IR HUB
INITIAL DESIGN REVIEW

By:
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DEVELOPMENT TEAM:

- **Jeremiah Prousalis:**
  - Project Lead
  - Firmware Lead
  - Bluetooth Module Interfacing

- **Nathaniel Bradley:**
  - Hardware Lead
  - Analog IR Design
  - Power System Design
  - PCB Layout Lead

- **Jesus Castro:**
  - Software Lead
  - Android Application
PRODUCT DESCRIPTION:

- IR Hub will feature an MCU connected to a **Bluetooth Low Energy Module**
- The BLE Module will enable users to interact with the Hub via an accompanying **Android app**
- An **IR receiver** will be used to read and store button codes from users’ remote controls
- An array of **IR LEDs** will be arranged around the perimeter of the PCB allowing known button codes to be rebroadcast on command
APPLICATION:

- IR Hub will solve the problem of cluttering your living room with one or more infrared remotes by turning your **phone** into a **universal remote**.
- The **IR sensor** will allow the Hub to act as a truly universal remote by enabling the device to **learn** the outputs of any remote control no matter how obscure the brand.
- This will all be housed in a domed casing intended to be mounted in a central location of a user’s room, and any IR signals transmitted provide **360° room coverage**.
INITIAL SPECIFICATIONS:

- Bluetooth
  - Bluetooth Low Energy module for communicating with user’s phone
- Sensor
  - Infrared phototransistor for reading raw signal from remotes
- Transmitter
  - 8 infrared LEDs arranged around the perimeter of the PCB
- Interface
  - Android Application allowing users to create, organize, and activate buttons for various devices
BLOCK DIA

TV
Hub
Stereo
Fan
IR Remote

User's IR Devices
IR LED's
LED Driving Circuitry
IR LED's
LPC Cortex-M4 MCU
BLE Module
GPIO
GPIO
UART
PWM
Gpio
Gpio
Read-Mode
LED Indicator
IR Sensor
IR
User's IR Remote
Bluetooth

User's Phone
ANDROID APPLICATION MOCKUP:
CRITICAL ELEMENTS:

- Precise signal capturing
- Precise signal broadcasting
- Responsive handling of user input
TECHNOLOGY REUSE:

• BLE Module
  • Existing Adafruit BLE Libraries for nRF51 based modules
• LPC Open
  • Open source libraries and code
PARTS:

- **Microprocessor**
  - LPC 4088
    - 512kB Flash
      - persistent storage used for remote codes
    - 12 bit ADC
      - 400kHz Conversion Rate
    - 120MHz Clock
    - 2.4V-3.6V Supply Voltage
    - UART Interface
    - On-Board PWM

- **Cost**: $12.90
PARTS:

- Bluetooth Module
  - Adafruit Bluefruit LE
    - UART interface at 9600 baud
    - HW flow control (CTRS, RTS)
    - Simple AT command set for configuration
    - 3.3V Supply Voltage
    - 20 mA peak current consumption
    - On-board ADC for battery read

- Cost: $17.50
PARTS:

- **IR I/O**
  - IR NPN Phototransistor
  - 8 IR LEDs
    - 940nm wavelength
    - 1.35V
    - 100mA

- **Cost**: ~$3.00
## APPROXIMATE BILL OF MATERIALS:

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Total: $120.96