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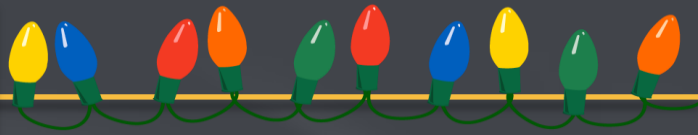
KJ92508

Christmas Lights Animation

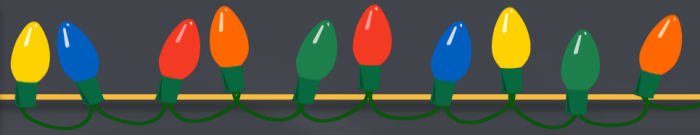
By Interactive Lighting

By:
Austin Wentz and Jordan Doell



Sponsor:

1. *L-3 Communications*
2. *June Alexander-Knight*



Problem:

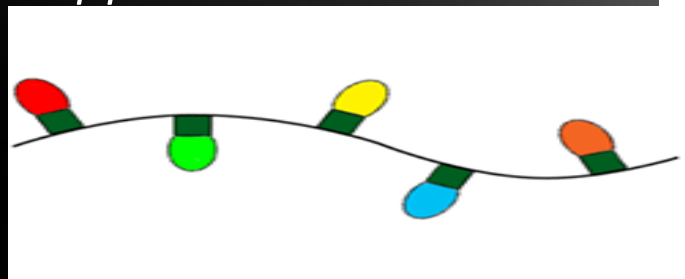
1. *Sync Christmas Lights to music*
2. *Use a Linux board to control the system*
3. *Be able to use an iPhone app to run the system*

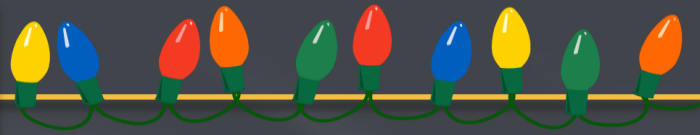
Christmas Lights Animation

1. Problem
2. Goal
3. Analysis

Goal:

1. *Choose a song from the iPhone app*
2. *Play music and have the Christmas lights synced to the music*
3. *Make sequences on the iPhone app to have a fully interactive experience*





Analysis:

1. Use SSR's to power lights on and off
2. Raspberry Pi running Linux, connect to a separate controller
3. Connect controller to SSR's
4. Develop an iPhone app that can connect to the system from any wireless location

Challenges:

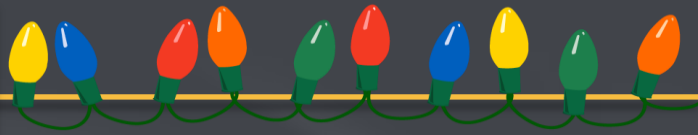
1. *Power on and off 120 volts*
2. *Limit of 4 amps per channel*
3. *Control 32 channels*
4. *Safety is a priority (We don't want the magic smoke)*

User Stories:

- The user would like to sync lights to music and control it with an app on their iPhone
- The rest is up to us

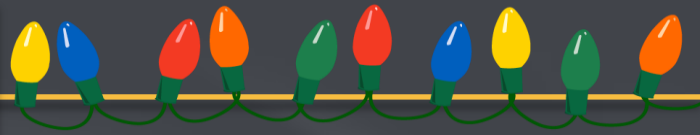
Backlog:

- Purchase Christmas lights
- Develop interface between SBC and additional circuitry
- Implement Renard serial protocol
- Develop prototype which switches lights on and off using predefined sequence
- Assemble/connect SSR and Renard
- Program and configure Linus SBC to act as midi sequencer for lights
- Develop and implement iPhone app to interface with controller to control lights and music
- Layer overtone framework atop of Linux SBC to enable live programmable lights/music



