Kani Public Arts Center

Dante Networked Sound at the Kani Public Arts Center

Special thanks to the Kani Public Arts Center, Yamaha Sound Systems, and Yamaha Music Japan

Photos by Kohei Osaki

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The Kani Public Arts Center opened in Kani City (Gifu Prefecture, Japan) in 2002, with two theaters, multipurpose lofts, practice rooms, an audio/visual theater, recording and rehearsal studios, and other arts and cultural facilities under one roof. It has become a valuable recreation and learning center for the local community. The center's main and small theaters were recently renovated for the first time since its opening, and a new state-of-the-art sound system was installed. With a Yamaha CL5 at the core, the new sound installation implements Dante capable devices in a fully networked audio system that provides unprecedented flexibility. Although networked audio has become more prevalent in recent years, systems like the one installed at the Kani Public Arts Center where everything from wireless devices to processors and power amplifiers are connected via a Dante network are still a rarity. We visited the Kani Public Arts Center to ask Mr. Kenji Show, audio director at the center's theatrical technology department, about the events that led to the installation of the new sound system, and about how it is performing in actual use. Specialists from Yamaha Sound Systems and Yamaha Music Japan who took part in the system's design also joined us for the interview.

Kani Public Arts Center Background

To begin, please tell us about the background and purpose of the Kani Public Arts Center.

Show: The Kani Public Arts Center is a cultural facility that was opened in 2002 and is managed and operated by the Kani City Arts Foundation. It is somewhat different from other culture centers in that not only does it provide spaces for the local community, but it also hosts a large number of concerts and theatrical productions in which the center's planning and technical staff are directly involved. We have two theaters, three multipurpose rooms that we call "lofts," a theater rehearsal room, an audio/visual theater, a recording studio, rehearsal studios, plus Japanese style rooms and meeting rooms. One distinguishing characteristic of our center is the availability of plenty of free space where citizens can read and relax or children can play in the water, even on days when no events are taking place. In the 12 years since the facility opened it has become an established recreational spot for the local community.

Tell us more about the two theaters.

Show: Our main theater has a seating capacity of about 1,000, and our small theater seats around 300. Since the maximum capacity we can offer is 1,000, the center is rarely used for large-scale live tours. We host a number of concerts, dances, lectures, "yose" (traditional Japanese comedy), and other types of events. Acoustically, our movable ceiling and reflectors allow us to achieve a nominal reverberation time of about 1.6 seconds, which is relatively short and comparable to many European halls. In fact, a number of artists visiting from Europe have praised our acoustics. Halls in Japan tend to have relatively long reverb times, and that can be distracting for artists from overseas. Another feature of our theater is that it is a facility we create rather than a facility we simply manage. Our full-time staff handles both the operation and technical aspects. To be honest, the staff we started with when the center opened 12 years ago all had backgrounds in the practical aspects of theater operation but essentially no experience in management, so management has been our biggest challenge (laughs)

You have recently completed the first major renovation since the center was opened. Were no other changes to the acoustics made until now?

Show: No changes were made to the acoustics until the recent renovation. Of course the acoustic response changes over time, so we have made a few adjustments electronically. Specifically, the response of the reflector panels changed considerably since they were first installed. Members of our community orchestra pointed out that the response had changed, so the difference must have been quite noticeable.

Tell us about the original sound system in the main and small theaters.

Show: The original house console in the main theater was a Yamaha PM1D, and the speakers were JBL SP series with a BSS processor.

The monitor consoles were a Yamaha PM3500 and Yamaha M2500. In the small theater we were using a Yamaha DM2000 as the house console with Bose 502 speakers, but those original speakers didn't provide enough power so we switched to Yamaha IF series. The monitor consoles were the same as those used in the main theater.

Why did you feel it was necessary to upgrade the sound system?

Show: Lack of flexibility was the biggest problem. The house console was digital, but the overall audio system was analog and we were having difficulty adapting to various types of content. When the center opened in 2002 we assumed that the theaters would be used mostly for theatrical productions, but once operation actually started we found ourselves faced with the need to accommodate other types of content as well. Since the sound system was primarily designed for theatrical support we had to rent equipment from outside suppliers to suit other types of content, and the costs were piling up. We thought about updating parts of the system, but realized that in order to flexibly accommodate the widest possible range of content we would have to update the whole system. A partial upgrade would not have solved the problem, so we continued working with what we had for a while.

