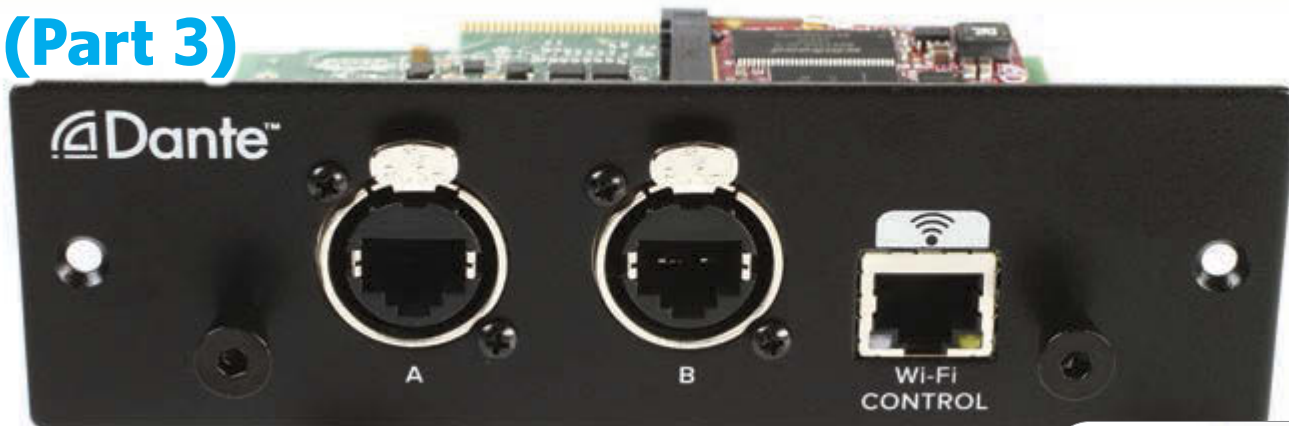


Audio Network Development (Part 3)



Developing Products Based on Dante



In the first two articles in this series, we touched upon the evolution of audio network connectivity, available technologies and platforms, and provided an update on existing audio networking technologies. In this article, we address how to implement products over Dante—a technology directly developed and supported by Audinate.

By
João Martins
(Editor-in-Chief)

Among the available technologies and platforms for audio networking product development, Audinate's Dante is the most widely available solution. There's a reason why Dante is so popular and that is because Audinate licenses and fully supports all development efforts directly. We also cannot dispute the amazing success Dante has had in the professional audio industry.

A white paper published February 2015 by British firm RH Consulting that examines the current state of the audio networking market states, "Audinate's Dante audio networking solution has had significant growth in licensees over the last 24 months, nearly four times the next largest protocol. (...) Over 700 networked audio products are currently available, with the number of Dante-enabled products introduced in the last 12 month significantly outpacing all other networking protocols. The number of Dante-enabled products is forecasted to grow by 75% in 2015, and 130% by 2016."

"Audio networking is following the same pattern as most new technology," says Roland Hemming principal audio consultant at RH Consulting. "The success of Dante is consistent with easy-to-use, end-to-end solutions driving the market when technology

is in the early growth phase." He continues, "Over time networking has become less about specifying a protocol and more about specifying products that work together."

As Audinate states in its published paper, "The Three 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

Audinate based Dante on these foundations, leveraging modern audio networking directly from computer networking—specifically, switched TCP/IP over wired Ethernet and its associated standards.

Focused on Support

Another reason Dante captured the attention of the audio industry in its early stages was because it focused on solving the challenges of delivering tightly-synchronized audio using standard IP networks,

achieving ultra-low network latency and simplifying network set-up, creating an intuitive and easy-to-configure user interface.

As Lee Ellison, CEO of Audinate, explains, “Audinate’s core expertise is in IP networking that began development more than a decade ago. With digital networking, the physical connecting point is irrelevant: media signals can be made available anywhere and everywhere, eliminating the many bulky cables needed to provide point-to-point wiring for analog AV installations.

