New Protocols Up and Running

by Dan Antonuk

A dedicated group of lighting industry professionals came together at this year's ETS-LDI to demonstrate that high-quality, forward-looking industry standards are not only possible, but actually here. In a ten by twenty foot space, glued to the back of the ESTA booth, two groups of protocol experts quietly heralded a new era of lighting control. This space, the "ESTA Interconnectivity Pavilion," contained equipment from over fifteen manufacturers working together. Consoles, dimmers, and moving lights were talking ACN, while controllers, splitters, scrollers, LED luminaires, and moving lights were speaking RDM. At the same time, gateway equipment was talking both ACN and RDM, allowing ACN consoles to discover, configure, and control all the equipment.

Long days and late nights

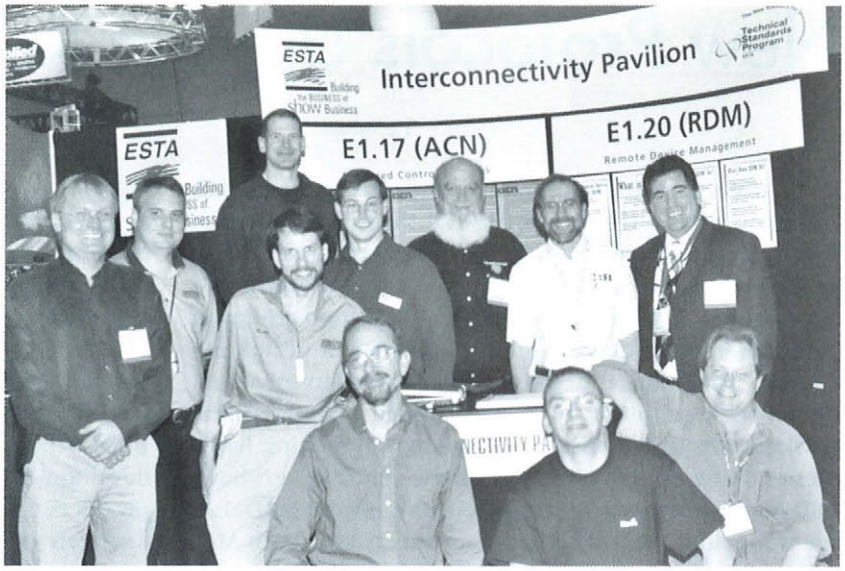
One week earlier, all the ACN Task Group members had been feverishly working to finish their code. I did a final build on my dimmer pack and took it to shipping at 5:00 P.M. Friday. I would see it again on Monday night in Orlando. All of us had agreed to meet in Orlando on the Tuesday before ETS-LDI. Would our equipment really communicate? Nothing ever works the first time.

On Tuesday in the hotel, it was clear that not all participants had completed their demo equipment. The CD player from Sand Network Systems was working, as was the moving head from Martin Professional and the ETC dimmer, but the Pathway Connectivity ACN to RDM gateway still needed to talk RDM. Neither of the planned lighting desks was talking yet. "How fast can your dimmer handle updates?" I was asked. "As fast as you can send them—theoretically," I said. This is the way it is with the development of new industry standards: companies have products to build and deadlines to meet, so standards efforts rely on those companies and individuals willing to go on working after the money-making work is done.

Thursday night, after three days of last minute coding and testing and just before the 10:00 P.M. closing time, we loaded up our gear and headed for the show floor. Great excitement filled us as we plugged things together. Ethernet, not DMX512, cables were connected. One ACN-RDM gateway didn't even need a power cable; it got its power from the Ethernet switch over the Ethernet wire. Tomorrow we would get to show off what we'd been working on so hard for so long. Would anyone else be as excited as we were?

What am I looking at?

On the ACN table at the left of the Pavilion were lighting control consoles from Horizon and Strand, along with an ACN to DMX512 gateway, an ACN CD player, and ACN visualization software interfaces, the latter three from Sand Network Systems. On the floor in the middle of the booth was a dimmer rack from ETC, with a Martin Professional moving light sitting on top. The Horizon console was running a chase on four lights attached to the dimmer rack. A Web page on a laptop at the front of the booth was showing that even Web browsers could monitor ACN equipment. As the chase ran the lights up and down, sliders on a Web page moved up and down, showing the actual data values reported back from the dimmer in real time. A person could easily link the Web page to the Martin moving light, and use those same sliders to move the light or change the gobo.



On hand to demonstrate ACN and RDM are: (back) Philip Nye of Engineering Arts, (middle) Yngve Sandboe of Sand Network Systems, Robert Bell and Alan Martello of Horizon Control, Kevin Loewen of Pathway Connectivity, Tom Grimes of High End Systems, Peter Willis of Howard Eaton Lighting, Tracy Underhill of Electronics Diversified, (front) Dan Antonuk of ETC, Ole Bystrup of Martin Professional and Wayne Howell of Artistic Licence (UK).

As the chase on the lights was running, a person could go to the Horizon console and release two of the dimmers, then step over to the Strand console and change their intensity, while the chase kept running on the other two lights. Two consoles were simultaneously controlling the same dimmer rack. At the heart of this small demonstration was the proof that ACN is going to provide interoperability between equipment made by different manufacturers over Ethernet, and also over DMX512 through RDM gateways.

From the ACN table an Ethernet cable ran into a Pathway Connectivity ACN to RDM gateway and a DMX512 cable ran out the other side going to a Wybron color scroller running RDM on the RDM side of the booth. To the ACN controller, the scroller looked like an ACN device. It appeared in the ACN discovery list, and allowed monitoring of its properties and setting of its control parameters by normal ACN commands. To the scroller, the gateway looked like an RDM controller sending RDM and DMX512.