The Decision to Upgrade

What was behind the final decision to go ahead with the upgrade?

Show: The equipment we needed to put together the networked audio system we envisioned had become available. Definitive planning for the upgrade actually began about two years ago.

The main reason we carried on using the original system for so long without doing any partial upgrades is that we wanted to install a networked audio system. We were convinced that networked audio was the way of the future, but were held up for a while as we searched for equipment that would meet our specifications. Of course we considered the options available at the time, including CobraNet and EtherSound. The PM1D console installed in 2002 has its own networking capability, but it was clear that trying to implement another network around it would end up being a half measure that would just be a downgrade. But when the Yamaha CL series came along with full Audinate Dante networking capability, our immediate reaction was "this is it!" We finally had a worthy replacement for the PM1D, and Dante was the audio networking solution we had been searching for. Availability of the Dante capable NXAMP developed jointly by Yamaha and Nexo meant that we could assemble a complete Dante system, and that is when we decided to go ahead.

Is there an overall concept behind the new sound system?

Show: The main underlying concept is that it is a fully networked audio system. An analog audio system must be designed from the start with clear input and output routing. But in a networked audio system all devices have a network address and can be freely connected or disconnected as required. Inputs and outputs can be flexibly rerouted to suit musicals, jazz concerts, theatrical productions, or just about any other type of content. 12 years ago we started with a system designed specifically for theater, but were soon faced with the need for flexibility that was beyond the capabilities of a theater system. A networked audio system was the only way to fully overcome those limitations.

At times we also provide sound reinforcement for concerts at other locations. With the former system we had to have separate portable equipment available to handle outside jobs, but our new, networked audio system can function as both a fixed installation and as a portable rig. We can take our wireless equipment to outside locations, and if the main theater wireless gear isn't sufficient we can also bring the wireless equipment from the small theater, for example. Another example, although it would be a rare case, is that if a customer asked to borrow a console we could simply bring the console from the mixing room into the main theater. With the original PM1D system we had no alternative but to maintain separate fixed and portable systems. A networked system allows us to make the most efficient use of our primary equipment. Since gear is shared between fixed and portable applications, the total amount of equipment required is significantly reduced. We can deliver higher quality for a wider range of applications on a limited budget.

Mr. Kenji Show, audio director at the Kani Public Arts Center theatrical technology department

The Kani Public Arts Center main theater

The audio control room at the Kani Public Arts Center main theater with its Yamaha CL5 main console

You mentioned that you considered all of the available network protocols, including CobraNet and EtherSound. What led to the final choice of Dante?

Show: We really did try out and consider all the alternatives. We could see limitations with CobraNet and EtherSound, and MADI isn't really a network protocol so it was eliminated right from the start. Dante is ideal for networking not just the console, but just about every other component required by the system as well. That includes power amplifiers, wireless gear, DAWs, and more. And it allows flexible control over the inputs and outputs of every device on the network. Another advantage is that most of our network devices are made by Yamaha, so we're assured of high stability and reliability. It was not so much a matter of choosing Dante from among the numerous networking protocols that are available, as realizing that only Dante would be capable of providing the networked audio system we envisioned.

The New Dante Sound System

Tell us about the newly installed system.

Show: Both the main and small theaters have basically the same system configuration, with a CL5 and Rio3224-D functioning as the house console, Shure ULX-D4 wireless microphones with Dante modules, DME64N processors, NXAMP amplifiers, and XMV8280-D amplifiers in the amp room, and other gear. All Dante capable devices are connected via Ethernet switches to create our networked audio system. Unlike analog or AES/EBU connections, the devices are not directly connected to one another. Everything goes through the Ethernet switches for almost unlimited routing freedom.

Stage side MTX5-D matrix processor and XMV8280-D power amplifier units are used for communication, stage ambience, and microphone input, controlled via wall-mounted DCP series control panels that provide a customized set of functions for our users. That helps to prevent "accidents" while at the same time making management easier.

Are the main and small theaters connected in any way?