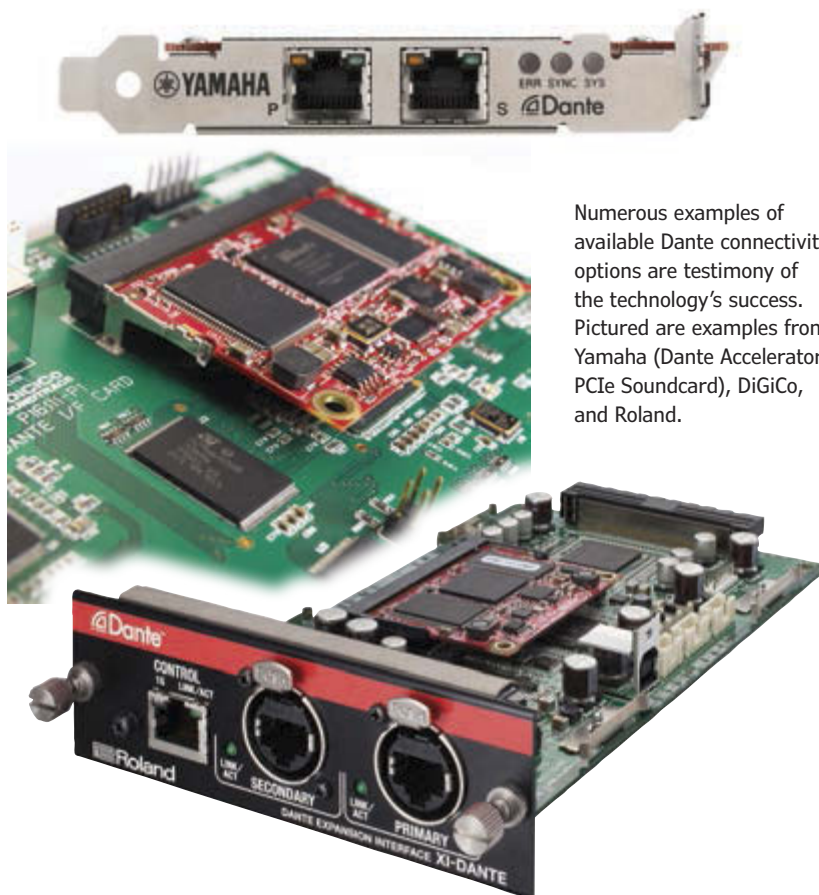
“Audinate simplified network configuration compared to other audio networking approaches that required complex programming of ID numbers and bundles. The Dante networking solution is a true plug-and-play solution, because devices and channels are automatically discovered and easy to program. Patching and routing are logical functions configured in software, not via physical wired links. Audio networking brings enormous benefits enabling audio equipment to become intelligent devices,” he adds.

Even though early success stories for the technology originated from live sound applications—in 2008 the successful Dolby Lake Processor became the first Dante-equipped professional audio device—the technology was quickly adopted for installed systems and gradually evolved to professional recording, corporate systems and broadcast.

And Audinate did face some competition. The company adopted a flexible attitude toward existing or emerging networking protocols, promising interoperability when clearly required by the market. Early on, it dismissed competing efforts from the Audio Video Bridging (AVB-IEEE 802.1) proponents, by committing to support an upgrade path when so required. Since the AES67 standard was established and Audinate announced it would also introduce an update to support AES67, it has maintained the commitment to support Institute of Electrical and Electronics Engineers (IEEE 1733) Layer-3 standard, including IEEE 802.1AS for synchronization and real-time transport protocols (RTPs).

Since existing Dante hardware devices can be firmware upgraded as Dante evolves, providing a migration path from existing equipment proved to be an effective way to gain market support, as it was recently demonstrated with the implemented AES67 support, incorporated as an option within Dante. The existing ATP and AES67 (RTP) mechanisms coexist in Dante solutions and the updated firmware “speaks” both.

