
BAAAHS Lights

Agenda

- Introduction
- Architecture
  - Physical
  - Electrical
  - DMX in depth
  - Server
- Deployment, setup steps
- Common issues, troubleshooting
- General usage

Introduction

BAAAHS, the Big Ass Amazing Awesome Homosexual Sheep, is known for its beats, its jaw dropping appearance, and its openness.

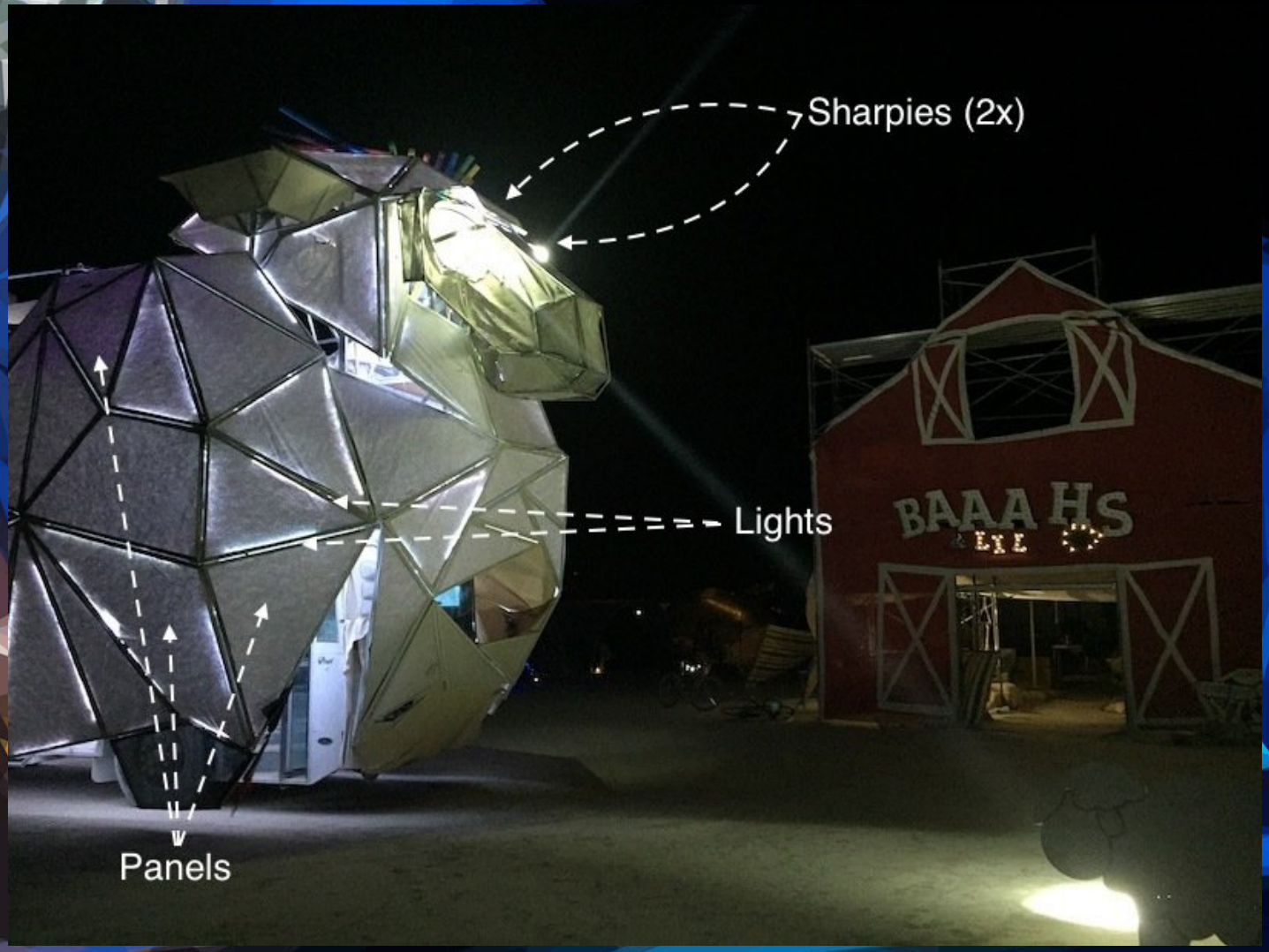
Tonight we'll talk about its bedazzling light shows and how they happen!

Introduction

BAAAHS nighttime illumination is made possible by roughly 140 skin panels, outlined with LEDs in tubes and sharpies that function as its eyes.

BAAAHS' server aims to give producers/DJs some amount of live influence over pre-programmed shows while they execute. The server talks to the panels and sharpies via a standard light control protocol termed DMX.

