

The Audio Industry and IT:

Is the march of digital technology changing audio beyond recognition?

by Alan Hardiman

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Over the past decade or so, certain aspects of the audio industry have become more and more influenced by the computer industry and reaped tremendous benefits, not the least of which has been the introduction of an entirely new approach to the design of components and systems at one end, and their operation and maintenance at the other. Without the IT industry as a driving force, the audio industry probably wouldn't be moving towards the use of such innovations as Ethernet switches, routers, and DSP (digital signal processing) as quickly as it has been. Even the very first DAW (digital audio workstation) was, and still is, by definition, a computer, though one dedicated to specific tasks. The increasing pace of advances in technology and in price reductions in the computer industry have been joined by the professional audio industry and brought about considerable benefits for working sound professionals. But will the audio industry continue to exist in its own right?

"In my world, the biggest change going on is the whole switchover to products being networked and communicating with each other," says Richard Zwiebel, vice-president of marketing for commercial audio at Cirrus Logic. "The whole beauty of a network is that in many cases it's already there and over one cable you can carry lots and lots of audio and other data." The company's CobraNet technology allows multiple channels of uncompressed, high-quality, bidirectional digital audio to be transported over standard Ethernet, along with control data.

Zwiebel cites the example of a well-known theme park: "All the audio in the park is carried over one backbone—there's actually two for redundancy—which has 250 channels of audio, show ride control, cash registers, inventory, and so on. All the park-wide audio is there, so you could make an announcement and evacuate the whole park if you had to. The installation includes products from so many manufacturers and they're all on one network,

and they work and communicate with each other.

"For the first time, you can connect all these components, the signals stay in the digital domain, and it's a true network, so you can route any input to any outputs in any combination, with just an RJ-45 network connector on the back of the product," he says.

For a touring sound professional, the savings in cable cost alone, not to mention the reduced size and bulk of the cabling, can be a significant factor in deciding to go with a network. Just compare a typical audio snake with a length of fiber optic cable—the difference is day and night. Networking audio also provides three other benefits: flexibility, in that any signal can be routed anywhere on the network; redundancy, in that if a switch or cable breaks, the system can sense that and immediately switch over to the second backbone; and new capability for an existing installation.

"For example, it's really easy to monitor back," Zwiebel explains. "If you have loudspeakers throughout the venue, you can monitor the performance of each speaker both audibly and with data, since the network provides two-way communication of audio and control information."

He notes that in stadium installations, of which he has designed a fair number, it used to be that "you'd just string all this point-to-point copper wire, electricians would solder the connectors, and that's pretty much what it was. Now a facility has so much flexibility because if anything can get to anywhere, you can do different things. One day you're having a football game, the next day you're having a basketball game, another day you're having a convention, and that convention could be one of 30 different formats, you just can configure it to be that. You don't have to actually re-wire stuff. The network allows complete flexibility of routing the audio so anything goes anywhere."

What's Happening?

Zwiebel envisages a shift in the near future from digital signal processing (DSP) being centralized in dedicated racks or consoles to DSP being distributed to various components of a sound system—mixing consoles, amplifiers, loudspeaker systems, wall panels, and even microphone snakes. "I think you're going to see centralized control software whereby you can talk to anybody's product in a nice, elegant manner, and you'll be able to drag controls from various components and create your own control screens across all brands of products. And since they're all on the network and they all have their local DSP, with their own flavor of algorithms, you'll be able to have central control from any location, such as a console or even a wireless laptop."

While not discounting Zwiebel's optimism, consultant Philip Giddings, president of Engineering Harmonics Inc., suggests a cautionary approach. "While these new products appear to be extremely attractive on the surface, we have a lot to learn about the reality of putting them into use and making them work effectively. It is very easy to design systems that are so complex that their performance capability is exceptional but the reality of setting them up and/or operating them also requires exceptional people or training. For example, mix engineers have an approach of trying to fix everything by making adjustments on a console, and they may have some outboard processing gear that they're intimately familiar with. In the new world, where we have these very sophisticated distributions of the signals out to the speaker systems, with delays, EQs, and limiters, an experienced sound man may do different mixes to the different speaker systems. Those people who are used to working on the surface of a console will now also have to be familiar with managing this processing system out to the speakers with a keyboard and a mouse.

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"It's becoming a world of specialization," Giddings warns. "You can't do it all. While it is possible with DSP to provide all the functionality of an entire audio signal chain in one device, this forces operators and technicians to rethink their use of these systems. Changes in the audio architecture have far-reaching consequences that are not always apparent at the outset. For example: system designs are more complex because they can be and design concepts are more sophisticated; servicing requires as much propensity in IT as it does in audio; operating them requires aptitude with completely different human interfaces as well as managing the more complex signal flow; calibrating systems is a long and involved process due to the complex design, the high standards of performance, and the test equipment used. It's all changing, and, quite frankly, each one of these areas is becoming highly specialized. There are very few guys who can do more than one or two of these things well."