The way support for AES67 was rolled out, started with the company’s highest volume shipping modules—the Dante Brooklyn II card—released for



Numerous examples of available Dante connectivity options are testimony of the technology’s success. Pictured are examples from Yamaha (Dante Accelerator PCIe Soundcard), DiGiCo, and Roland.



Sennheiser’s Digital 9000 wireless system is one of the examples of Dante networking conquering the pro audio industry.

“With over 500 Dante enabled OEM products available, and hundreds more in the development pipeline, Audinate has become the “de facto” solution for audio networks” — Lee Ellison, Audinate CEO



Focusrite RedNet modular Ethernet-networked audio interfaces harness the power of Audinate's Dante digital audio networking system designed with multiple audio applications in mind, from Live Sound to Multi-room Recording Studios.

integration and testing into products, helping to reassure OEM partners. The upgrade option was offered to OEMs so they could determine if and when AES67 would be incorporated into their products.

As Audinate explained "Dante is a complete media networking solution designed for high-quality AV streaming. The AV industry has embraced Dante because it is easy to set up, delivers a rich and robust feature set and is the most interoperable networking solution available. From the beginning, Audinate has incorporated standards to create the Dante product

suite, and AES67 provides another standards-based transport choice within Dante for Layer-3/IP-based audio networks."

Audinate also states, "Neither AES67 nor AVB are competitive equivalents to Dante. Dante is a commercially supported solution, and more than just a standard. (...) Our OEMs recognize the benefit we provide to enable them to develop their products quickly and benefit from our expertise."

No doubt, Audinate will continue to introduce new extensions to its technology, as its adoption to new application fields and commercial requirements progress.

Dante Product Development

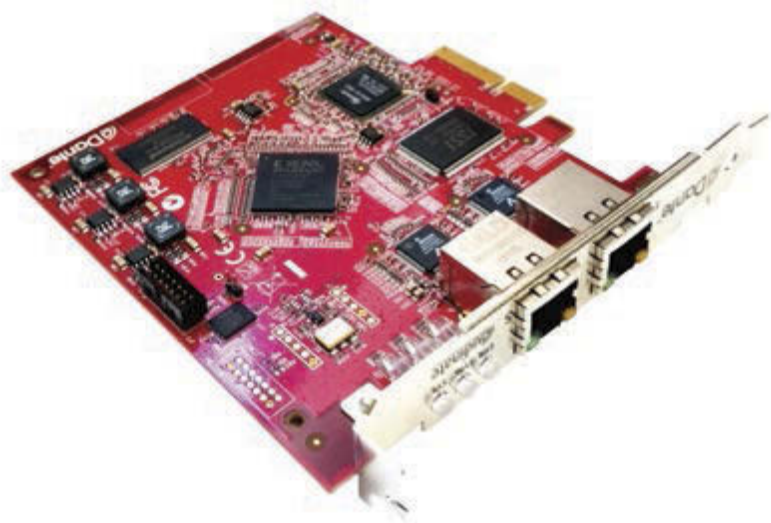
When we visit any audio, AV, or broadcast trade shows, the number of "Dante Spoken Here" signs displayed everywhere serves as testimony to the technology's momentum. Visiting Audinate's Dante online Product Catalog provides the same impression (see Resources).

As Ellison states, "Customer research tell us that the single biggest factor when selecting an audio networking solution is the number of available products on the market. With hundreds of products launched in the last 12 months, Dante has reached the tipping point and has become the industry standard for Audio over IP networking."