Physical bits



Panel Layout

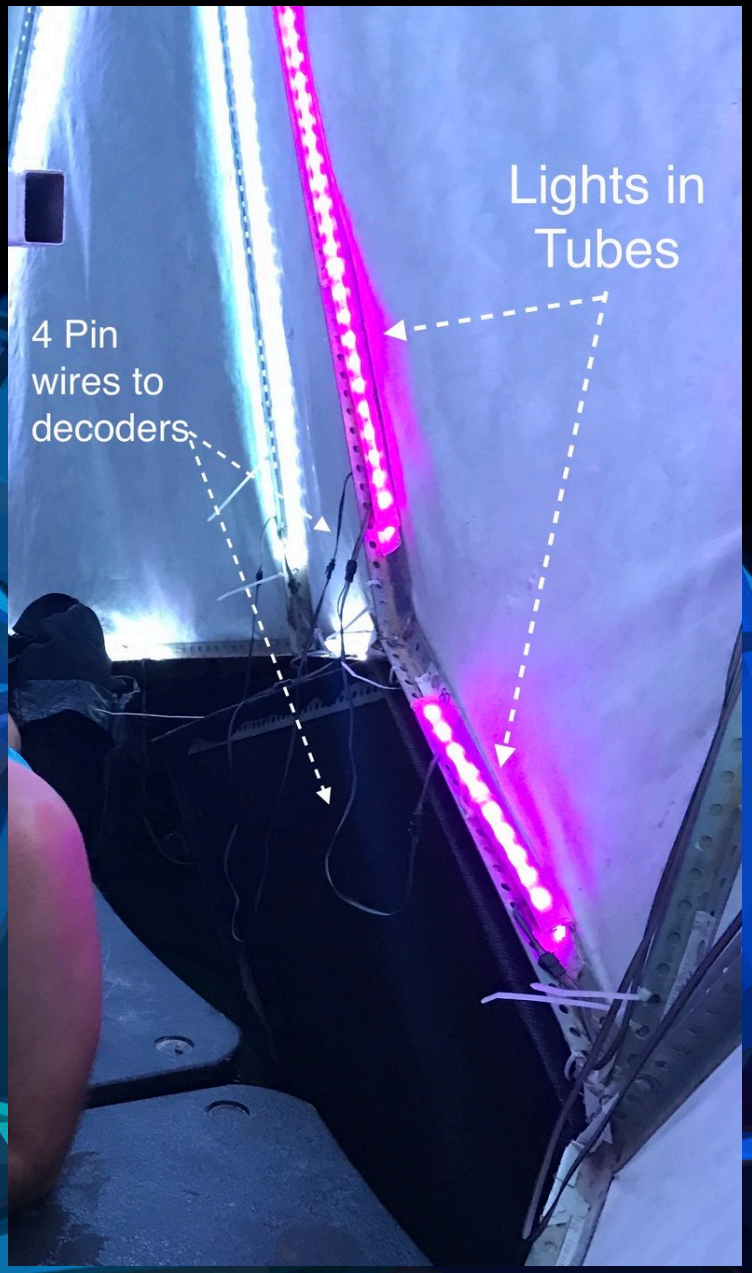
Panels are spread across various regions of the bus:

- party side (side with DJ and speakers), also known as the “D” side for driver
- business side, also known as the “P” side for passenger
- head, butt, and feet

LED strips

Panels typically consist of 3 or so (up to 5, as few as 2) light strands bundled inside tubes connected in a series.

Each tube has a male and female connector end and some panels use extensions in-between panels.



Eyes & Sharpies

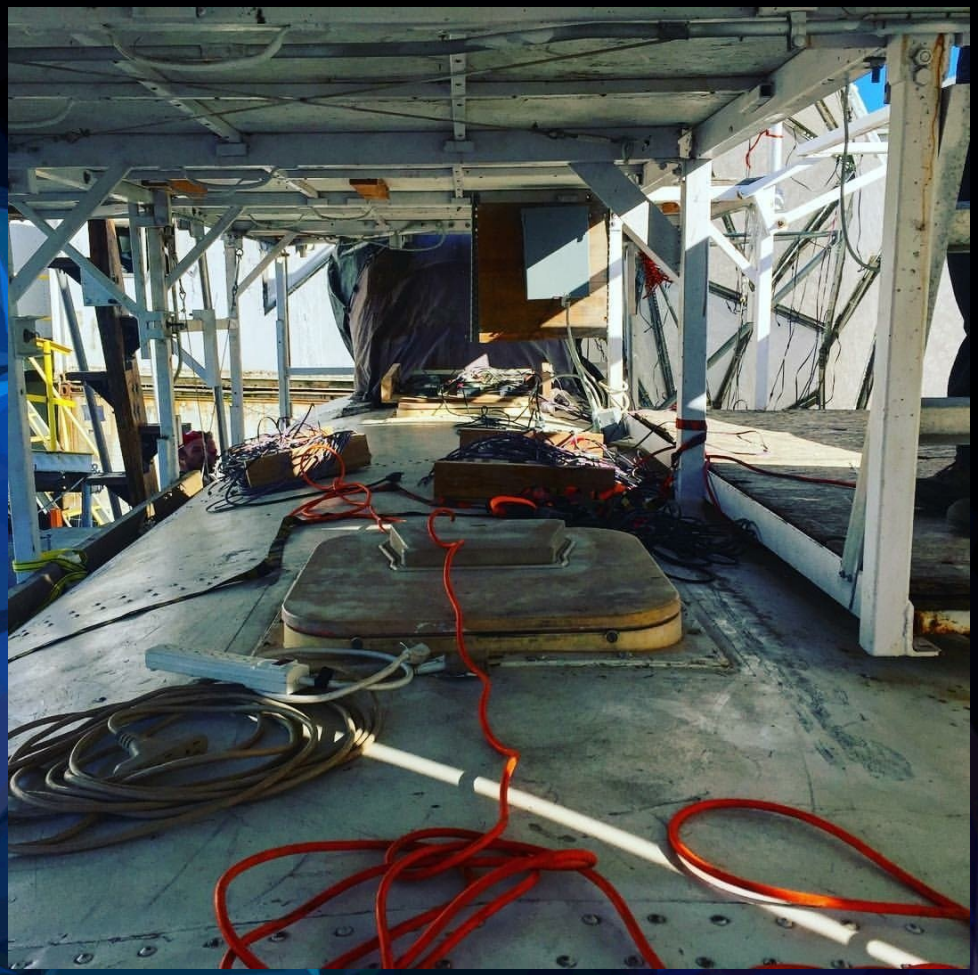
The sharpies are installed on sliding rails and retracted during the day when reflective hemispherical eyes are installed. At night the sharpies are deployed and aimed, most commonly at...

