Initial Design Review
What are we going to do?
Product Description

Build a **compact** device which allows a person to **broadcast** their voice to a specific room’s **SONOS** devices and **control** their **music**.
Required Functionality

Communication

Real time voice broadcasting.

Allows user to select which “room” to talk to.

“room” = a group of SONOS devices.

Music Control

Play/Pause

Next

Previous

Volume
Design Constraints

Experience

Minimize audio latency.
Responsive controls.

Simplicity

Durability

Product should withstand home environment (drop/water proof).

Affordability

$49.99-$99.99 is acceptable for such a simple device.
Target Market

Middle to Upper class people who own SONOS devices.
Young families.

SONOS

Research and Development &

SONOS
Who’s on the team?
Our Team

**Legend**
- **Underline** = Leader
- **Bold** = Primary Group Member (1 per person)
- **Italics** = Secondary Group Member / Communications

**Discipline Leaders**
- Luke Bucklew, Brian Sandler, Kuan Sung

- **Thermal/Power**
  - Kyle Li
  - Yiqin Wang
  - JianYang Lu
  - Subho

- **DSP+MIC Array**
  - Yiqin Wang
  - JianYang Lu
  - Kuan Sung

- **PCB/Hardware**
  - Mohammed Cazi
  - Luke Buck
  - Yubin Liu
  - Marcellis
  - Brenden
  - Brian

- **Structure/Design**
  - Kuan Sung
  - Kenny Wang
  - Yang Xue
  - Kyle Li

- **Software**
  - Brian Sandler
  - Richard
  - Marcellis
  - Subho
  - Brenden
How will it be done?
Components

WF121 WiFi Module

PCM1862 ADC

1.44” ST7735R
Components

Final Version

Capacitive Touch Controllers

AT42-QT1010(x2) Digital Output SOT23 or PCF8883(x2) (NXP)

Capacitive Surface

Prototype Version

Push Buttons 519PB-ND(x5)
## Interfaces

<table>
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<tr>
<th>Symbol</th>
<th>Choice</th>
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<th>Purpose</th>
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<td>SPI 2 CHIP SELECT</td>
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Hardware Block Diagram

- **Wall Wart**
  - 3 Volt 1.5 Amp Power Adapter
  - 4.5 Volt 1 Amp Power Adapter
  - 5V 2A PA

- **Button array**
  - Button array will be replaced later with a more elegant solution. This is for the first board only.
  - Button Array (Talk, Play/Pause, Next, Prev, Volume)

- **WF121 WiFi Module**

- **LPC4088**

- **PCM1862 ADC**

- **MEMS Mic Array**
  - SPM0408LE5, SPU0414HR5H

- **ST7235R Adafruit 1.44" Display**
Software Block Diagram
The Microcontroller

Processor: NXP LPC4088
Manufacturer: NXP Semiconductors
Part Number: LPC4088FBD208

Used to connect and control all peripherals through the SPI/UART interfaces on the ARM Cortex-M4 processor.

Cost:$11.30
The WiFi Module

WF121 WiFi Module:

Will be used to join a network that has other Sonos products

2.4 GHz 802.11 b/g/n

BlueGiga’s Wi-Fi Software

Cost: $28.71
The ADC

PCM1872DBTR from Texas Instruments.

24 bit resolution ADC converter.

2 channels

Allows the microcontroller to process the inputs from the mic array.

Cost: $3.79
The Screen

Adafruit 1.44" Diagonal Color TFT LCD Display

128 x 128 resolution, 18 bit color
SPI Digital Interface
Built in MicroSD slot
3.3V or 5V compatibility
~25mA max current draw for LCD and Backlight
10g weight
33 mm x 45mm x 7mm total size

Cost: $14.95
Critical Elements

Minimize latency when broadcasting real time audio using the SONOS API.

Same MCU will be performing DSP as well as interacting with the API on the network.
Schedule

For this project the ECE 189A Gantt Chart was followed: