Using DMX for Layout Lighting

I have always liked layouts which incorporate lighting as it adds to the realism for me. When it came to desiging the lighting on Loch Lochy I wanted to be able to simulate a transition from day to night, have lighting in most buildings, and on platforms, streets and elsewhere.

I didn't want a load of wiring and switches to control them so after some research I came across DMX512. If you've ever been to the theatre or a concert it's almost certain that the lighting (and often the effects) will have been controlled by a digital communication standard for lighting called DMX512, which is usually shortened to DMX. It is typically used to connect lighting control desks to dimmers and lights, and typically consists of a twisted pair of wires which are fed from the controller (usually a lighting desk) and then daisy chained between every light or effects unit. Each dimmer or light will have a DMX address and a decoder, and will listen for commands that affect it – such as fade up, fade down, change beam shape, colour, etc.

Many lamps these days are known as "moving head" which means they have motors inside allowing them to move in all directions. DMX can transmit the necessary commands to handle these sorts of lamps as well.

You can almost think of DMX as the DCC for lighting – the DCC command station equating to the lighting control desk, the lights being our locomotives with DCC decoders, etc. The main difference is that power is not sent over DMX.

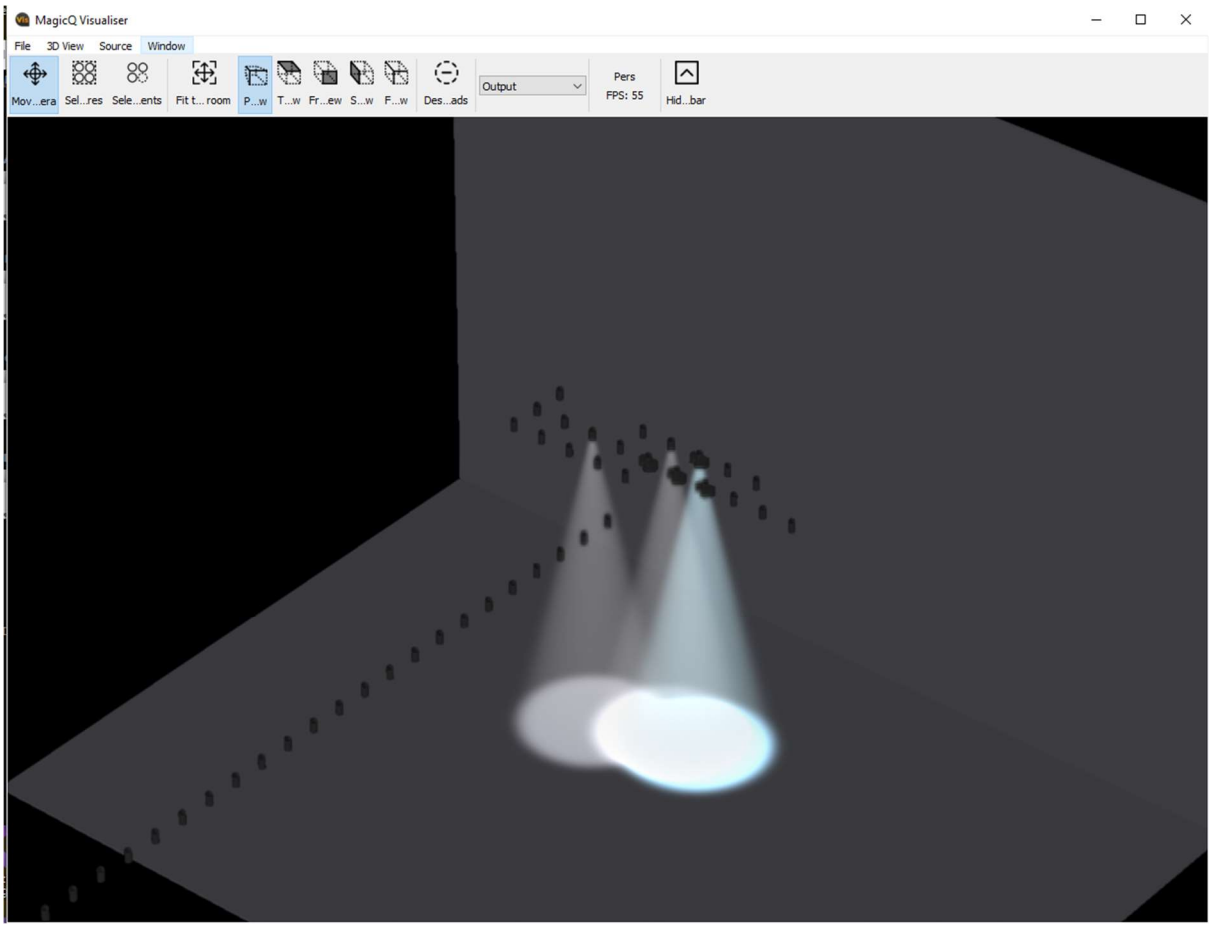
It seemed to me that this could be ideal for the lighting on Loch Lochy but I didn't want to have a hardware based lighting desk to control it due to the space it would take up. As I already use a PC to operate the layout it seemed sensible to also control the lighting this way so I looked around for suitable software. After trying a few packages I settled on MagicQ from Chamsys. Chamsys make large and expensive lighting control desks which are used in theatres and concert venues across the world but they also offer software which has the same layout and functionality as their hardware desks. The reason for this is that lighting designers can design the show offline (assuming they know the arrangement of lamps at the venue) on their laptop then save it to a USB stick. When they arrive at the show all they need to do is plug the USB stick into the hardware lighting control desk and everything is ready to go.