...disco balls!


Electrical

Jefferies Tubes

The area between the roof the bus and the floor of the upper platform is known as the Jefferies Tubes. Here, six controller boxes are mounted on roof (the floor of the upper platform), affixed with door pins and hinges.



Controller Mounts

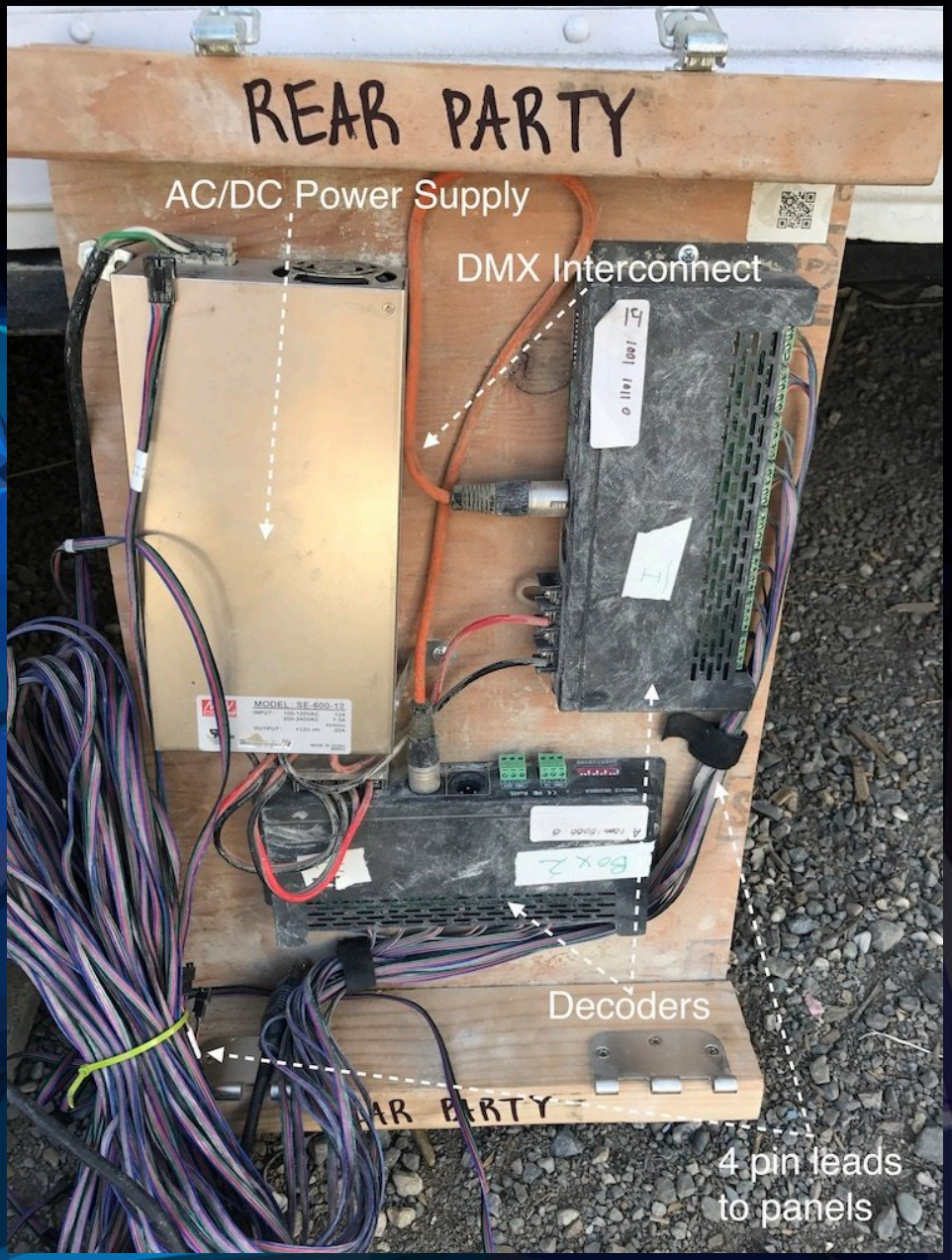
The controller boxes are labeled and are additionally identifiable based on their width.