Show: Both the main and small theater consoles are connected to the mixing room via a 64-channel Dante link. By making use of both theaters we believe that we can deliver some interesting new content, and are currently discussing the possibilities with the production team.

Abe: One notable point is that a network bridge has been provided between the main and small theaters as well as the mixing room. Specifically, we're using an AuviTran AVBx7 as sort of a barrier between sections of the network to enhance security. If all rooms are directly connected via Dante, any device on the network can be controlled from any room. The use of a network bridge allows us to build one large network while maintaining the independence of individual rooms.

Eight NXAMP4x4 power amplifiers in the Kani Public Arts Center main theater amp room

Three Yamaha DME64N units and three XMV8280-D amplifiers in the Kani Public Arts Center main theater amp room

Show: The AVBx7 can be fitted with up to seven interface cards. In addition to the Dante cards, we have also installed an AES card that allows connection to the PM1D or other console brought in from the outside.

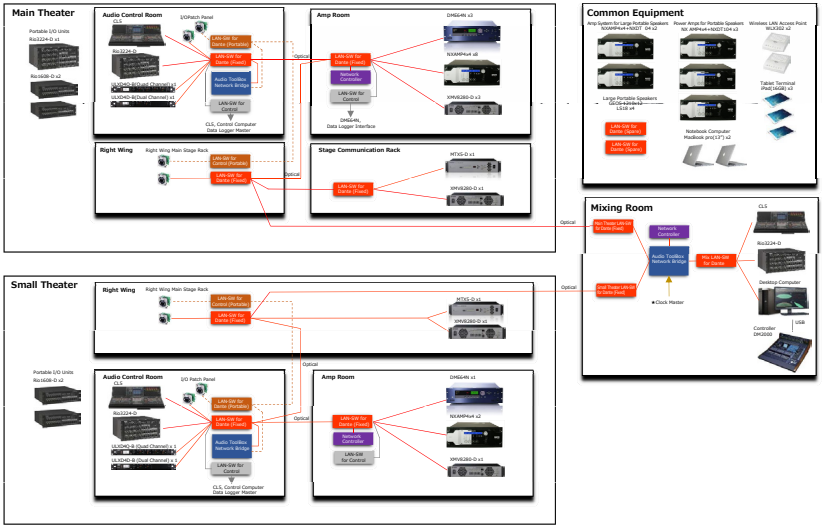
How are the DME64N units being used?

Show: In addition to speaker processing, the DME64N units are being used as routing and summing matrices, and to provide scene recall for content changes. They are very versatile and useful devices. Since the DME64N units are being used to matrix all devices on the network, in a way they could be considered our "main console."

Is it possible to use standard Ethernet lines for a Dante network?

Kikuchi: Since Dante is based on the 1000BaseT Gigabit Ethernet standard, it is possible to use standard Ethernet lines as long as a few precautions are observed. At the current time it is not easy to mix Dante with Internet or other types of data on the same Ethernet line. Unlike Internet lines, Dante does not provide error compensation. The Ethernet installation must therefore be built to the highest possible quality standards. We do not recommend

Kani Public Arts Center Audio System Diagram



The Kani Public Arts Center small theater

directly connecting to a normal LAN, for example. For this particular installation we used category 5e STP cable made by Tachii Electric Wire Co., Ltd. The Tachii cable is of high quality and has excellent tensile strength, so we're confident that the network will be reliable. We are using Yamaha SWX2200 series network switches, but other general-purpose products could also be used.

How did the cost of the Dante system compare to a comparable analog system?

Kikuchi: The larger number of cables that must be installed for an analog system means that installation takes longer and is therefore more costly. The installation cost for a Dante system is significantly lower. And since less hardware is required for a Dante system, the basic hardware costs are much lower than analog too.

How much latency can be expected in a full Dante system like this?

Iwakami: In this system each pass through the Dante network results in a delay of 250 µS. More passes through the network will obviously result in correspondingly greater latency.

The audio control room at the Kani Public Arts Center small theater, featuring a Yamaha CL5 console

The main speakers at the Kani Public Arts Center small theater are NEXO GEO M6 units

Show: Personally, I am not particularly concerned about latency. We're careful to set up the system so that monitoring and wireless microphone latency is minimized, but we apply processing and delay to the house sound anyway, so it is not much of an issue.