However the big plus point is that the software is free and all I would need would be a way to interface the software to the layout lights. The downside is that this is an incredibly powerful piece of professional software which has a suitably steep learning curve. However there are plenty of online tutorials and after a while it begins to make sense.

MagicQ screenshot showing some input channels

One of the main features is that it has cue stores – a cue is basically a transition from one lighting state to another and these can be scheduled (stacked in the jargon) in various ways. This is ideal for use on the layout as it means that a cue could be turning on a platform light, brightening the main day lights, or dimming the nighttime lights. These cues could all be linked together to create a complete day to night transition – and much more.

MagicQ screenshot showing some cues in a stack

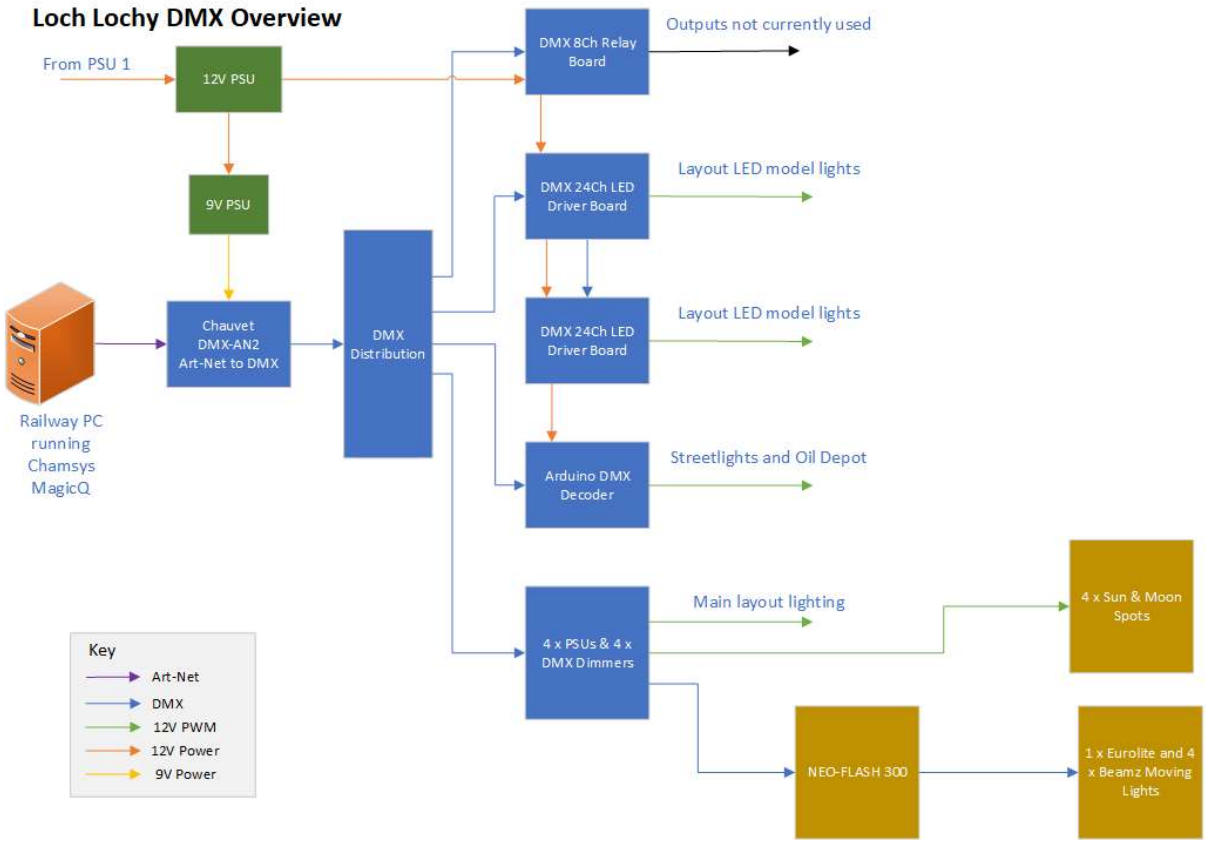


The MagicQ 3D visualiser allowing designers to create shows

To connect the software to your lights you first need to get the signal out of the PC. You can buy USB to DMX interfaces quite cheaply but after battling with drivers being overwritten by Windows Updates, and other issues, I settled on an IP based device. This uses another protocol called Art-Net which allows DMX to be transported over IP and has proved 100% reliable. The device is plugged into your local network and connects to MagicQ running on the PC. It then emits a DMX signal which is distributed to dimmers, switches and lights.

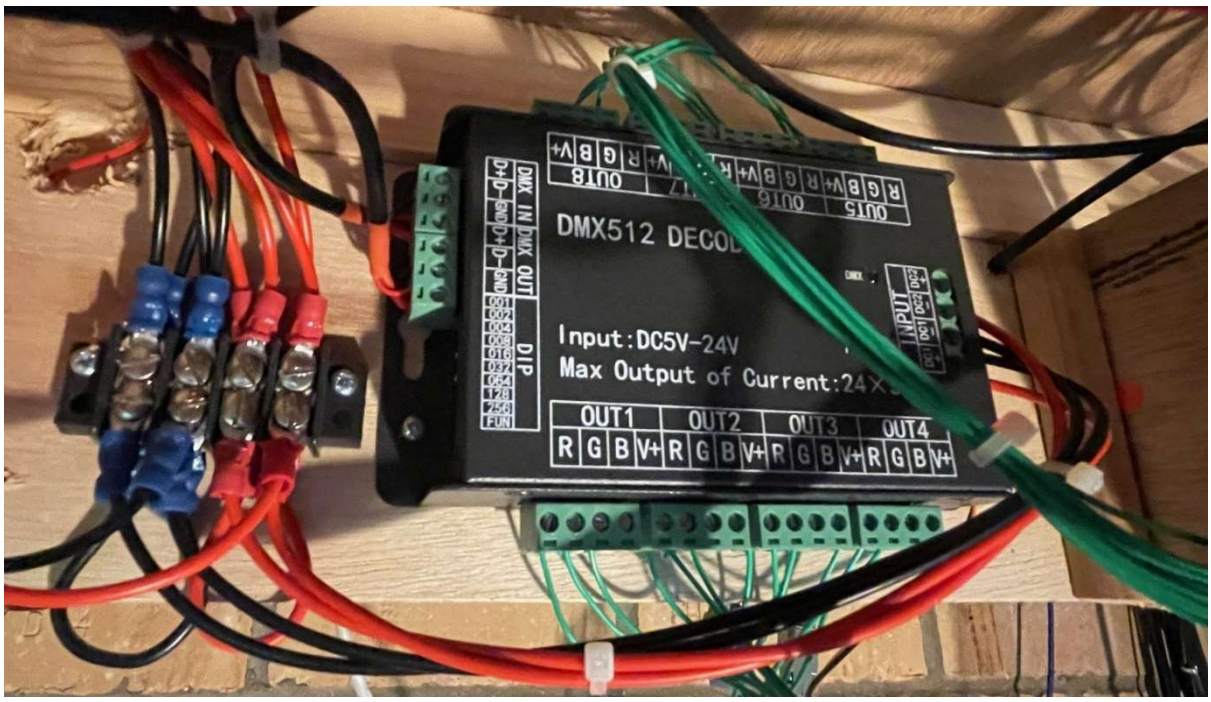
Art-Net over IP to DMX

This is the current DMX network on Loch Lochy.