The two front boxes are 24" wide. The middle party is 18" and the middle business is 20" wide. The rear boxes are 15" wide.

Controller Box Anatomy

Each box contains a minimum of the following:

- AC/DC power supply
- 2x DMX-512 24-Channel Decoders
- 4 pin cables, with male JST SM connectors
- DMX Interconnect cables



Controllers cont.

Front

4 Decoders

Middle

3 Decoders

Rear/Biz

includes "CPU"


What is DMX?

DMX

DMX-512 is a standard for digital communication networks that are commonly used to control stage lighting and effects.

They are serially connected systems consisting of:

- a controller which transmits a stream of data
- slave devices, in our case, DMX Decoders and Sharpies, that receive a signal, act on it, and send it along unchanged
- A terminator (optional, based on distance)

Signal

The Controllers transmit data (frames) at a rate of about 40x per second. Each frame consists of...

- a Universe, which consists of...
- 512 Channels, each with a numerical value ranging from 0-255

Cables and Connections

Though the official standard for DMX is 5-pin, most modern day lighting systems use 3-pin XLR cables and interfaces.

DMX-512 female connectors are outputs while the male connectors are inputs. (ex: the server's controller interface is female)

Slaves

BAAAHS consists of the following DMX Slaves:

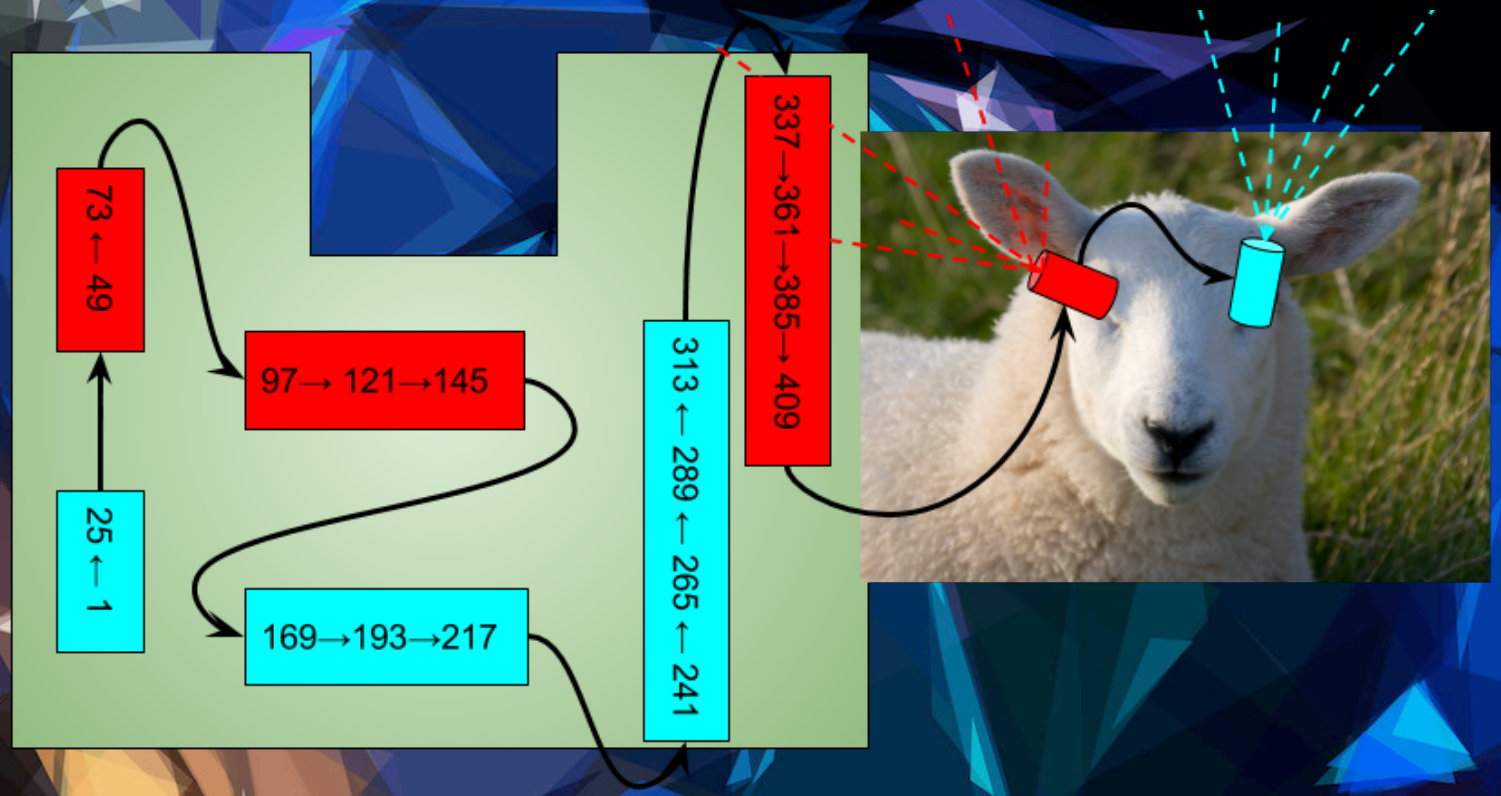
- eighteen 24-Channel DMX decoder boxes
- two 16-Channel sharpies

Addressing

Pre-configured offsets are defined per slave and dictate what portion of the 512 Channels the slave interprets.

