

Bridging Barriers by Wayne Howell

As shows become more sophisticated, the data transmission issues tend to become more complex. In this article, I would like to discuss some of the options available for lighting control distribution.

DMX512 has been with our industry for many years and whilst it serves its purpose very well, it is not well disposed to either long distance transmission or bridging physical barriers. Getting lighting data across a river or between multiple buildings is now a common place requirement. A number of manufacturers offer 'DMX512 over Radio' products but in general these suffer from low distance, high cost and country to country licensing problems.

The advent of Ethernet based data transmission for lighting control has significantly improved the situation. Products such as the Artistic Licence 'Art-Net' range allow DMX512 to be transmitted via Ethernet. Having converted the data to Ethernet, there is a wide range of 'off-the-shelf' products from the computer industry that can be used. These include WiFi radio links that start as low as €100 per node. Other technologies such as LASER links also become available.

Radio Links come in a number of flavours. The most prevalent is WiFi (or more properly IEEE802.11b). This system is most often seen in an office environment, allowing for example portable computers to connect to a server without cable.

The available range is very much manufacturer specific, but tends to be around 500m line of sight. When specifying such products, it is important to appreciate that there are two types of WiFi product on the market. The first is a WiFi Node and the second is an Access Point. The significance is as follows. A node can talk to an Access Point but not to another Node. An Access Point can talk to Nodes and other Access Points. Given this, point to point links should be implemented using Access Points at both ends of the link. Unfortunately, some WiFi manufacturers are a little unclear in their product description. I have used the 'Elsa Lancom II' on numerous occasions without problem.

Another issue that can cause problems is the fact that two radio transmission modulation techniques exist in the market place. The first is called Frequency Agile or Frequency Hopping. The second is called DSSS or Direct Sequence Spread Spectrum. At the risk of oversimplifying, Frequency Agile splits the available frequency bands into a number of channels. It uses one channel, but 'hops' to another if it encounters interference. DSSS spreads the data transmission over a band of frequencies.

Where real time data is concerned, DSSS is the best system. Frequency Agile can be used, but you run the risk of all data halting occasionally while the system resynchronises after a 'hop'

Many people express concern over the available bandwidth using WiFi links. In fact, this is rarely a concern. WiFi operates at 10MBS. That is theoretically equivalent to bandwidth required for 40 DMX signals. In reality, some of that bandwidth is not available. A realistic limit is nearer to 10 DMX universes.

Another concern is whether any other devices are using the same frequency band. Using a WiFi link in a city commercial district could be a problem if numerous companies are also using WiFi links for office data transmission. In fact this is often not a concern as the average WiFi transmission distance in a building is of the order of 100m. That said, nothing beats a site survey, but remember to do the survey at the same time as the show schedule. Also, keep in mind that the Bluetooth¹ standard uses the same frequency band as WiFi.

In conclusion, with a little advance planning WiFi solves most medium distance transmission problems.

At distances over 500m, more sophisticated radio techniques are needed. Distances of up to 10Km can be achieved using directional aerials. The 'Pro 11' range is excellent for this type of application. The range is available from Black Box.

In some instances, radio solutions must be abandoned completely. This usually only occurs if there is simply too much WiFi traffic in the show site. In this instance, LASER² transmission is the best option. A number of companies manufacture point to point LASER data links including 'Cablefree Solutions' and 'Freespace'. They are significantly more expensive than radio links but do not suffer the same potential interference problems. Again, a site survey is most important. Laser links can be affected by weather issues such as fog or even cloud cover.

Other technologies do exist, although they tend to have greater drawbacks. Where the task is to bridge two buildings, existing telecom systems can be used.

The most reliable is leased line. This simply involves renting a dedicated telephone line between the two buildings via the telephone exchange. Additional electronics are needed to make the connection between the ethernet port and the telephone wire. Devices for this purpose are manufactured by companies such as Allied Telesyn. The AR370 costs around €500 and includes ISDN as a backup to protect against a leased line failure.

A similar option is to use an ISDN connection between the two buildings. An ISDN ethernet router will be required to complete the interface. Products such as the Netgear RT338 at around €200 can be configured for the purpose. The ISDN option is less robust than leased line because the link must be renegotiated if the line is dropped.

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¹ Bluetooth is a relatively new radio link system designed to allow items such as PDAs, mobile phones and portable computers to communicate.

² LASER data links used non visible infrared light in free air, to transmit data.