"Dante is more than a protocol and is actually a complete networking solution. We recognized early on that there was a huge gap in terms of simplifying the networking technologies, not only with respect to how easy it was to configure and deploy a networked-based audio system, but in terms of providing a completed solution to OEM companies integrating the technology into their products. Audinate provides OEMs with a complete toolkit of networked implementations. This enables OEMs to implement Dante into their products quickly and cost-effectively based on the product requirements. Effective, reliable, and standardized connectivity is a key issue for hardware and software vendors for widespread adoption," Ellison says.

So far, approximately 260 OEMs have licensed Dante to integrate into their products and, as Ellison explains, development is a simple straightforward process. "The Dante PDK (Product Development Kit) contains all you need to quickly become familiar and confident with Dante technology and products. Audinate has a series of PDKs for it various platform implementations. The PDK is a fully functioning system with digital and analog I/Os, word clock, and software components."

Audinate also delivers ready to implement solutions that range from low channel count



For basic testing and high channel count professional audio applications Audinate supplies the Dante PCIe-R soundcard, which also benefits of Thunderbolt external chassis support and is firmware upgradeable.

microcontroller chips, to a high channel count FPGA-based solution supporting up to 512 x 512 channels. This way, manufacturers are able to tailor their Dante implementation to the specific needs of their application/market. Dante has been embraced by OEMs across professional live audio, commercial installation, broadcasters, recording and production, transportation and evacuation public address, and music instrument (MI) markets. And even though no Dante products have been introduced for consumer-oriented applications and no specific marketing efforts have been planned, Audinate confirms that might soon be changing. High-end home theater companies are already implementing Dante and the company confirms that its roadmap will also help open up the consumer space.

Interoperability

As a solution, the Dante API toolkit facilitates rapid development for custom user interfaces and applications to interact with Dante devices. Control data can be shared over the same data network using SPI or UART ports. Access to Dante's powerful control and monitoring capabilities, via the Dante API,



The Dante Brooklyn II module features a MicroBlaze CPU, which includes its own Linux environment, enabling the development of custom embedded applications for device and network control and monitoring.

enables deep and seamless Dante integration with manufacturer's custom features for the development of highly sophisticated systems and solutions.

And contrary to the long and complicated certification process embraced by the AVB member companies within the AVnu Alliance, projects built using the Audinate-provided platforms and development kits have guaranteed compatibility following simple test procedures.

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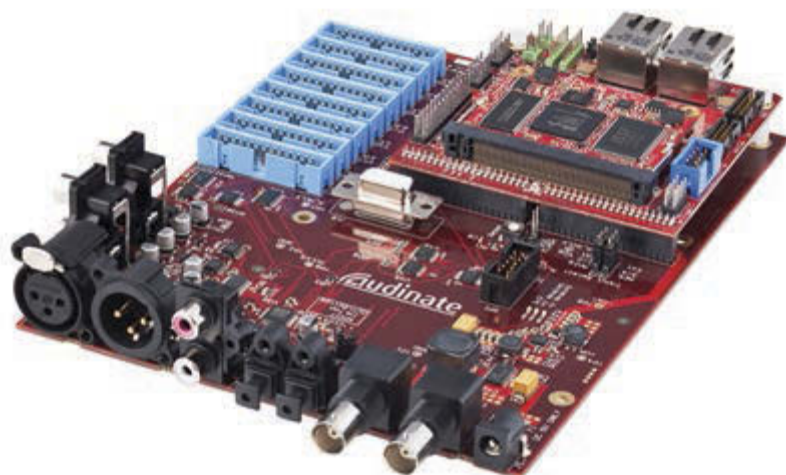
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The Dante Brooklyn II PDK (Product Development Kit) contains all manufacturers need to design, develop, and test fully integrated Dante-enabled products. The PDK is a fully functioning system complete with digital and analog I/Os, word clock, and software components (including the Dante API toolkit), as well as an Audinate technical support package.