The image to the left is configured to 241, meaning it interprets channels 241 through 264.

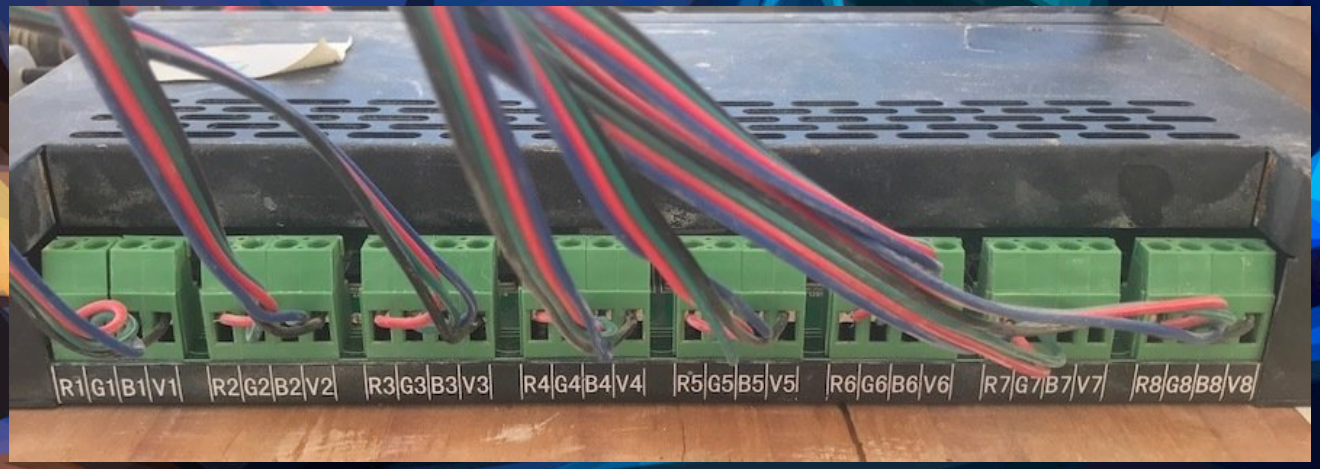
Target Addressing



The sharpie offsets are 433 and 449.

Channel usage

- The sharpies use 16 channels to control functions like: pan, tilt, focus, color, etc...
- The DMX decoders map their 24 channels across the 8 connected panel leads starting with the Red, Green, then Blue LED for each channel -- RGBx8



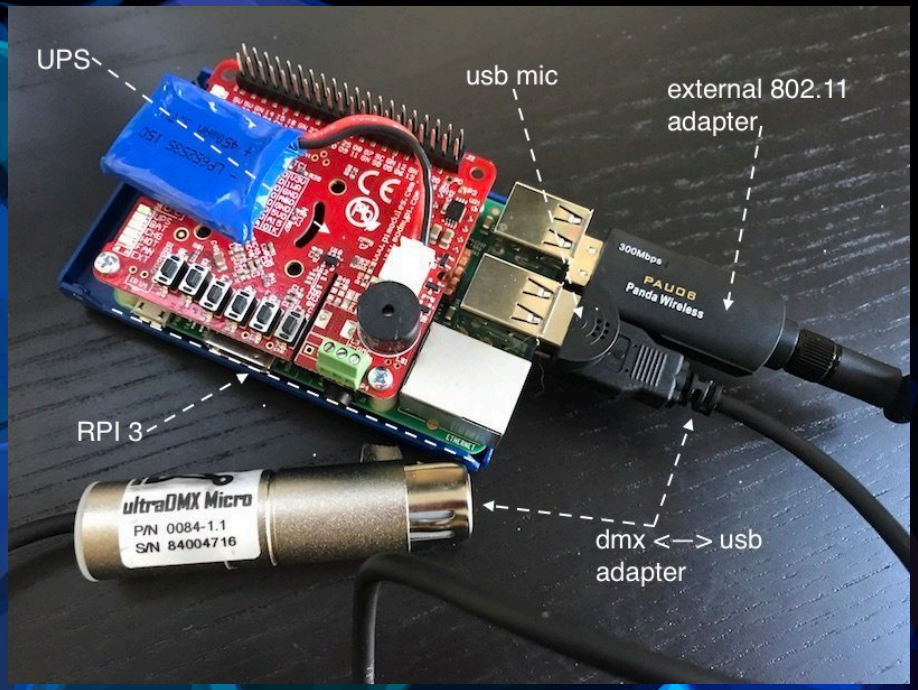
Control Server

The server is the controller of BAAAHS' lights and its sharpies. It runs extra special code, maps colorful shows to panels, and talks to those panels thanks to DMX.

The server additionally establishes a WIFI access point so that mobile devices and computers can connect to it for admin and non-admin functions.

