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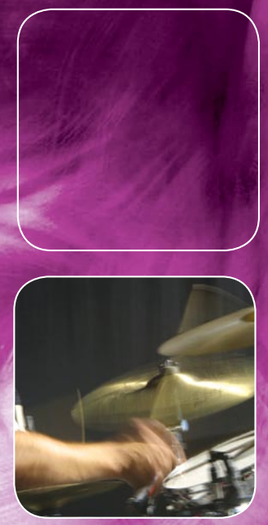


Case study:

Enhancing live music with digital audio networking

from imagination to impact...

National ICT Australia

The challenge

Whether it's a U2 rock concert or a Beethoven symphony, good sound quality is vital to the enjoyment of live musical performances.

Audio engineers go to great lengths to ensure sounds from instruments and voices are captured, amplified and delivered as faithfully as possible. Sophisticated mixing decks, effects machines and amplifiers must all be configured to work as an integrated system.

In large venues, long cables are required to carry signals from the stage, to the mixing desk and on to the speakers. Shielded to reduce interference and extraneous noise, a dedicated cable is required for each audio stream. The result is a complex and costly infrastructure.

Those involved in staging live performances have been keen to find a better way of delivering quality sound to audiences. Rather than relying on expensive cables, connectors and patch panels, they have been looking for a system that can maintain audio standards but at a much lower cost.

The NICTA approach

In 2004, a team of researchers from the Digital Audio Networking project began studying how digital audio networking technology could be used to develop an answer.

In a traditional live sound system, signals are transmitted from instruments and microphones in analogue form over copper wires. The team believed that, if the signals could be digitised and the wires replaced with a conventional data network, cost and complexity could be reduced. Rather than needing a plethora of shielded wires, all audio streams for a concert could be carried over a single Ethernet cable.

Under the new system, instruments and microphone outputs are converted into a digital stream which can then be transmitted over the network in the same way as any other type of data. The streams are then converted back to analogue form before being amplified and sent to the speakers.

But, while the theory is relatively straightforward, the team discovered there was a key challenge that needed to be overcome – network latency.

In an analogue system, there is no delay between a sound being created on stage and it reaching the speakers. However in a digital system, the conversion from digital to analogue and the characteristics of a data network mean that slight delays can occur. These, in turn, can affect the amplified sounds and put them out of synchronisation.

Working on this challenge for two years, the NICTA team has devised a networking technology that keeps latency to an absolute minimum and the signals in sync. The result is a system that offers sound quality matching, and even exceeding, conventional analogue systems.

Migrating to an Ethernet-based network infrastructure also brings significant cost advantages. Because the system can be built using off-the-shelf components such as switches, routers and cables, the total price is a fraction of what a similarly configured analogue system would cost.

Another significant advantage is that conventional PCs can also be hooked into the network. Rather than requiring dedicated effects machines, PCs can be used to perform audio processing and recording, serving to reduce costs even further.

The results

The NICTA team has demonstrated that its digital audio networking technology is capable of delivering sound quality that exceeds the demands of professional audio users.

The team has also worked to include a 'zero configuration' into the technology. Because audio engineers are not necessarily computer experts, the new system needs to be easy to set up and manage. A range of technical features have been incorporated into the system to ensure this is the case.

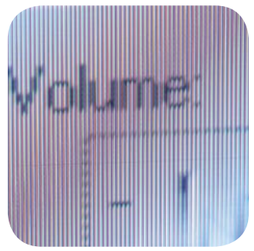
In the future, the team expects that instruments and other audio gear will be designed with in-built Ethernet ports. This will remove the need for a converter to be placed between, say, a guitar and the network, further reducing complexity and costs.

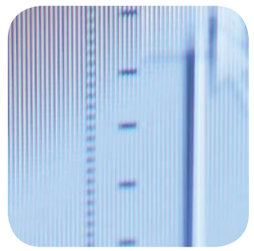
Work is also under way on developing ways to carrying other signals over the network, such as those used to control lighting. In most cases, sophisticated lighting rigs require their own dedicated control network. Removing the need for this would be a significant step.

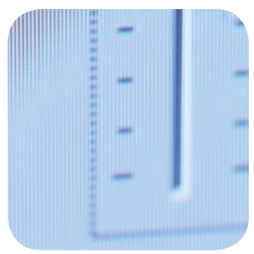
Commercialisation opportunities

A spin-off company, named Audinate has been established. This company will oversee the commercialisation of the team's digital audio networking technology.

Audinate is working closely with a range of companies which have expressed interest in incorporating the networking technology into their equipment.







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