As Ellison details, "One of the enormous benefits Audinate brings is guaranteed interoperability. The core Dante software across all of the implementations, from Dante Ultimo (up to 4 x 4 channels), Dante Brooklyn II (Up to 64 x 64 redundant channels) Dante HC (up to 512 x 512 channels), and Dante PCIe (128 x 128 channels) cards are effectively the same, and are as a result automatically interoperable. This benefit and peace-of-mind interoperability should not be underestimated, taking this burden off the manufacturer. Interoperability is not a one-time phenomenon. Audinate is continually making improvements and new features so the end customer does not need to be concerned that changes are going

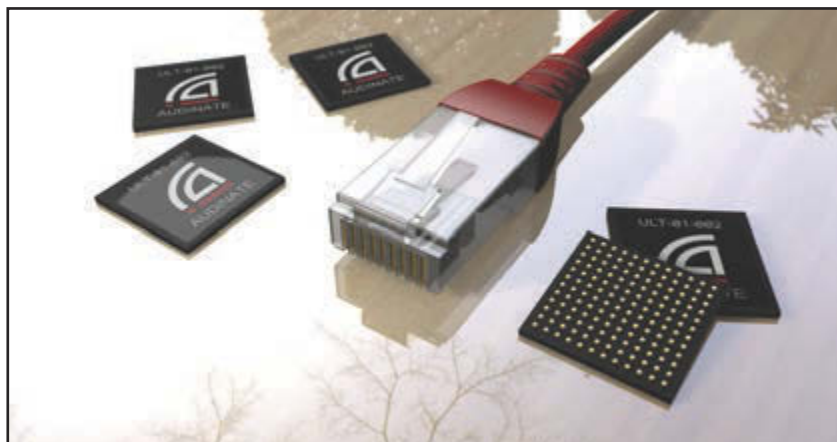
to impact them and customer's interoperability. In our development and test center, we have racks of equipment from partners for regression testing of new updates and releases. With Dante, manufacturers do not have to spend tens of thousands of dollars to ensure interoperability as they do with other technologies. With other networking protocols, or with manufacturers who try to spin their own networking implementation, they really have no control over the changes made by other third party's code development."

"In addition, Dante Controller, a feature reach control management software provided by Audinate, is an enormous benefit to both OEMs and end-users. Having a robust feature rich system configuration and management toolkit is core to the interoperability and industry adoption of Dante. The lack of a sophisticated management controller has been a stumbling block to real world use of other protocols. Audinate's Dante Controller incorporates label based device and channel names, one click signal routing plus the added support tools like health status monitoring," Ellison adds.

For manufacturers who do not have the resource bandwidth to develop new networked products, Audinate also works closely with authorized implementers who can provide engineering support. Attero Tech and Auvitran are two authorized Dante implementers providing additional turnkey development to companies who have limited available development resources.

The Future of Dante

According to Ellison, this technology will continue to evolve supporting market requirements and industry initiatives such as AES67. "Audinate introduced AES67 for the Dante Brooklyn II module to connect transport streams to other AES67 compliant implementations. AES67 will allow streams from one manufacturer's implementation to be set up to another vendor's implementation. This is a positive step, but it should be stressed that someone has to develop and support the implementation to make a usable networking solution, and Audinate has one of the largest organizations in the world dedicated to develop and support of networking as a solution. Dante is built on standards but over a hundred of engineering development years went into making Dante the full solution suite available today. Audinate presently has 45 people in its global organization, 70% being engineering, with a goal to provide networked solutions that meet the customer and end customer needs. Audinate works closely with OEMs and installation contractors to provide input to its roadmap that is planned for the coming year."

