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THEATRE NETWORKING THROUGH MIDI

By Charlie Richmond

Last year was an eventful one for networking and this year looks to be even more so. While FDDI, an expensive high-speed fibre optic standard (Sound Column, TD&T, Summer '89), is gaining acceptance, other computer network protocols continue to be popular. Now, a complete set of standard theatrical messages are being developed by a variety of theatrical equipment manufacturers who want their systems to communicate with the outside world (and with each other). The protocol of choice is MIDI (Musical Instrument Digital Interface), primarily because it has become a de facto live performance communication standard. Musicians have been using MIDI since 1984 to allow their musical instruments to "talk" with each other and other intelligent devices, primarily personal computers, using a vast amount of MIDI-oriented software.

Theatre sound designers are also using these instruments and intelligent devices to their advantage. Even though the MIDI sequencer software and controllers commonly available are not perfectly suited to the impromptu nature of live theatre, the MIDI protocol itself is easily adapted. As long as only a small amount of information is required to call a cue, MIDI can simultaneously communicate such requests to several devices-such as memory lighting systems-quickly and efficiently. Usually, these devices hold large amounts of detailed data in their own cue storage areas then act upon it quickly when sent simple MIDI "Go Cue" messages. Usually they can both send and receive MIDI messages, allowing flexible system configurations in which key units can function as a MIDI translator or interpreter. For example, the translator may receive the same type of message from different devices at different times yet be programmed to send different types of messages on to the rest of the system.

Here are some good examples of current MIDI applications in professional theatre:

-The current tour of Lily Tomlin & Jane Wagner's "The Search for Signs of Intelligent Life in the Universe" now uses MIDI to trigger about 50 different sampled sound effects on an Akai S950 plus longer cues on an Akai S1000 and to change six channels of Akai PEQ6 programmable equalization on a cue-to-cue basis. The MIDI messages originate from the Amiga 2000 computer running the show's Richmond Sound Design COMMAND/CUE system software containing both MIDI cues and regular cues that control the hundreds of faders, cross-faders and switches used to distribute the sound in the theatre.

-The "Indiana Jones Epic Stunt Spectacular" theatre at the

Disney-MGM Studios Tour theme park in Orlando uses a similar system with an Amiga 2000 to send MIDI messages to several Yamaha SPX90II programmable audio effects units and simultaneously receive messages from a Lexicon MRC MIDI remote control unit. The MRC has four sliders and switches which are programmed to control the Grand Master and several Inter Master volume controls on the COMMAND/CUE system's Master screen. The MRC is a compact low-cost universal MIDI controller which effectively gives the operator portable live control over hundreds of channels of audio. Additional units could be added with a MIDI merge box to control even more system Inter Masters if necessary, or a larger unit such as the J L Cooper Fader Master could easily be used. The MRC could even send its messages over a wireless MIDI link if desired.

-Finally, at the new Mirage Hotel in Las Vegas, the Siegfried and Roy illusion show is using another similar system in a slightly different configuration. Rather than using the Amiga 2000 as the central control unit exclusively, this installation allows a two-way "conversation" to be conducted between it and the NED Direct-To-Disk digital recording/playback system which assumes the role of primary synthesizer and musical sequencer. Since many audio effects must be tightly synchronized to the music, the NED sends MIDI time code to the Amiga, allowing the COMMAND/CUE software to execute specific sound system cues at certain times during musical sequences. Conversely, the Amiga may invoke, start, stop and synchronize specific musical or synthesized sound sequences on the NED precisely according to the live action via operator execution of pre-programmed MIDI cues.

In these ways and more, designers are finding easy solutions to what used to be impossible problems, and they are doing it on their own with off-the-shelf MIDI products. Even the software which ties it all together is already set up to handle the MIDI messages the equipment requires, simply because the communication protocol has been well defined and is completely standardized. These days, it is refreshing to take two pieces of computerized equipment from different manufacturers out of their boxes and have them talking to each other within minutes!