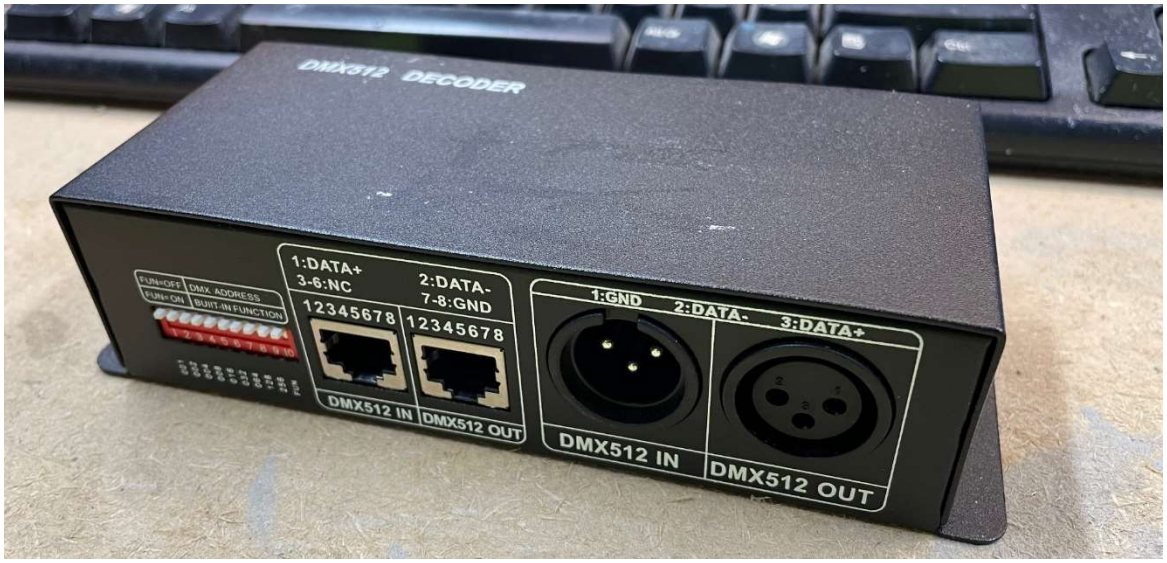
There are a range of dimmers and switches available on the market which have DMX inputs and can handle everything from LEDs to powerful lights of many thousand watts. However for use on the layout you can buy cheap LED dimmers from well known auction sites very cheaply. They typically have 24 channels or more of outputs and I use several of these to control the many individual LED lights in buildings, cars, platforms, street and elsewhere.

The common standard for inter-connecting DMX is 5 pin or 3pin XLRs and these are readily available. Most DMX dimmers and switches require 12V and have terminal blocks for inputs and outputs.



DMX multi channel LED decoder

I wanted to use a range of LED strips over the layout to give a range of day and night lighting effects but these would take more current than the multi channel output LED dimmers could handle. After more research I found high power LED dimmers which could handle 4 channels at 12V 8A output. This would be ideal for the LED strips at the length I was using. However the first dimmer I tried was disappointing because the dimming effect wasn't smooth – you could actually see the step changes in brightness. It transpired this was because they were 8 bit dimmers meaning they had 255 brightness steps. If you were using them to control incandescent bulbs this wouldn't have been an issue but it was no good for LEDs. However I found some equivalent 16 bit dimmers and these work perfectly as they have 65,536 steps.



High current 12V LED DMX decoder showing the XLR interfaces

I wanted to have multiple LED strips in different colour temperatures, alongwith RGB strips, so that I had plenty of flexibility when it came to operating the lighting. All of these would require plenty of 12V power so I bought 4 suitable supplies, one for each 4 channel dimmer, and housed them in a suitable box which provides protection for the mains input to the supplies and adequate ventilation.

High current 12V power supplies and associated dimmers behind perspex panel at bottom.

The LED strips themselves are for a range of colour temperatures from very warm white to daylight. I can use these either individually or in different combinations to simulate a range of different day light condidtions.