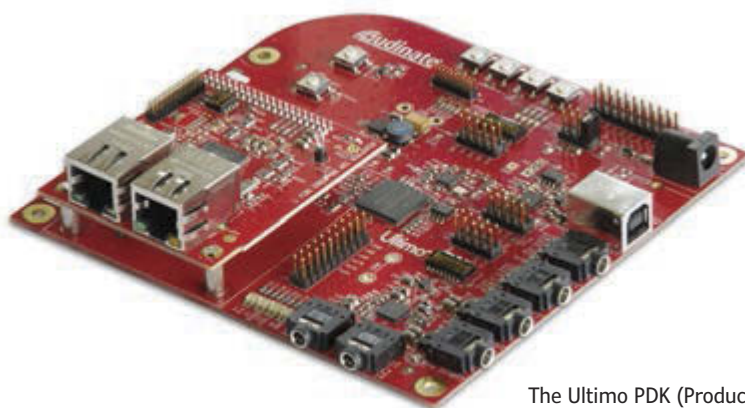


The Dante Ultimo chip is a cost-effective but feature-rich Dante solution for low channel-count applications. Ultimo delivers up to 4x4 channels at 44.1 and 48 kHz, or 2x2 channels at 88.2 and 96 kHz.

One example of its roadmap was the planned development of software solutions such as Dante Via, an innovative network solution for Macs and PCs, which opens up a considerable number of new applications for the technology. Dante Via software connects any audio application or device from a computer to a Dante network and enables USB, FireWire, or Thunderbolt devices—including microphones, legacy mixing consoles, or I/O boxes—to join any Dante audio network. The software also enables a Dante network to be created without the need for dedicated Dante hardware, providing straightforward approach to routing audio using only computers. Sporting an intuitive, easy-to-use “drag-and-drop”-style interface, Dante Via enables rapid discovery and simple connection of devices and applications.

How to Start

Since this a licensed solution, directly supported by Audinate, implementing Dante on a new audio product should naturally start with contacting the company. Licensing policies are not in the scope for this article series but Audinate does make it



The Ultimo PDK (Product Development Kit) includes hardware, software, documentation, and a technical support package for the design and testing of Ultimo integration projects.

easy for any company who wants to explore Dante prior to licensing. Audinate’s executives attend all major industry trade shows, and they promote educational and training events on a regular basis. At those events (e.g., the Dante AV Networking World conferences promoted throughout the US, Europe, Middle East, and Asia), there’s ample opportunity to speak with the company, Dante development partners, authorized implementers, and many of the existing OEMs. Apart from demonstrations



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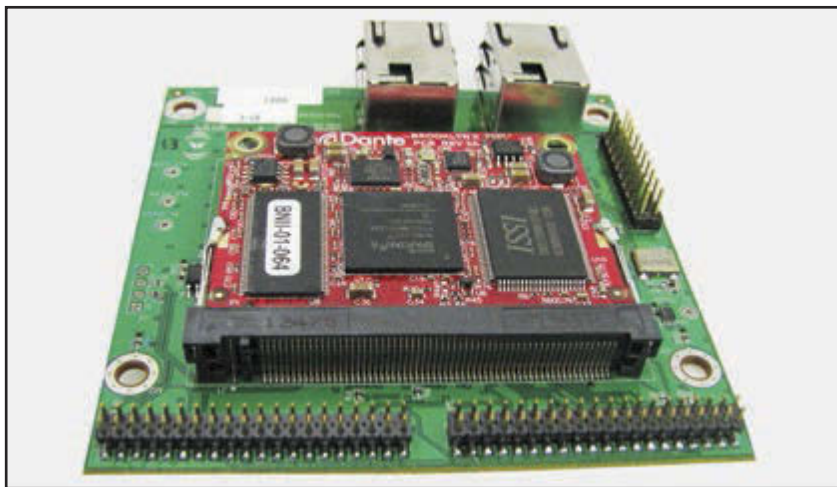
Model no.	Nom. size [mm]	Nom. imp. [ohm]	Freq. range [kHz]	Sensitivity [dB@2.83V/1m]	VC. diam. [mm]	X _{max} [mm]	S _d [cm ²]	F _s [Hz]	R _{DC} [ohm]
TW013WA01	13	4	5-50	87	13	±0.3	2.1	1,300	2.9
TW022WA02	22	4	2.5-30	88.5	22	±0.45	6.1	1,150	3.6
TW022WA04	22	4	2-30	89.5	22	±0.45	6.1	825	3.6
TW022WA05	22	4	2.5-25	91.5	22	±0.35	6.1	750	3.7
TW022WA06	22	4	2-25	90.5	22	±0.35	6.1	750	3.7
TW030WA01	30	4	2-25	94	30	±0.65	11.5	1,050	3.4
TW030WA02	30	4	2-25	94	30	±0.65	11.5	1,100	3.4
TW030WA05	30	4	1.5-25	91.5	30	±0.4	11.5	450	3.4
TW030WA06	30	4	1.5-25	91	30	±0.4	11.5	450	3.4
TW030WA07	30	8	1.5-25	89	30	±0.4	11.5	470	6.3
TW030WA08	30	8	1.5-25	88.5	30	±0.4	11.5	470	6.3
TW030WA09	30	4	2-27	92.5	30	±0.4	11.5	725	3.4
TW030WA10	30	8	2-27	90	30	±0.4	11.5	750	6.3
TW030WA11	30	4	1.5-25	93.5	30	±0.4	11.5	410	3.5
TW030WA12	30	8	1.5-25	91	30	±0.4	11.5	425	6.5
TW030WA13	30	4	2-30	93.5	30	±0.4	11.5	690	3.5
TW030WA14	30	8	2-30	90.5	30	±0.4	11.5	715	6.5