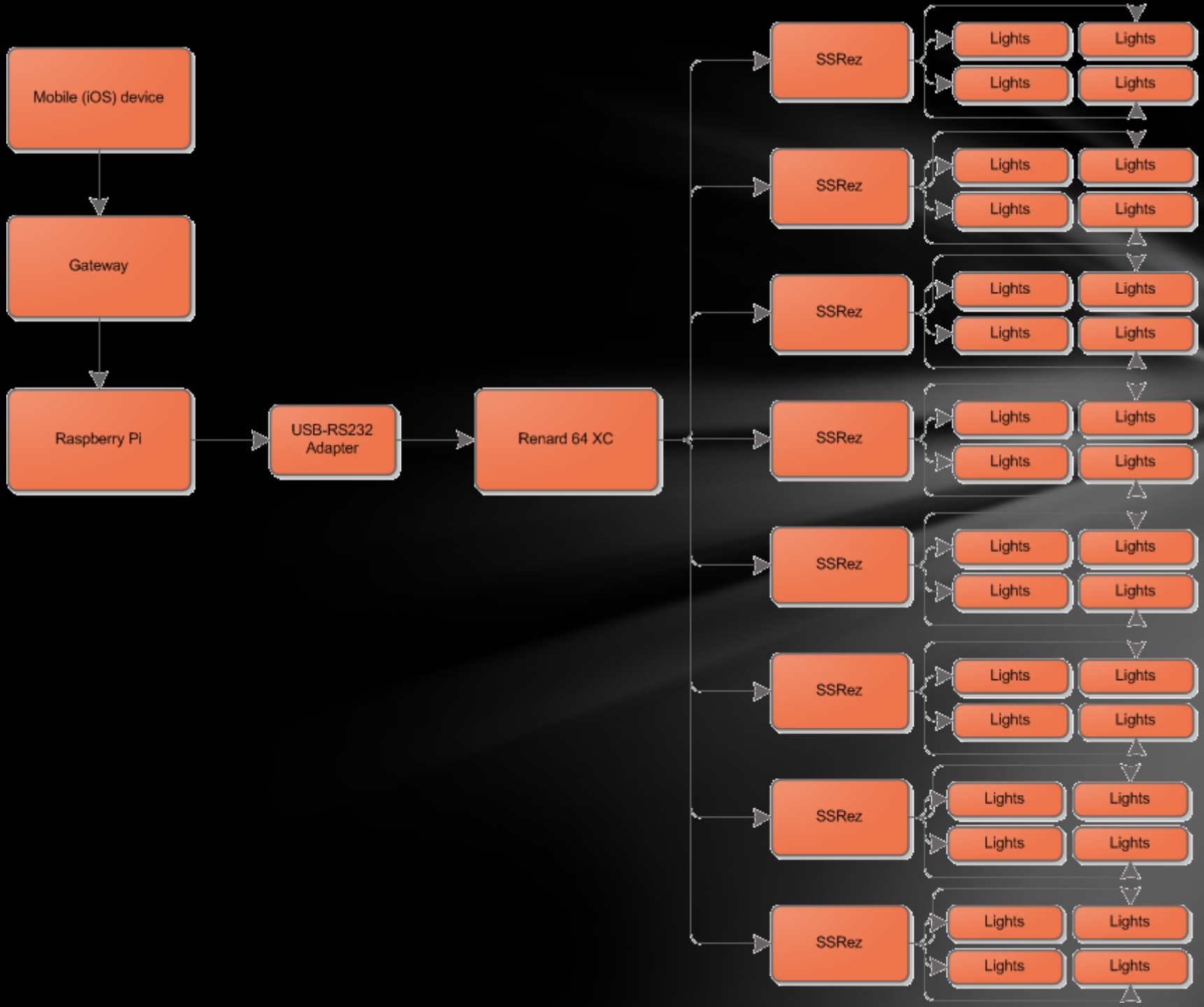
Design & Architecture:

1. *Initial Design*
2. *Reasoning and Justification*



1. Initial Design
2. Reasoning & Justification

Initial Design


Mobile (iOS) device
Gateway
Raspberry Pi
USB-RS232 Adapter
Renard 64 XC
SSRez
Lights
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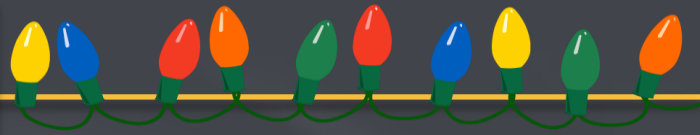
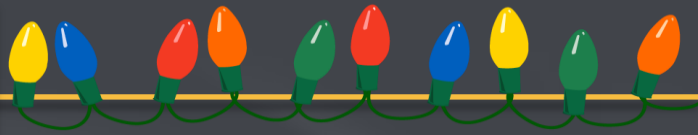


Reasoning & Justification

1. *Most cost effective approach*
2. *Extendable – easily add more channels if needed*



Hardware Requirements

1. *Raspberry Pi*
2. *Renard 64 XC and SSRs*
3. *iPhone*

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Raspberry Pi

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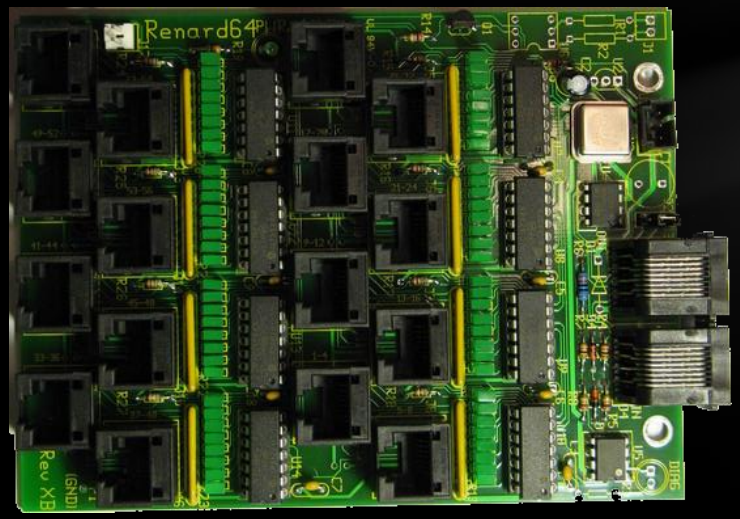
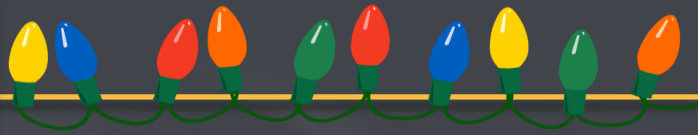
Renard 64 XC and SSRs



