

## **Networking URE Book 3**

### **Network Control Protocols**

#### **Introduction**

The basic IVP4 protocol is what makes all networks tick. However, all this protocol does is give us a method for getting information from one place to another. It doesn't actually say how the information will be presented. This is where the specific lighting protocols take over and there are many different ones in use nowadays. To cover every single one would take forever so in this book we will focus on 3; ArtNet, MA Net and ETC Net/sACN. Each protocol has the benefits and their downsides and we will look at situations where they are best used.

#### **ArtNET**

ArtNET is the name that is bounced about most when people talk about network systems, and that's because it was one of the first network protocols that could actually cope with a large rig (for that time).

ArtNET was created by Artistic License Engineering and is designed as an open source protocol. This is why ArtNET is found on almost every device, as it is free to implement and modify. ArtNET has 3 versions; ArtNET, ArtNET2 and ArtNET3. However due to ArtNET being the most widely found of the 3 and the most compatible with most equipment, we will focus on it for this guide.

#### **How it Works**

ArtNET (version 1) is the simplest protocol to understand, because it works very similar to how DMX works. The difference being while DMX sends out a packet for each DMX channel, ArtNET can send out a packet for a universe, and within that all 512 channels. This means we can distribute large amounts of data very quickly to large lighting rig without having lots of cable.

#### **IP Adresses**

ArtNET can theoretically be used with any IP Address you want. However in order to standardise the systems people were building, Artistic License Engineering decided that ArtNET should be used in the IP Range 2.0.0.x. This means that for a device to receive ArtNET it must have an IP in this range (i.e: 2.0.0.150). The IP address of the console sending out ArtNET does not matter, as long as the receiving units are addressed correctly.

#### **Advantages**

Having been around for a very long time, there is a lot of equipment that can be used with ArtNET. This includes but is not limited to:

Hippotizer Media Servers	Catalyst Media Servers	Arkaos Media Servers	Resolume Arena Servers
EOS Consoles	GrandMA Consoles	Avolites Consoles	Many Moving Lights
ArtNET to DMX Nodes	ArtNET to MIDI Software		

### Disadvantages

It's Slow. Like really really really really slow.

The way ArtNET works is by broadcasting every single bit of data to every single device in the network all the time. This is fine when you have only a few universes but if you have a large network and running lots of universes then you very quickly stand to see bad network lag. Some examples of this can be seen on the SuperBowl 2015 Half Time show, where the lights are seen to be doing a ripple effect, when actually they were programmed to be pulsing at the same time.

It is for this reason, even though all version of ArtNET can theoretically support 256 universes, that ArtNET 1 will start to break down at about 40 universes, beyond which the network becomes so slow and unresponsive it is unusable.

### Final Points

ArtNET is a great protocol if you are looking for approximately 30 universes and maximum compatibility. However for more complex shows. MA Net or ETC Net/sACN should be considered.

## **MA NET**

MA Net and MA2 Net are network protocols developed by MA Lighting to work with the MA1 and MA2 console ranges respectively. The protocol is a proprietary format and can only be transmitted by GrandMA Consoles. MA Net is what is used to run most large scale events and shows, including but not limited to the Olympics opening ceremony, The Beyoncé Miss Carter world tour, Les Misérables 25th Anniversary Concert.

### How it Works

MA Net is different in it's approach to networking to other protocols in that it shares the show file with every device on the network. In this way, every device knows what it is going to do next and hence we reduce some of the lag associated with ArtNET. MA Net 2 can support up to 256 Universes in one session and can reproduce this across the network at the correct speed.

### IP Adresses

Both MA Net and MA2 Net work on the ip address range 192.168.0.x and any console or computer connected to the network should use this range of IP's. In MA Net, since the console is part of the overall session, the IP address of the console does in this case matter.

### Advantages

It's fast. Like really really really fast. Because of the way it distributes data, this protocol is one of the best way to send large amounts of data across a network quickly. Because every station has a copy of the show file, it knows what DMX to output next. Hence all you ned to send to the node is a "GO" command, which is far speedier than repeating every bit of data over and over.

Also, because every device in the network has a copy of the show file, you instantly having a great backup solution if you lose your show file off the console.

It's also very easy to add station onto to network and start working either as a multi user setup or in a tracking backup setup, simply get them to join the session and you are done!

### Disadvantages

Since the protocol is developed my MA, you need MA hardware to use it and take advantage of it's show file sharing. This means that all your nodes need to be MA Nodes and that can come with a price tag. However if you are looking for the very best in speed and reliability, this is a price you'd be willing to pay.

## **ETC Net/sACN**

The final protocol we will look at is ETC Net/sACN. ETC Net is a series of protocols developed by Electronic Theatre Controls, build upon the sACN topology. sACN stands for Streaming Architecture for Control Networks and is very different and distinct from both MA Net and ArtNET.

While MA Net is designed to work by sharing it's show file, and ArtNET works by wrapping DMX up in network form, ACN is a truly network based protocol that is designed from the ground up to be expandable and updatable, allowing users to add and remove functions as they see fit.

ETC Net is ETC's custom brand of sACN (the "s" early refers to streaming in the sense that the data sent out is consistent and constant) and comes with a number of handy features. It provides ETC console with advanced access to their fixtures Remote Device Management (RDM) features like allowing you to address fixtures remotely over the network, and have live feedback from the fixtures to the console, for example the fixture telling you if a lamp has blown.

### How it Works

sACN work similar to ArtNET in that is continuously sends out data like DMX does. However sACN avoids the issue of lag by doing what is called an unicast. This mean it will only send data to where it is needed. For example if we have an output node that is setup to output universes 2 and 3, sACN will only send universes 2 and 3 to that device, cutting down network traffic. This let's us push a high universe count without slowing down our network too much.

### IP Addresses

sACN is incredibly flexible as due to its open architecture, it could be configured to work with any IP range, in any system.

The most well known implementation of sACN, in the form of ETC Net, does have a set range of IP addresses that varies depending on which devices you are using. However they generally fall into the pattern 10.101.x.y, where x is decided by the device type (i.e: EOS, Gio, ION) and the y is decided by the user, to provide adequate separation. For example, if I had two ION's in a network, I may assign them addresses 10.101.100.101 and 10.101.100.102.

### Advantages

sACN is a very open protocol meaning it is expandable and easily updatable in the future. It is also found on many devices, including being usable by both MA and ETC consoles to talk to devices.

As a specific implementation of sACN, ETC Net has the advantage of being able to support an insane amount of universes, 63,399 to be exact. It is also extremely simple to configure and implement.

### Disadvantages

The protocol itself doesn't really have any disadvantages. However, it lacks the large event capability of MA Net and also doesn't have a solid backup support.

Also for smaller venues or events, it may not be supported by cheaper equipment.

However as medium scale networking solution, it is unparalleled.

### Conclusion

All of these network protocols are very useful and the choice of which route to take is down to the system designer. And that's part of the fun of creating a networked system.