The Dante HC reference design is the industry's highest-capacity networked audio ready-to-use solution for professional AV systems. Dante HC supports up to 512x512 redundant bi-directional uncompressed audio channels on a single Xilinx FPGA with automatic device discovery, one-click signal routing, and user-editable device and channel labels.



The new Dante Via software makes it even easier to connect any audio application or device from any computer to a Dante network. Dante Via enables USB, FireWire or Thunderbolt devices—including microphones, legacy mixing consoles, and I/O boxes—to join any Dante audio network.



Dante implementers like Attero Tech and Auvitrans also supply turnkey development to companies that have limited available development resources. Pictured is a module from Attero Tech, featuring a Brooklyn II Dante board.

of products in action, presentations, training workshops, and interactive panel discussions, the events provide ample opportunities to discuss the products with other audio manufacturers and meet with installation and systems integration companies. But more importantly, Audinate supplies a full range of development tools, including product development kits and software applications.

For basic technology testing and audio networking information, Audinate supplies the Dante PCIe-R soundcard with supports for up to 256 uncompressed audio channels (128 x 128 redundant channels at up to 96 kHz or 64 x 64 at 176.4 or 192 kHz sample rates) with low round-trip latency, ideal also for recording solutions and audio processing. The Dante PCIe-R soundcard is can be used to displace legacy MADI point-to-point hardware with an advanced networked solution.

For testing, design, and development of Dante-enabled products, Audinate offers the Dante Brooklyn II PDK, which includes the Dante API toolkit and SDKs for integration into PC and Mac software, the latest Dante Controller software, and up to 4 Dante Virtual Soundcard licenses for installation on Windows or Mac and OEM Portal Access.