In Operation

How is the new sound system performing now that it is in full operation?

Show: We are very satisfied. The installation work began in the middle of July 2014 and was finished about three weeks later. We had a full schedule so operation began the day after the installation was completed.

We were expecting a networked audio system to be convenient, but once operation actually started it exceeded our expectations by a wide margin. It is not only extremely convenient to use, but seems to offer almost unlimited potential. To be a bit more specific, the Dante inputs and outputs are all managed via a DME64N matrix, and can therefore be easily reconfigured to suit any situation. Previously, when a customer brought in their own console it was necessary to route the outputs of the customer's console to our own theater console, and then route the outputs from there. That was an excessively complex and inefficient approach. But with the new system we can simply connect the customer's console directly to the DME64N units, so the outputs of their console are effectively connected directly to the amplifiers and we can let them take over from there. That type of convenience hadn't even occurred to us at the design stage. Of course with this much flexibility system management becomes an issue, but the possibilities have expanded immensely.

The MTX processor we included for system control is very useful too. Operations that previously required access to the main audio control room can now be easily carried out on the spot via wall-mounted DCP series control panels. The DCP control functions can be freely customized so we

The mixing room with Yamaha CL5 and DM2000 consoles, a Steinberg Nuendo DAW, and more

can provide specific controls that the customer requests, and make changes whenever necessary.

One aspect of the system that could be improved is computer based Dante matrix routing operation. With a system of this scale the computer display becomes correspondingly large and complex, and it can be very difficult to locate a desired point for adjustment. You can scroll and scroll and still not find what you're looking for. At the very least there should be a way to assign colors to the matrix for easier identification. This is one area we hope Audinate will improve in the future.

Can you give us any advice for trouble-free operation of a full Dante networked audio system?

Abe: The most important thing is data management. Problems can occur if several people are operating a system where patches and parameters have to be altered to suit changing content. Just one misplaced matrix connection can result in no sound.

Show: There are usually four or five staff operating the system for concerts and similar events, and if multiple operators attempted to switch to different patches for any reason the result would be utter confusion. At the same time, assigning the job of system management to the main operator would be too much of a burden, so we're considering the need for a dedicated network manager. The matrix becomes huge for productions such as musicals or operas, and management can be very difficult.

Abe: The flexibility of a Dante system is a huge advantage, but some of that freedom needs to be restricted to prevent problems during day-to-day use.

Show: There is still very little experience to draw on in operating a full Dante system, so optimizing operation and security will be a matter of trial and error for a while. For example, we are considering managing our computers by MAC address to enhance security. If permanent settings are all that is required an analog system is probably easier to manage. Dante wouldn't be necessary in a closed system. The whole point of having a full Dante system is that we have unlimited potential for now and the future.

Describe the sound quality of the new system.

Show: The NXAMP amplifiers give us precisely the type of natural sound that we were aiming for. We often have to move speakers to the floor to suit certain types of content, and achieving optimum response with both the suspended and floor speakers in operation can be quite tricky. Where tuning the system in such situations was previously a major challenge, the NXAMP amplifiers effectively maintain optimum phase even when switching presets, so all we really have to do is move the speakers into position and the blend is almost perfect without further adjustment. Only the usual basic tonal adjustments are required. The CL5 console has been a welcome improvement too. It lets us achieve precisely the results we're looking for. I'd have to say that it is the perfect console for our current needs.

In conclusion, what are your plans for the future?

Show: Refining our procedures is the first item on the agenda. There's security, data management, and a number of other subjects to concentrate on. Staff training will be important too, because we will need people who are well versed in Dante networked audio. Dante networked audio system experts are still hard to find, and I think that is an issue for the entire industry.

From left to right: Manabu Takeda (Yamaha Music Japan), Yojiro Kawashima (Yamaha Sound Systems), Shogo Ogawa and Kenji Show (Kani Public Arts Center), Tomohiro Iwakami (Yamaha Sound Systems), Masayuki Nagoya (Kani Public Arts Center), Tomohiko Kikuchi (Yamaha Sound Systems), Yoshitaka Abe (Yamaha Sound Systems)

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