Parts

- Raspberry PI 3
- USB to DMX interface, the “controller”
- USB 802.11 WiFi Adapter
- USB microphone
- RPI3 UPS HAT



Server Functions

- 802.11 Access Point
- SSH daemon
- OpenLighting daemon
- Python show or "lights" daemon
- Touch OSC Layout Server
- Python sound analysis / beat detection
- USB DMX Controller

Lights and DMX Control

The "lights" server runs shows, which in turn make API calls to the OLA daemon, which has a pre-configured DMX universe. The universe is configured to output DMX frames over the server's USB controller.

```
[shows] -> [OLA] -> USB/DMX -> DMX -> DMX...
```

The shows and show servers are written in Python.

Shows

There are a variety of show types:

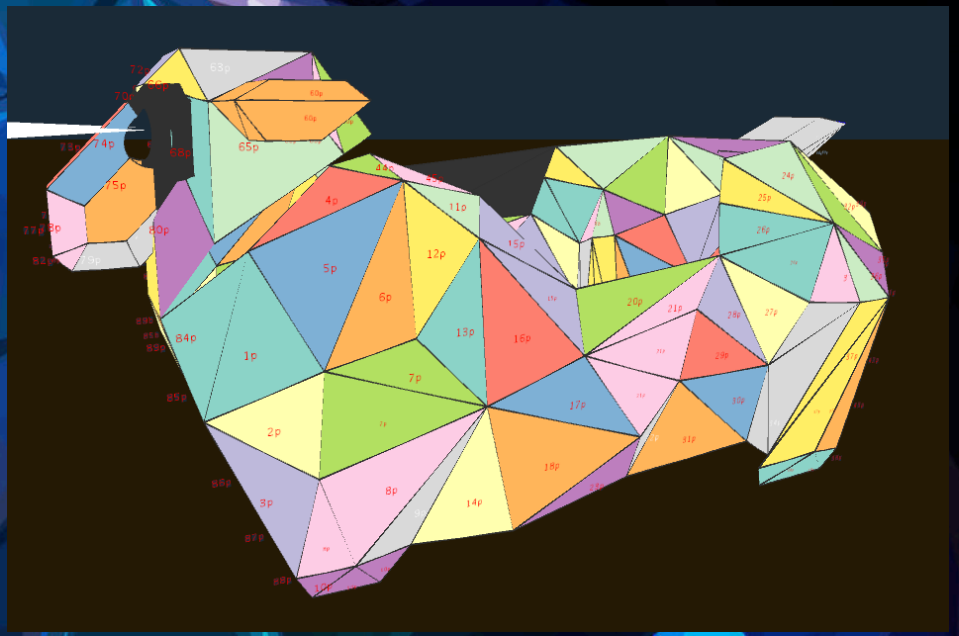
- Panel show ("master", most of what we're talking about)
- Eyes only show
- Overlay shows

Some shows have configurable parameters:

- primary and secondary colors
- brightness, tempo, and intensity

Panel Mapping

The lights service contains a model of the sheep that refers to each specific skin panel. This provides show developers a reliable "API" from which to change aspects of sheep such as the color of specific regions, waves of color, etc...



Panel Mapping

Each time BAAAHS panels are deployed the mapping changes. This concept not only benefits show developers, but builders too! It frees them from the burden of consistently ensuring specific panels are connected to specific DMX decoders.

It does mean, however, that an essential step in any deployment is running and replacing the panel mapping file.

Resiliency

There are a few levels of resiliency with BAAAHS' server infrastructure.

- All essentially daemons (lights, OLA, OSC layout) are monitored for failure and automagically restart
- An internal UPS ensure safe shutdown and temporary power when line power fails
- Multiple network interfaces allow for wired and wireless access to the server in the case of an adverse event

Web Interfaces

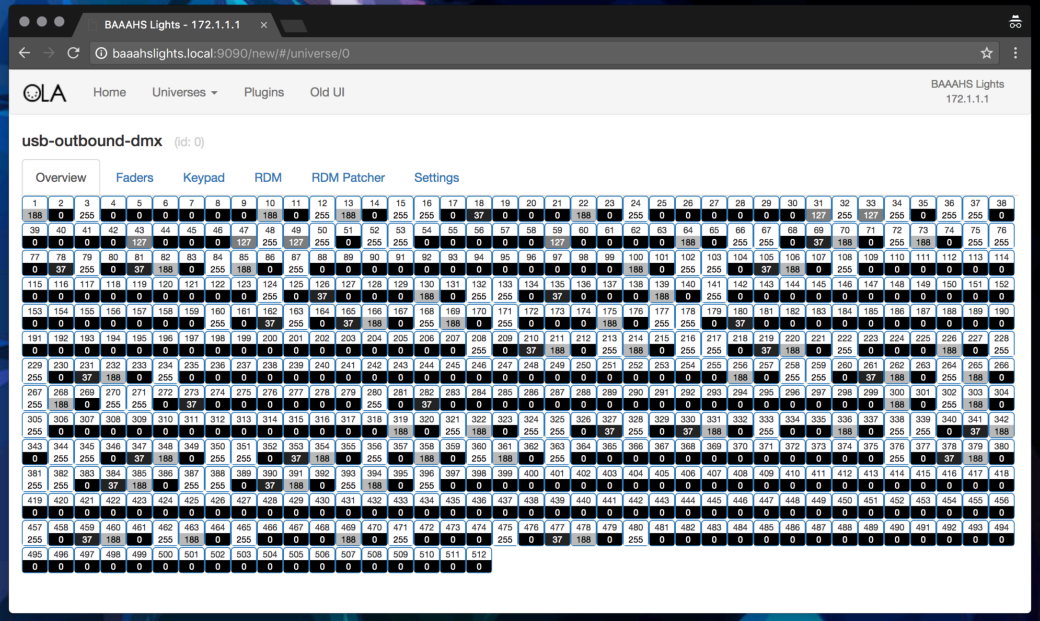
To interface with the server you'll need a mobile device or computer and will need to be in range of the sheep. If you are, you'll see an 802.11 AP "baaahs". The password for this network is "baaahs2017".

