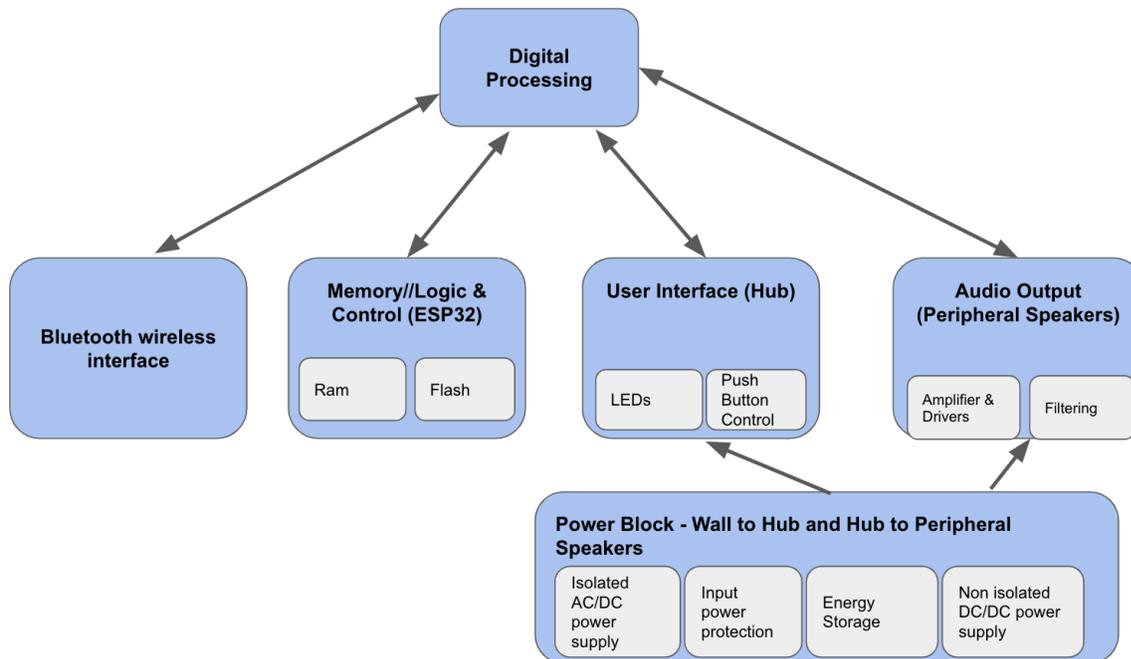


# Team 2 - Design Review 0:



## Sub-systems & requirements:

### Power - Requirements

We require power to drive the speakers. This includes an isolated AC/DC power supply, input power protection, energy storage, and non isolated DC/DC power supply. This will ensure that the speaker hub can carry and store energy to charge the peripheral speakers. The hub will be charged through wall outlets.

### Power - Plan to achieve requirements

The peripheral speakers will have parallel charging from the hub so that all components can charge at the same time from the same voltage, and each will have a 5V rechargeable battery. There will be an on board regulator to 3.3V for on board components, because of the ESP32.

To power the hub, there will be an AC/DC adapter into the hub (120V AC to 24V DC). Within the hub, there will be a DC/DC converter (24V DC to 5-8V DC). There will also be a

parallel charging circuit for all batteries and an on board regulator to 3.3V for on board components.

## Signal Processing

**Bluetooth interface:** The ESP32 must have a Bluetooth interface that can connect to multiple peripheral speakers to play calibrated outputs.

To meet this requirement, we will use AD2P to connect a source to the speaker hub and then ESPnow to connect speakers to each other via the hub. We do not yet know how the hub and peripheral action will go, we are basing this prediction off of online projects that are similar.

**Input User Interface (Hub):** The input user interface must communicate battery level and connectivity with the user.

To meet this requirement, we will include an RGB LED for battery level and a blue LED to show bluetooth connection.

## Audio Output

For high quality sound, we require high quality speaker components that fit our budget.

It will be necessary to filter the audio signals going into each speaker. The subwoofer signal will be low pass filtered and the midrange drivers will be high pass filtered both with cutoff frequencies around 5 kHz. This can be achieved either through digital signal processing on the ESP, or through an analog filtering circuit. Doing this will simulate the crossover network of a system with one source. After filtering, the signals will be sent to an amplifier circuit. This can be achieved through pre-existing amplifier boards, on board amplifier components, or a custom designed circuit. The amplifier must have an input voltage around 5V and provide enough power for an 8 ohm load.