While the entire signal processing in a venue can readily be controlled in the digital domain in a highly integrated and networked sound system, it raises the question: What happens if the crew with a road show that's coming in next week wants to use a different console? Can they use the console of their choice without compromising—or losing altogether—the configuration information to the loudspeaker systems, for example?

"There isn't any way that a traveling sound guy can sort that out in an afternoon," Giddings says. "We spend weeks on it. So these capabilities that are coming along as a result of all this DSP power are changing the way you have to think about operating these systems. Frankly, the knowledge base is lagging on the operations side and the industry needs to look at some retraining."

Audio capability is going up and prices are coming down, but are current trends in

SOUND

Stanley P.

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the audio industry detrimental to its most cherished value, quality? In a digital audio system, the primary factors determining sound quality are the analog-to-digital and digital-to-analog converters at each end of the signal chain, and the type of data compression used, if any. It's worth remembering that 30 years ago, digital audio was being written up as a cure for such ills as wow and flutter, and was considered by some to be scarcely more than a noise-reduction process alongside those from Dolby, dbx, and Burwen, one promising approach among others in the pursuit of high-quality sound.

"I know there are a lot of people who feel the audio industry has really lost its bearings," laments former Audio Engineering Society (AES) president Stanley P. Lipshitz, professor of applied mathematics and physics at the University of Waterloo, and a member of its Audio Research Group. "It used to be that to strive for the highest possible quality was the dominating motivating force behind the industry. Now it does not seem to be that any more. Are people going for quality now? Mp3s are so convenient, and most people, I think, are using mp3 at 128 kilobits per second, but that's still a data compression ratio of 10 to 1, only half the data rate you need for the data compression to be essentially inaudible."

Regarding developments in analog and digital conversion, Lipshitz takes particular aim at the recently developed one-bit sigma-delta modulation converter which he considers "an absolutely stupid way of doing things." Lipshitz, together with his colleague John Vanderkooy, has presented at least six technical papers on the subject to such esteemed groups as the AES.

"One is criticizing the system and then trying to see how these things work, some investigations into the behavior of sigma-delta modulators," he explains. "There is no general mathematical theory for them, and you can't dither them properly so you cannot eliminate distortions and noise modulations with a one-bit system using a sigma-delta modulator. We feel pretty negative about that. It's terribly wasteful of bits and isn't perfectible."

"I think that it's just commercial interests now that are driving the thing. I mean the CD patents have expired, so Sony and Phillips...I don't have any knowledge that this genuinely is what's behind it, but it's a reality that the patents behind it have expired and if they want a new source of licensing fees, then you invent a new incompatible system and offer it

to people if they're willing to pay the licensing fees," Lipshitz says, noting that the sigma-delta modulation converter is at the heart of Sony's new Super Audio Compact Disc (SACD) technology. "Of course audio no longer is the glamour thing it was 30 years ago—it's a sort of mature industry," he says.

Giddings suggests that audio quality can't be considered apart from the overall experience of the audience. "In the past, quality was an issue because, comparatively, there wasn't a lot going on. It was only two-channel stereo and you could focus on that and listen for quality," he says. "Nowadays, when you go to Cirque de Soleil, for example, your senses are bombarded in every conceivable way, and the experience, particularly if you're not used to it, can be overwhelming. Why? Not because the audio quality is unbelievable, but because of the things they're doing with wrapping the sound around, and with panning and ambience, and with the extended low end and the fact that the sound is perfectly localized to what's happening on the stage. Thirty or 40 years ago, it wasn't like this. The multimedia experience is way larger today. So while the quality of some of the individual components may be less, and the execution might be a little sloppy, the impact of the experience is far greater, and much more relevant to the modern generation.

"These are the people who are playing video games with their iPod on, and they're watching the MSN Messenger out of the corner of their eye—these people are multi-tasking," Giddings notes. "Statements and concerns about audio quality are reflective of values, and maybe those values are changing. I don't think you can talk about quality any longer as something apart from the overall experience of going to a show."

For the foreseeable future, developments in professional audio will remain linked to the evolution of information technology, and that promises to be pretty exciting, at least to this writer. But will these developments erode the status of audio professionals themselves in favor of IT experts? I suspect this is a trend that's already well under way, but that's a topic for another article. If you have an opinion on this I'd like to hear from you, especially how you see the impact on your job or in your sector of the industry. ☎

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