There are 3 web interfaces to be aware of...

Web Interfaces: OLA

The OpenLighting alliance web interface allows for the configuration of:

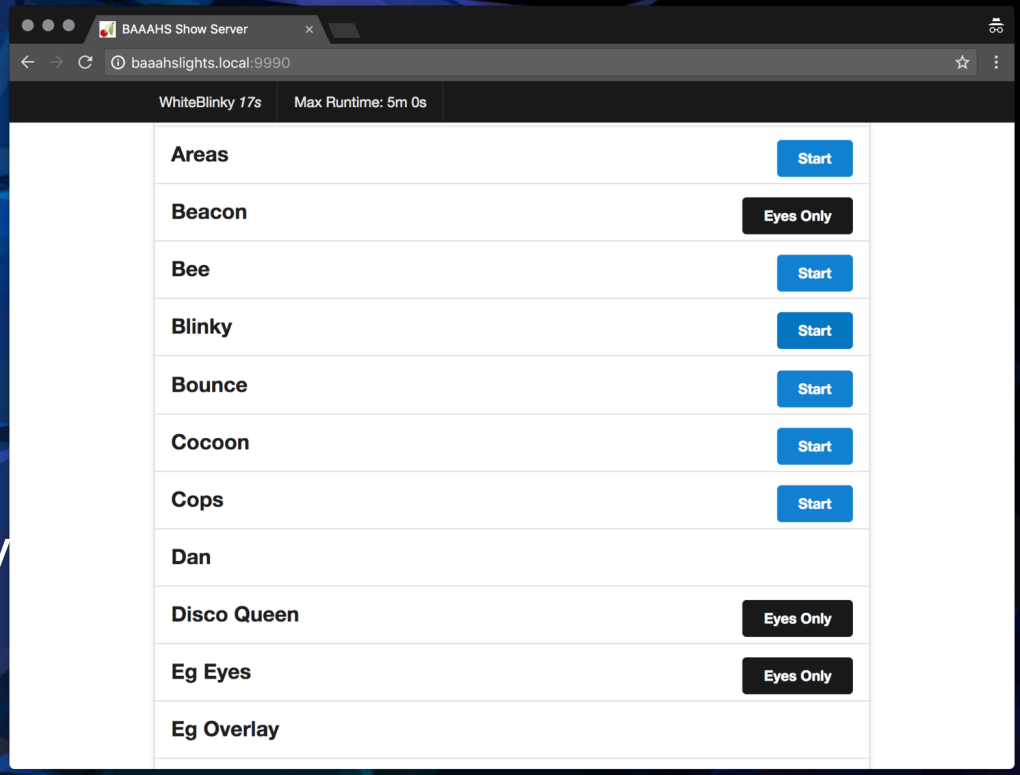
- universes and input/outputs
- explicit channel value overrides -- i.e. all channels dark (0), all channels white (255)
- channel states



Web Interfaces: lights

The lights web interface provides a mobile-first alternative to TouchOSC for show selection.

The lights server additionally provides the backend APIs for the TouchOSC clients.



Web Interfaces: OSC Layout

There's no screenshot for the Touch OSC Layout service. This services sole function is to serve a layout file which can be loaded into a mobile application for iOS and Android named TouchOSC. After installation, you point Touch OSC at the server and it will hand you back our custom layout and interface patterns.

SSH Access

Generally users will not have to SSH into the server. The only time it is *normally* necessary is for the panel mapping step.

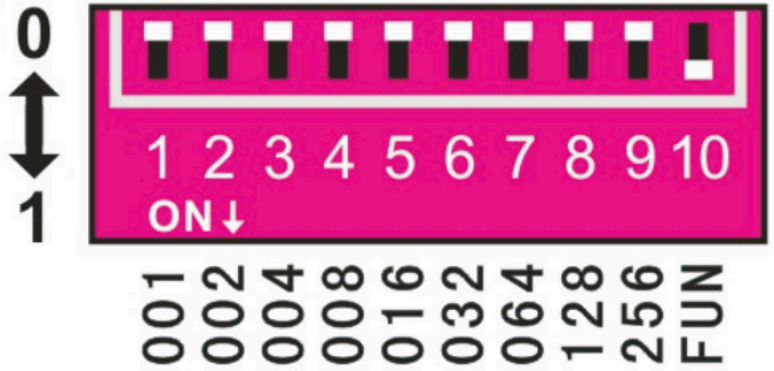
There are two accounts on the server; baaahs and pi. The pi account comes stock with the OS and is used for automated delivery and setup of the server. All configuration and administrative tasks should be done from the baaahs account.