The LED strips themselves are mounted in gutters which have aluminium sticky backed foil in them. The foil provides heat dissipation, although they generally run very cool, and a good deal of light reflection.

There are two rows of these gutters, one right at the front of the layout, to avoid shadows, and one further back. In addition there is a row of RGBW LED strip behind the 3D hills on the backscene which is very useful for setting sun effects.

The two main overhead gutters include RGB strips to provide blue/green night effects and there is also a UV strip (black light) in the back gutter which I'm aiming to use to experiment with star effects.

A lighting gutter showing different colour temperature strips

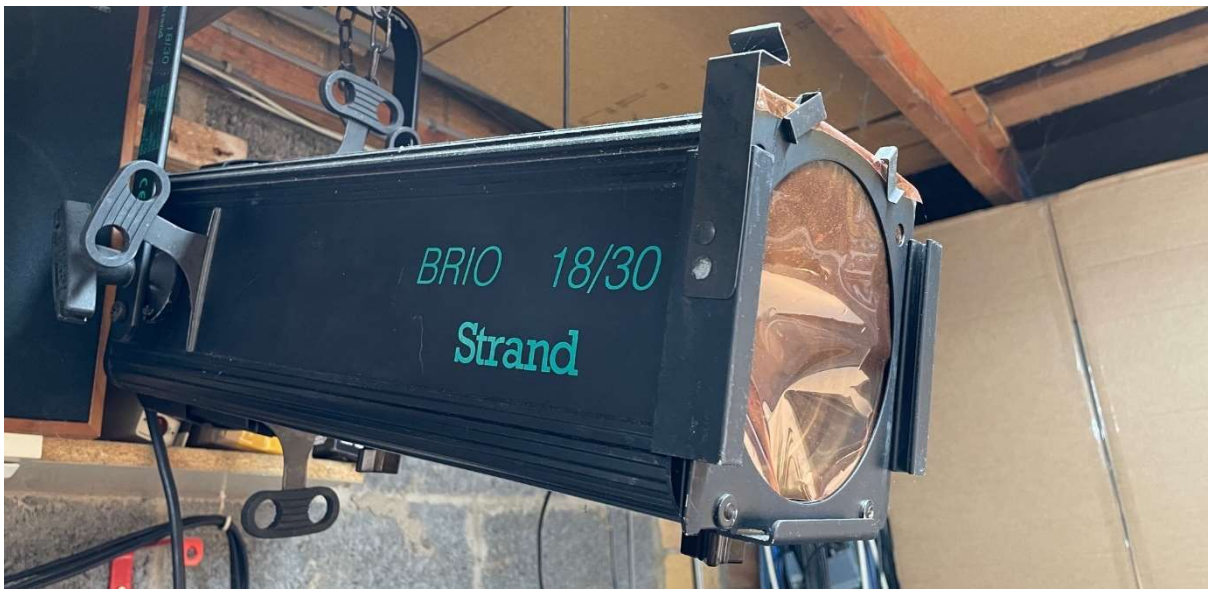
Of course you can buy lights which have DMX incorporated and there are a bewildering multitude available. One device I have which is very good for lightning effects is a Neo blinder. This is a large array of LEDs which is usually used for on stage effects such as flashing and strobing. Slung from the ceiling and configured to simulate lightning, whilst synchronised with suitable audio effects, always goes down well with visitors.

The Neo blinder

Other lights include several LED par cans which I have mounted at a low level. With suitable gel filters these are used to simulate either moonlight or early morning sun.

PAR16 LED lights

Finally I have an old Strand spotlight which was given to me by my neighbour, Denis, who was a film cameraman. Using a suitable gel and gobo I project a moon on to the plain white backscene. The large incandescent lamp does require a suitable mains DMX dimmer – the only one I use.



Moon effects from the Strand spotlight

So what is the benefit of all this technology? Principally that it allows a huge range of lighting on the layout which can be controlled either by individual lights or completely automated as a sequence. When we exhibit our layouts I often think it is analogous to a theatre presentation so in many ways this is a natural evolution in layout realism.

Here are some nighttime examples.

Early morning sunrise behind the distant hills

Waiting for a bus as a car goes past

Working late at the quayside

The fluorescent lights in the oil depot flicker into life

The sodium streetlights change from red to orange

The evening light fades behind the hills