On the RDM table were a Wybron controller and the ESTA RDM Reference Controller Platform. These two controllers were connected to a manual switchbox that selected which controller was connected to the network of devices. The Wybron controller could discover the RDM devices connected, determine how many DMX512 slots each required, and graphically patch them. The ESTA RDM Reference Controller Platform, developed by University of Texas at Austin students Matt Stroud and Jason Potterf, showed a Web-based user interface with which devices could be discovered and RDM messages could be sent to the devices and the responses decoded.

These two controllers were able to communicate through three levels of cascaded RDM splitters to an EDI dimmer stick, a High End Systems automated luminaire, and some Wybron color scrollers. Two of these splitters were from Doug Fleenor Design, and one was from Artistic Licence. While cascading splitters is no longer common with large installations, when needed, this can be done in an RDM system. The dimmer stick was a legacy product, upgraded with a tiny Wybron module to provide RDM communication and remote DMX512 patching. The Wybron color scrollers demonstrated the concept of subdevice properties, with multiple child devices connected to a parent device. This concept is important in dimming systems, which typically have dimmer racks holding a variety of dimmer modules.

Sitting on the floor in front of the RDM table was an array of 64 LED modules provided by Howard Eaton Lighting Limited, each one a separate RDM device, ar-

acknowledgments

Thanks to the following participants for providing time and equipment for the demonstrations.

ACN equipment:

Electronic Theatre Controls - ACN dimmer rack
Horizon Control and Entertainment Technology - ACN console
Martin Professional - ACN moving light
Pathway Connectivity - ACN to RDM gateway
Sand Network Systems - ACN to RDM gateway, ACN CD player, ACN to visualization software interfaces
Strand - ACN console

RDM equipment:

Artistic Licence - RDM splitter
Doug Fleenor Design - RDM splitter
EDI - dimmer stick
High End Systems - RDM moving light
Howard Eaton Lighting - LED effects board
University of Texas at Austin students Matt Stroud and Jason Potterf - ESTA RDM reference platform
Wybron - RDM color scroller, RDM controller, DMX512 to RDM upgrade module

ranged in an eight by eight grid. Each module had red, green, and blue LEDs that could be controlled through normal DMX512 channels. There was also a small yellow LED on each module that was mapped to flash whenever an RDM message was sent to that specific module. This was a visual display of the RDM messages being interleaved between the normal DMX512 control data packets with no effect on performance. The Artistic Licence RDM controller for this demonstration also provided a graphical representation for the status of each of the modules.

When will ACN and RDM be done?

As of this writing the first public reviews of ACN and RDM (TSP projects BSR E1.17 and BSR E1.20) have ended. The comments received suggest that at least one more public review for each will be needed, so the earliest that ACN and RDM can be done would be this coming summer.

When will equipment be available?

It is impossible to say for sure, however, it is likely that within a very short time after these standards are ratified there will be equipment available.

How fast are these protocols?

The RDM standard uses DMX512 as its control mechanism, so it will be as fast as DMX512. The use of RDM for configuring devices and setting their DMX512 patches is commonly described as "faster than a climbing ladder." Status monitoring using RDM is done by interspersing messages between DMX512 packets. There are still the limits on the bandwidth of the DMX512 wire, so this polling mechanism could take a few seconds on the average system, but DMX512 never before had any feedback mechanism at all. To maximize performance, some may choose to turn off status monitoring during performances.

The ACN protocols do not distinguish between doing configuration and control, so it is fair to say that configuring devices using ACN is a lot faster than climbing a ladder. It is as fast as doing control in ACN. The time between two packets in DMX512 is something like 0.02 seconds; for ACN this minimum time between packets is less than 0.001 seconds. The actual throughput is harder to calculate, but suffice it to say that 10MB Ethernet will be plenty fast enough for small installations, and 100MB will handle all but the most demanding environments.

Is this really plug and play?

Both ACN and RDM discover devices automatically. Once a lighting desk knows a device is out there, it needs to find out what kind of device it is and how to talk to it. On a DMX512 link, an RDM controller (or an ACN to RDM gateway) asks each RDM device what subset of RDM commands it supports. On an Ethernet segment, a lighting console asks each ACN device for the name of a special text file used to describe the device. If the console already has that file, it can look up what properties are available for configuration, control, and monitoring. If it doesn't have the file, it may ask the device for a copy of it.

Finally, after an ACN or RDM controller knows how to talk to a device, it can ask for the current values of settings and it can change them. It is important to note that with daisy chains of RDM and DMX512 at the ends of an ACN network, ACN controllers will be able to discover, configure, monitor and control, not only ACN devices, but also RDM devices through ACN to RDM gateways. RDM is extending the two-way communication all the way out to the end of the DMX512 wire. Legacy DMX512 devices won't be plug and play on ACN systems, but once configured they will play. They need not be replaced prematurely.

Why do we need ACN and RDM?

Our industry has DMX512 and about twenty proprietary Ethernet protocols. Some of these protocols don't work well; none of them work together. ACN is trying to do for Ethernet what DMX512 did for serial lines: provide a standard way to talk to equipment from different manufactures. ACN's Device Description Language also provides a clear path for innovation, so that the protocols our industry's equipment uses never again will limit what we can create. With the versatility, speed, and power of ACN, and the remote patching, monitoring, and DMX512 compatibility of RDM, we have a clear path into the future, and a smart, practical way to take what we have with us. ●

Dan Antonuk is on the R&D staff at ETC. He is the project manager of ESTA's ACN Task Group.