Deployment Steps

1. Install struts, panels, bolt in place for head, party side, business side, etc...
2. Install (6) controller boxes
3. Establish connectivity between each panel and an available lead from controller boxes
4. Connect to server via SSH and run the panel mapping script
5. Interact with server via TouchOSC

DMX Decoder Testing

1、Testing function:
The 10th DIP switch is FUN, acting as the function key.
DMX512 Decoder works when FUN is at OFF, receiving DMX512 signals.
Decoder testing mode works when FUN is at position" ON" as Picture 3:
SWITCH1-9 OFF:BLACK
SWITCH1 IS ONRED
SWITCH2 IS ON: GREEN
SWITCH3 IS ON:BLUE
SWITCH4 IS ON:YELLOW
SWITCH5 IS ON: PURPLE
SWITCH6 IS ON: CYAN
SWITCH7 IS ON :WHITE
SWITCH8 IS ON :7 CLOLOR JUMPING
SWITCH9 IS ON: 7 COLOR SMOOTH

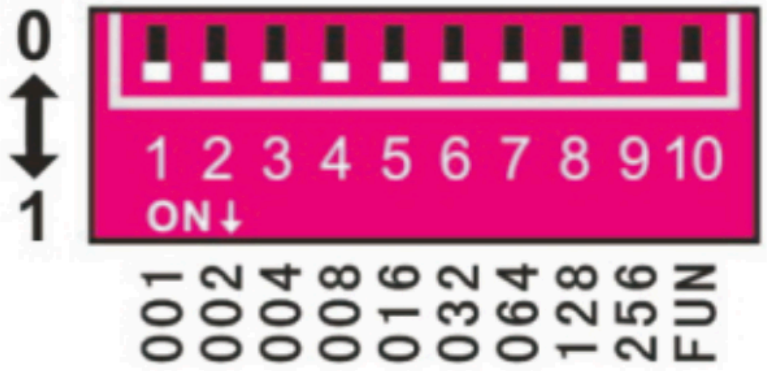


DMX Decoder Demo Mode

2、Color jumping & color smooth speed

When decoder is at testing mode, DIP Switch 8 is at “ON”, it’s the 7 Color Jumping, when DIP Switch 9 is at “ON”, it’s the 7 Color Smooth,
with 8 speed levels for each effect.

SWITCH 1-7 OFF:SPEED 0
SWITCH 1=ON:SPEED 1
SWITCH 2=ON:SPEED 2
SEITCH 3=ON:SPEED 3
SWITCH 4=ON:SPEED 4
SWITCH 5=ON:SPEED 5
SWITCH 6=ON:SPEED 6
SEITICH7=ON:SPEED 7



Picture 4

As Picture 4. When several DIP SWITCH at “ON”
at the same time, comply with the largest value switch; In Picture4, it shows the decoder status is color smooth at testing function, and is at Speed 7.

Common issues

BAAAHS needs DMV certified and the panel mapping is incomplete.

Turn off the "lights" service and instruct the OLA daemon to set all Channels in the universe to 255 -- is a one button click.

Common issues

The lights are on, but stopped changing all the sudden.

Open the web interface for the lights service and see if there's an active show running. If the service isn't running it likely crashed and will be restarted in a few seconds.

Note: When the server restarts it selects a light show at random.

Common issues

The sheep is dark, the server is offline, and all other paths of resolution yield no change.

Refer to the test and demo functions in the DMX section of this presentation. They include the dip switch positions to active the test and demo modes of the controller. When these are active the DMX decoder does not evaluate DMX signals from the server. Additionally, if fallback to these modes is required, each DMX decoder requires the dip switch positions/configurations.

Common issues

You're connected to "baaahs" WIFI but can't access anything at "baaahslights.local".

This sometimes happens because Avahi, an offline DNS daemon, is amuck. A simple restart of the server will fix the issue or you can interact with the server via it's IP at 172.2.1.1.

Common issues

I need to restart the BAAAHS server. It has no buttons.

The server has a battery and power regulation mechanisms inside, but is set to self shutdown after 60 seconds without line power. To shut the server down, unplug the micro USB connection from the server and wait 90 seconds before re-connecting power. You will hear two tones; one when power is disconnected and one 60 seconds later when the shutdown signal is issued.

TouchOSC

TouchOSC is an iOS and Android OSC client that interfaces with the BAAAHS Lights service to control shows, control the sharpies, speed or slow shows, change colors, etc...

TouchOSC Demo

Click here to view the PDF on the configuration of the TouchOSC client for BAAAHS.

THE END

LINKS

- Lights source code
- Infrastructure, OSC layout and server, and beat detection source code
- Panel layout
- Recording of Presentation
- TouchOSC Configuration Instructions