Distributed DMX Network over IoT

Aim

The overall aim of my project is to bring commercial DMX512 signalling through the use of software which is open source and freely available, to allow it to be transmitted over Internet Of Things , through the use of Arduino based Systems and LoRaWAN.

The use of LoRaWAN will allow multiple sets of lights to be placed around on buildings, or famous landmarks, and for all of them to be controlled simultaneously and with low delay from one remote location, using pre-existing infrastructure. The input can either be entirely digital, or using a physical DMX lighting control desk.

From DMX Lighting Desk through Connector to LoRaWAN broadcaster

DMX512

DMX512 is the standard [1] which I used for this project, and is well known for DMX. This protocol was designed for packets, and it sends 512 channels of signal along one cable, each containing the values 0 through to 255. This is how all the lights are controlled.

The signal itself is through serial, meaning most controllers can produce it, and it goes through one wire with 3 inputs. These are usually A and B, referring to Non-inverting signal and Inverting signal, then a ground pin. These packets, or frames, have a start frame to indicate the first use which is never used, and is usually 0, followed by each of the values from 1 to 512, this signal is the repeated continuously to form the full signal.

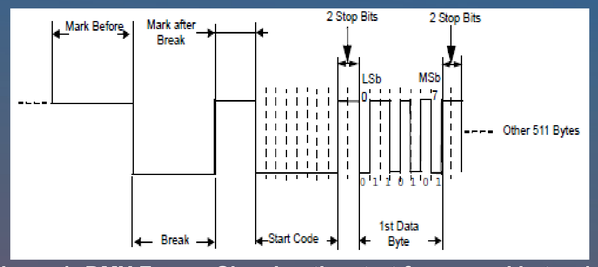

Figure 1: DMX Frame. Showing the start frame, and bytes 1 to 512 bytes afterwards. [2]

The limits to DMX are 1 to 512 Channels, which each light takes up a certain amount, but you can create multiple universes, each containing 1 to 512 to control multiple. The only other limit is through the cable length which is meant to be kept under 400M, but can be boosted.

ArtNet does exactly the same as DMX512, but it is run through Internet based clients, using local networks instead. This allows for it to be controlled remotely on the same network, but for it to pass controls to lights.

Lighting Occurs on the buildings, city-wide From LoRaWAN transmission.

How it works

LoRaWAN is mainly a MAC (Media Access Control) protocol network. The specific design of it is to allow smaller devices wihich need low power to communicate with the Internet, and any applications, over a long range wireless connection.

Figure 2: Heltec Receiver Board, used to communicate through LoRaWAN and convert to serial

Usually the devices are on the End of the Node, then these connect to a LoRa gateway which is linked to the networked server, and this goes back to the application. This allows to and from device communication over long range while sending and receiving data.

Because of the nature of DMX, only small packets are needed making LoRaWAN ideal for the application, with the additional bonus of it being over long distance. [3]

Figure 3: DMX Connectors showing Male and Female Termination. Used for the cables and to pass the signal.

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References

[1] http://www.dmx-512.com/dmx-protocol/dmx-protocol-basics/

[2] Image sourced from https://response-box.com/gear/decabox-dmx-slowdowner/

[3] https://www.thethingsnetwork.org/docs/lorawan/limitations.html

ART NET ETHERNET

LoRaWAN