help desk

Networked Lighting | By Wayne Howell

"A network control protocol is the language used by the lighting console to communicate with the dimmers and lights . . ."

In LSi November 2017 I looked at the basic concepts of networking - the IP address, the subnet mask and casting. This month I will take the complexity up a notch and look at how that relates to lighting control protocols . . .

A network control protocol is the language used by the lighting console to communicate with the dimmers and lights. Two key types of data form the payload of the control protocol: level control and management data. Level control is the data carried by DMX512 - it changes the levels of channels which may map to intensity, colour or movement. Management data is carried by RDM (remote device management) and is used to patch start addresses, configure personalities, upload firmware and a wealth of other features. Communication tends to operate in one of two styles known as 'streaming' or 'vector'. A streaming protocol is something of a blunt instrument - it simply transmits a continuously repeating flow of data, while a vector protocol is more sophisticated and sends specific commands and instructions. There are a number of network protocols in use and each has their own benefits . . .

ACN

ACN stands for Architecture for Control Networks. It was developed as part of the ESTA Technical Standards Programme (ESTA TSP) and became an ANSI standard in 2006 (E1.17). ACN is a heavyweight vector protocol - it's very sophisticated but complex for developers to implement and has received minimal industry support. ETC is one of the companies who support it and has used ACN as the architecture for its Net3 protocol (the successor to the proprietary ETC Net2 protocol).

Pros: It's a very efficient protocol with good bandwidth use and vector support for both level control (DMX) and management data (RDM). It is also an ANSI standard.

Cons: ACN has received limited industry support and is complex to implement, particularly in low processing power products.

ART-NET

Art-Net was invented by Artistic Licence in the late '90s. At the time, only proprietary protocols were available and Art-Net was made open and royalty-free. It's a combination protocol that uses both streaming and vector techniques - steaming is used for the level control - and in fact the raw DMX data is simply encapsulated in an ethernet wrapper and unicast to the network - while management data in the form of RDM is handled as a vector protocol with the gateways managing device discovery.

Art-Net sends the DMX data using unicast, which is very network-efficient and works with all types of ethernet switches. Art-Net implements a simple discovery system which allows the lighting console to discover which gateways wish to consume which universes. It then unicasts each universe to the relevant consumers.

Pros: Art-Net is widely supported and provides transport for both level control (DMX) and management data (RDM). It's open and can be used for free subject to registration of the supporting product. Art-Net also supports firmware upload and network configuration.

Cons: Art-Net is an open protocol rather than a standard. Management data (RDM) is handled via broadcast, which could cause network congestion on very large networks (tens of thousands of universes) so this is not generally a problem in practice. However, Art-Net doesn't yet support the IPv6 protocol but could be modified to do so if there is industry demand.

SACN

sACN stands for Streaming ACN. It was developed as a cut-down version of ACN in response to the lacklustre support for ACN. It's also an ANSI standard (E1.31) and a lightweight streaming protocol, making it easy to implement, but it only handles level control data (DMX) and offers no support for RDM.

The sACN approach to sending DMX is very similar to Art-Net: the raw DMX is encapsulated in an ethernet wrapper. However, the data is sent using multicast. In the multicast system, any gateway that wishes to receive a particular universe will subscribe to a specific multicast address. For example, the multicast address is 239.255.xxx.yyy, where xxx and yyy represent the sACN universe number. So, the IP address of the first sACN universe is: 239.255.0.1.

Pros: sACN has growing support, it's an ANSI standard and is compatible with ACN, with its next version set to support IPv6.

Cons: sACN doesn't handle management data (RDM). Some network switches have limited support for multicast, which can cause sACN to be converted to broadcast, leading to network congestion. Network switches have vendor-specific limits on the number of concurrent multicast addresses, thus limiting the total number of universes. This is because each multicast group uses expensive resources in a switch. In some low cost switches this limit can be as low as 64 universes.

RDMNET

RDMnet is in development at the ESTA TSP and will become an ANSI standard (E1.33). As the name suggests, it's used to transport RDM over the network and, along with sACN, provide transport for both DMX and RDM data. RDMnet adds a number of new terms to the lighting lexicon, *broker* being the key one. This is a server that sits between the lighting controllers and the gateways to lessen the processing load on both by handling issues such as message routing and discovery. The broker may be designed as a module inside a lighting console or as a separate server box.

Pros: RDMnet will provide support for RDM over network and allow it to operate with multiple controllers.

Cons: RDMnet is a heavyweight vector protocol that adds a significant load to the product developer. It's expected to be completed by the end of 2018.

For those wishing to learn more, the PLASA Lighting Protocols Plugfest to be held on 25-27 April will provide a great opportunity . . .

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Wayne Howell is the CEO of Artistic Licence, the lighting controls company that he founded in 1988. Wayne invented Art-Net and is actively involved in the ESTA technical standards programme.