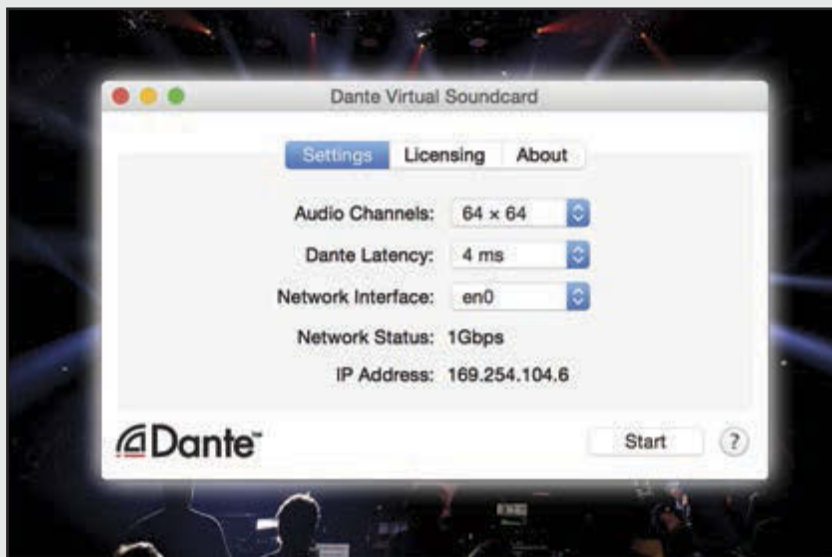
Access to Audinate's OEM Portal provides manufacturers with documentation and software, plus technical design information and schematics, design and configuration tools, and support information.

The Dante Brooklyn II Gigabit Ethernet module is another solution for easily integrating Dante into new and existing products, featuring a powerful FPGA engine and MicroBlaze CPU that includes its own Linux environment for custom embedded applications. A single Brooklyn II module provides a complete, ready-to-use Dante interface, and can equip a networked audio device with as many as 64 channels of bi-directional digital streaming.

For manufacturers looking for a higher level of integration in applications for low-channel count Audinate provides the Dante Ultimo chip, a highly cost-effective but feature-rich Dante solution, ideal for end-point products (e.g., powered speakers, amplifiers, wall plates, and break-out boxes designs). This chip solution, also firmware upgradable, has been designed for quick and easy integration, and is supported by a comprehensive network-side API and a range of control interfaces. The complementary Ultimo PDK is a comprehensive development platform including hardware, software, documentation, and a technical support package. It features a range of audio and control interfaces (I²S digital audio, UART, SPI, I²C and GPIO control headers), integrated clock and codec chips, flexible signal routing, USB serial

Software for Dante

Dante solutions are complemented with the Dante Virtual Soundcard and Dante Controller software solutions, supporting the latest Apple Mac OS X and Microsoft Windows operating systems, including Windows Server. These Audinate applications enable users to instantly connect a computer to any Dante network using the computer's Ethernet port to send or receive audio from Dante-enabled devices on the network. The Dante Virtual Sound Card supports sample rates from 44.1 to 192 kHz, for both ASIO and Core audio. Just recently, Audinate also released its Dante Via software, a new tool to expand audio-over-IP networks to a wide range of computer audio devices and applications, without the need for dedicated Dante hardware.




console, and configurable user interface elements such as LEDs and push buttons. Power can be supplied via 5 VDC power supply/USB/Power-over-Ethernet.

Finally, there's the Dante HC reference design, on which OEMs may build upon to create cost-effective AV products. The Dante HC reference design is ideal for AV equipment products requiring high channel capacity (e.g., audio matrix routers, large format consoles, public address and evacuation systems, and large-scale DSPs). This solution supports up to 512 x 512 redundant bi-directional uncompressed audio channels (128 x 128 at 176.4/192 kHz) on a single Xilinx FPGA with automatic device discovery, one-click signal routing, and user-editable device and channel labels. Dante HC also offers a wide selection of interface options including SPI, I²C, RS232, and configurable GPIO. A powerful onboard microprocessor enables local control and management without the need for any additional CPU.

As Ellison adds, "Audinate recognizes the importance of time to market. Audinate supports its OEMs through its global technical solutions teams to help with issues that could arise during the design, development, and test their Dante-enabled products. Dante OEM partners have access to an OEM portal which contains detailed documentation needed to integrate Dante into the audio products."

"Because the interfaces are all well-defined, we have had some customers develop a whole new range of Dante-enabled products in just a few months," he adds.

For more information about Dante or other products from Audinate, visit www.audinate.com. 

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