**





What if the top engineers and strategic thinkers from the best audio manufacturers in the world came together to make a network?

Enter Milan: Created by, and chosen by, live sound leaders in Avnu Alliance, Milan is the manufacturer's network; the technical AND business decision for the top leaders in the market. These manufacturers, in direct competition with one another, have come together to collectively take the driver's seat in creating and advocating for the change they want to see in the pro audio market. Through this process they brought to life a vision for a complete media network – one that is easy-to-use, future-proof, open for creativity, scalable across markets, and delivers a convergence between audio, video and control with IT on one network.

Over the past three years, these manufacturers deliberately decided to work together and invest their brightest technical knowledge, expertise, and strategic resources to work together to produce

something exceptional, which meets their individual and collective requirements for their own products and customer demands. These leaders can now say today, "we're not competing on the network foundation anymore."

This kind of collaboration amongst competitors to develop Milan couldn't have occurred without the framework provided by Avnu Alliance. Membership in Avnu gives manufacturers a voice to collectively define the market requirements to meet their unique development needs for a fully realized professional AV network solution.

Milan is not just enabling network connectivity; it is the grid to build on for the future.

Co-developed in deep cooperation between these manufacturers and in alignment with other industries such as automotive and industrial, Milan builds on a common networking technology – creating a link between AV, IT and silicon industries to enable a true IT convergence and develop a foundation that professional AV manufacturers can implement.

Milan is a standards-based, user-driven deterministic network protocol for professional media, that assures networked AV devices will work together at new levels of convenience, reliability and functionality.



Building on the technical benefits of the enduring open AVB standard developed by the IEEE, such as time synchronization and guaranteed quality of service, as well as risk-free coexistence of control and media data on one network, Milan provides defined device requirements at both the network and the application layer for media streams, formats, clocking and redundancy. Milan is the protocol that ensures reliability and determinism for AV networks.

Milan adds essential agreements about the implementation of AVB technology, including requirements for compatible and compliant media formats, media-clocking, redundancy, and controller software, while ensuring those requirements are implemented correctly through compliance testing and certification of end devices. **Milan promises an AV network that is deterministic, open, future-proof, and easy-to-use.**

What is Milan's impact on network systems and technologies?

Live sound audio engineering is one of the most challenging jobs; This market has the highest requirements for audio stability combined with the necessity for fast deployment. There can't be any guesswork when there is so much on the line. There could be thousands of people in the audience during any given performance and the systems must be robust so there is no degradation of sound but also must be easy enough to set up and configure in a time crunch. The creators of Milan come from this live sound production market and were forced to creatively develop solutions that do that job and do it in a reliable way. As a layer two technology built on a deterministic networking standard, Milan was created first as a network for live production and events.

Leveraging that experience, the creators of Milan agreed on three principles for Milan:

1. Convergence is a reality. Audio, video and IT must coexist on one network.
2. The network must be future-proof to support the growing requirements and transformations for the evolving Pro AV market.
3. The AV market must cooperate with the IT industry in order to manage and benefit from this convergence.

To achieve those principles, Milan is built on an open standard, which means it has broad market appeal, is supported by IT and interoperable with the entire stack of standards technology in multiple markets, making it an enduring standard that IT departments will embrace. With an open standard foundation, Milan enables increased flexibility and reduces the total cost of ownership by bringing an economy of scale, minimizing deployment and maintenance time. The open nature of Milan allows manufacturers to build their systems while having ownership over the network.

Milan aims to achieve ease-of-use around networking for end users, ensuring it just works and keeps working. Milan becomes a system architecture, giving manufacturers the right tools to build their system platforms on, to make that vision happen.

Milan's long-term product philosophy:

There is no one perfect network standard for every application and Milan is not competing with other network standards -- it's a deliberate execution of the solution that live sound leaders have chosen as their network. Milan is an evolving, long-term, viable, and durable network.

Milan wasn't created by a single entity defining how things are going to be implemented; its many manufacturers have come together to invest their expertise, resources, and experience to ensure that Milan is the system architecture for the future of many ecosystems. The ultimate end result is the creation of the most robust system architecture. The collaboration that it took to build Milan, ensures that



everyone gets everything they need out of the system and the network; that it is reliable, interoperable, open and delivering the best experience for end users.

Milan is always evolving, its creators still learning how to make it more robust, more interoperable, and more capable of delivering the best networked audio, but you can bet, “Milan will be better because it has to meet the high expectations of our customers.” To back up this promise, Milan is supported by a robust certification program to ensure device interoperability.

The manufacturers behind Milan agreed to own the network as the foundation for their own value proposition. In doing so, they’ve created a collaborative, deterministic network standard for the industry, by the industry, that when certified for interoperability, can meet the challenging requirements of Pro AV and can adapt to meet future requirements as network capacity and demand scale. Milan is the foundation to build on for the future.