Hardware Requirements

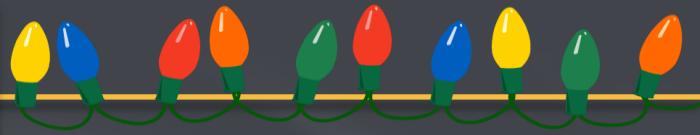
1. Raspberry Pi
2. Renard 64 XC and SSRs
3. iPhone

iPhone



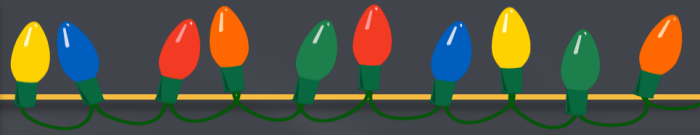
Software Requirements

1. *Protocols*
2. *iPhone App*
3. *Sequencing & Interaction*



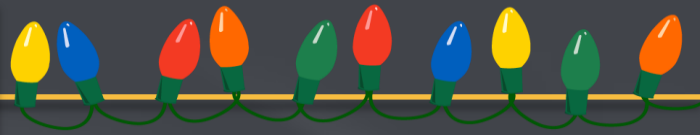
Protocols

1. *iPhone App – Raspberry Pi*
2. *Raspberry Pi – Renard*
3. *Renard – SSR*



iPhone App

1. *GUI*
2. *Syncing Music & Lights*

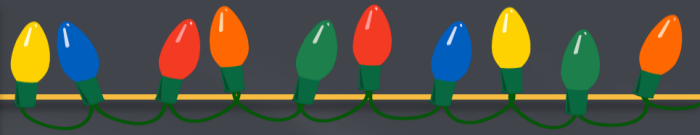


iPhone App

Framework:

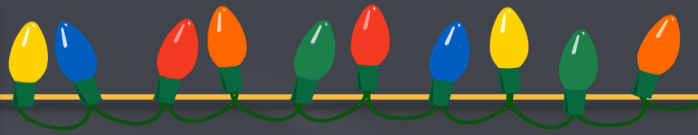
Part of a Remote Home Mobile Service

1. *Allows users to register and connect devices at home*
2. *A DDNS service is a registry of all home stations and devices*
3. *A home station has a server that is responsible for controlling each device*
4. *The home station tells which devices are online and lets you contact the lighting system*



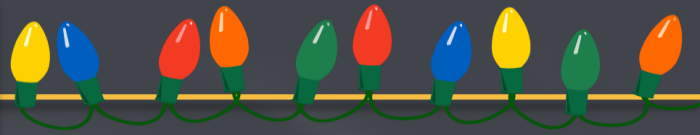
1. Protocols
2. iPhone App
3. Sequencing & Interaction

Sequencing & Interaction



Testing

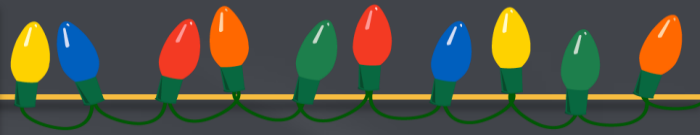
1. *Unit / Component Testing*
2. *System Testing*
3. *System Integration*



1. Unit / Component Testing
2. System Testing
3. System Integration

Component Testing

1. *SSR's*
2. *Renard Controller*
3. *Raspberry Pi*
4. *iPhone*
5. *Christmas Lights*
6. *Extension Cords*



1. Unit / Component Testing
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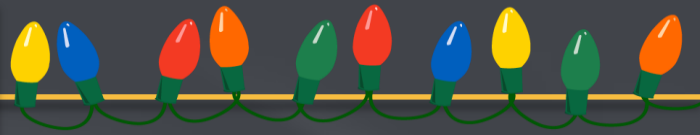
System Testing

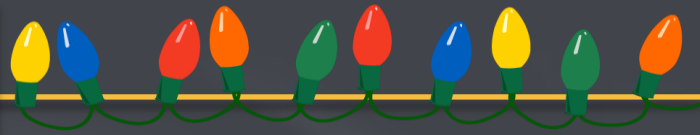
1. *Systematic Approach*



1. Unit / Component Testing
2. System Testing
3. System Integration

System Integration

1. *32 channels with 256 dimming levels each – 8,192 possible states*



Budget

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Items	Cost
Raspberry Pi & Accessories	$100.00
Renard 64 XC kit	$70.00
SSRs (32 channels)	$80.00
Christmas Lights x 64	$100.00
Extension Cords x 32	$50.00
Animated Christmas Lights	**Priceless**

Summary

Questions?