Not content with just this and partly as a result of the panel discussion "MIDI Mania" at LDI'89 in Nashville, several manufacturers decided to see whether they couldn't get more agreement on MIDI communication standards throughout the rest of the theatre industry. It was gratifying to see the potential of MIDI was not going unnoticed, since many of the memory lighting console manufacturers were in the process of adding MIDI ports to their boards. To be fair, a few of them have had MIDI controlled consoles for some time but there has been a lack of agreement on which messages to employ and for what purpose.

Because MIDI is a musical communication protocol it has not been key to lighting people. However there is a natural potential tie-in when performers using MIDI sound equipment also want to control lights during the same performance.

During further discussions with lighting control manufacturers, I discovered that many were unaware of one or more of the

following:

1. The MIDI Manufacturer's Association (MMA) exists to oversee the development of MIDI standards;
2. MIDI is already used by some lighting manufacturers; and
3. A MIDI lighting standard has been proposed.

It seemed logical to advocate joining the MMA and becoming actively involved in creating a truly useful MIDI communication standard for the theatre environment.

As a result of this increased interest, many theatrical equipment manufacturers have become members of the MMA and are now engaged in developing this standard through the facilities of the Performing Arts Network's "MMA Forum." Involved at the time of writing are several lighting console manufacturers from North America and Europe, two moving light controller manufacturers, a projector slide control designer, and a theatre sound memory programming system manufacturer. More of these-plus laser control companies, rigging manufacturers, and even pyrotechnics manufacturers-are considering participating. The MMA hopes to complete this process soon by receiving official approval and adoption by the International MIDI Association.

There will never be a perfect communication link, since cost always increases with performance and the cost/performance tradeoff is different in every application. MIDI has certainly had its detractors, myself included, but here it seems to embody some good characteristics and few bad ones. To explain, most critics have focused on one or more of the following perceived faults:

1. Lack of speed;
2. Inability to travel long distances; and
3. Open-loop design.

First, it is true that MIDI is slow if one attempts to transmit the amount of data contained within even one single sound or lighting cue. But that is not what we will be doing during a performance. Other standard and proprietary protocols, notably USITT's DMX512, exist for this purpose. It's true we will develop a standard which will allow this data to be communicated but it will be primarily used for archival, transportation or telecommunication purposes. The messages carried by MIDI during live performances will be cryptic high level commands telling the various intelligent controllers what to do or where to be within their own frames of reference. The longest of these messages can be easily sent in fewer than 10 milliseconds.

Next, although the MIDI spec clearly states the maximum usable distance is 50 feet (15m), this is a minimum standard allowing manufacturers to keep costs low and products accessible to the average musician. Most users are aware that most MIDI products will send and receive over much longer distances and there is no technical reason for any limit independent of cost. MIDI "boosters" are common, buffering weak outputs to send 1000 feet (300m) or more. Wireless MIDI links are available, though they can be less reliable than hard-wire connections. Fibre-optic

links make very long distances possible. Even some musical "events" have used satellite links to transmit MIDI signals between different parts of the world.

Finally, the open-loop design of MIDI, while potentially less dependable, is probably more appropriate for live, real-time performance applications than a network in which every message is checked for errors, acknowledged, and perhaps retransmitted. Live performers would probably rather have the odd minor error than have the entire system shut down or become unbearably slow because the communication link has become unreliable. Even so, the inherent openness of MIDI design still allows sophisticated two-way communication. Most complex controllers can easily be programmed to look for a highly defined series of commands. In the example of MIDI-controlled rigging (or anything else requiring absolutely fail-safe operation), an operator could be required to manually transmit a confirming "safe-to-proceed" command over the network. The rigging system would still have its normal safety switches and emergency controls as well.

Interestingly, a new system has emerged which promises to address all the above concerns in an even more comprehensive manner. A company named Lone Wolf has developed a very high speed MIDI network called "Medialink." It allows rapid and reliable communication between thousands of MIDI devices over long distances and can configure its communication paths through software. This means that users will be able to interactively define the sender to receiver matrix while the system is in "setup" mode, yet the original real-time MIDI objective is preserved while in the "performance" mode. These ideas are all valid, and, whether Medialink becomes a widely-used product or not, the MIDI messages that are carried will always remain compatible with any equipment available today.

In all, this absence of serious flaws combines with some good unique features to make MIDI be the current choice for theatre networking.
