help desk

Low level recovery | By Wayne Howell

"LLRP has the potential to be a real game changer, so do ask your favourite manufacturers whether they are supporting it, and if not - why not . . ."

Last month at PLASA, I gave a seminar on controls and received numerous follow-up questions. There were two types of questions: the first was about the problems that can be encountered with sACN in large universe systems - a subject I plan to examine in LSi November - and the second was asking for more detail on LLRP. It seems that everyone is enthusiastic about a system that allows a lost network device to be recovered! LLRP (low level recovery protocol) is one of the protocols in the new RDMnet suite. So, why the excitement? In order to answer that, let's have a quick refresher on network addressing . . .

IP ADDRESS

Each piece of equipment that connects to a network is called a host. Each host requires an IP address - a unique number that allows hosts to communicate with each other. Hosts could be the lighting console, the dimmers, the moving lights or indeed, the cue light panels. There are two types of IP addressing - IPv4 and IPv6, with the former being more favoured currently.

An IP address is a 32-bit number comprising four 8-bit bytes (sometimes called octets), which is usually written as four decimal numbers separated by dots, ie 192.168.1.1. The IP encodes two numbers: the network address and the host address. The network address will be the same for all IP addresses on a given network but the host addresses will be different and unique for each host. This simple construct allows many networks to operate on the same cable without interfering with each other.

SUBNET MASK

The subnet mask is used to decipher the network and host parts of the IP address. It's the same size as the IP address and also expressed as four decimal numbers separated by dots, i.e. 255.255.255.0. The significance of the subnet mask is revealed when we switch from decimal to binary.

11000000.10101000.00000001.00000001 is binary IP address 192.168.1.1

11111111.11111111.11111111.00000000 is binary subnet mask 255.255.255.0

The binary 1s in the subnet mask define the network address and the 0s define the host address. So, we can see that the network address is 192.168.1.xxx and the host address is xxx.xxx.xxx.1. This means the network address 192.168.1.xxx can have 256 IP addresses in the range 192.168.1.0 to 192.168.1.255, with only 254 that can be used as 192.168.1.1 and 192.168.1.254 are reserved. 192.168.1.0 cannot be used either because it describes the network address.

The last IP address - 192.168.1.255 - is called the broadcast address and is accepted by all hosts on a given network.

CONNECT THE LIGHTING CONSOLE

Let's say that your lighting console is connected to two Ethernet gateways (Ethernet to DMX512 converters). The console has an IP address of 192.168.1.1 and the two gateways have IP addresses of 192.168.1.2 and 192.168.3. Everything has a subnet mask of 255.255.255.0.

The lighting console can communicate with the gateways in three ways. It can send a message directly to each IP address - a process called unicast - or broadcast, i.e. send its message to 192.168.1.255 so that both gateways will receive the message. The third method is called multicast and involves sending to special addresses that are not affected by the subnet mask.

MISCONFIGURATION

Network connectivity problems are mostly caused by incorrectly configured network addresses; misconfigured subnet masks are the biggest problem. Consider the example above where the gateways have been incorrectly configured with a subnet of 255.255.0.0. The console, with the correct subnet, would believe the broadcast address to be 192.168.1.255. However, with the incorrect subnet, the desk would think the broadcast address is 192.168.255.255, so communication will fail for both unicast and broadcast.

LLRP

Multicast addresses are not affected by a misconfigured subnet mask - in fact, they can be the 'get out of jail card' to recover network misconfiguration, which is exactly what the new LLRP protocol does.

LLRP makes use of two multicast IP addresses which allow communication to take place, even when all other network communication has failed. It's part of the RDMnet suite of protocols, but is actually standard-agnostic and therefore a valuable tool for sACN, Art-Net or RDMnet as well as audio protocols such as Dante. The protocol is intentionally limited, however - it allows you to reconfigure the IP, subnet mask, DHCP and other core network settings.

LLRP is now in public review and destined to become a standard in the near future. For those who want to experiment or indeed develop LLRP into their products, there are a number of resources. ETC has sample code and some command line utilities available for download from their GitHub portal (//github.com/etclabs). Artistic Licence can provide developers with LLRP-enabled beta firmware in any of the current gateway product range; the company is also about to release the new version of the DMX-Workshop lighting network tool, which will feature an option for Recovery that can assess the LLRP beta dialogue.

The screenshot below shows both the results and the process for an LLRP recovery. The lower part of the screen shows the command flow and it can be seen that a gateway at IP 2.0.0.88 and the PC at 192.168.2.65 are communicating. A right click will allow the gateway to be re-addressed quickly and without hassle.

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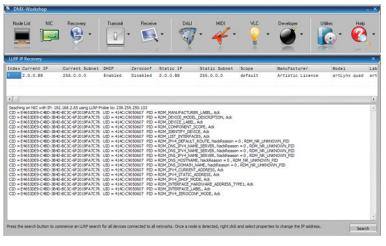

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