



H O M E F L O W

Winter Design Review

Team Members

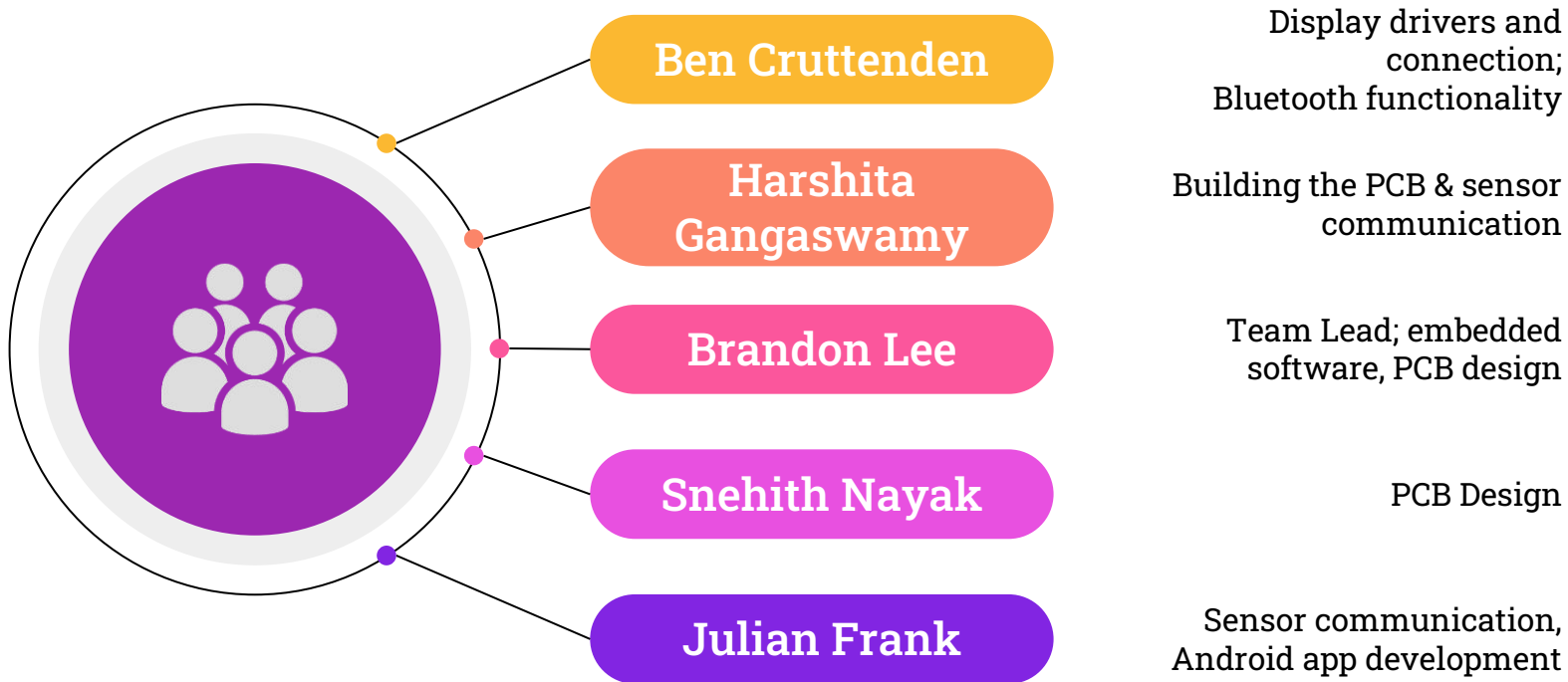
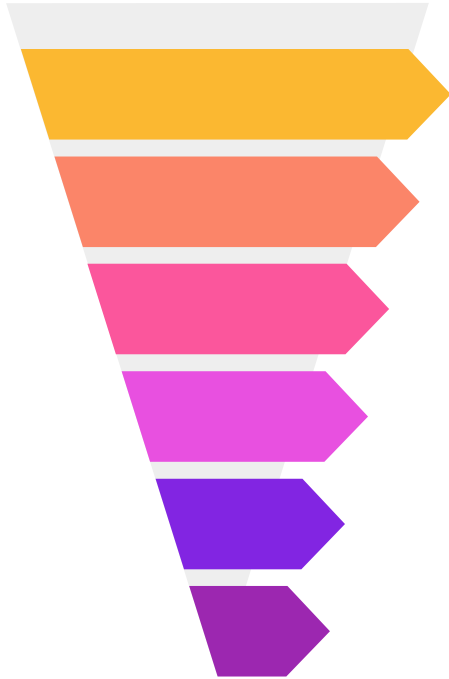


Table of Contents



Overview

What HomeFlow plans to accomplish

Hardware

Block diagram and hardware overview

Software

Embedded and mobile software overview

PCB

PCB progress overview

Timeline

Accomplishments so far, future timeline

Risk Analysis

Risk factors and areas of concern



HomeFlow Overview



Collect and analyze meaningful data to produce useful insights

Data-Driven



Simple, streamlined UI will enhance ease of use

Intuitive



Essentialist

Include only features that are essential to device functionality



Affordable

Minimal features and simple design will keep price low

Specialized purpose provides additional benefits to particular populations

Specialized



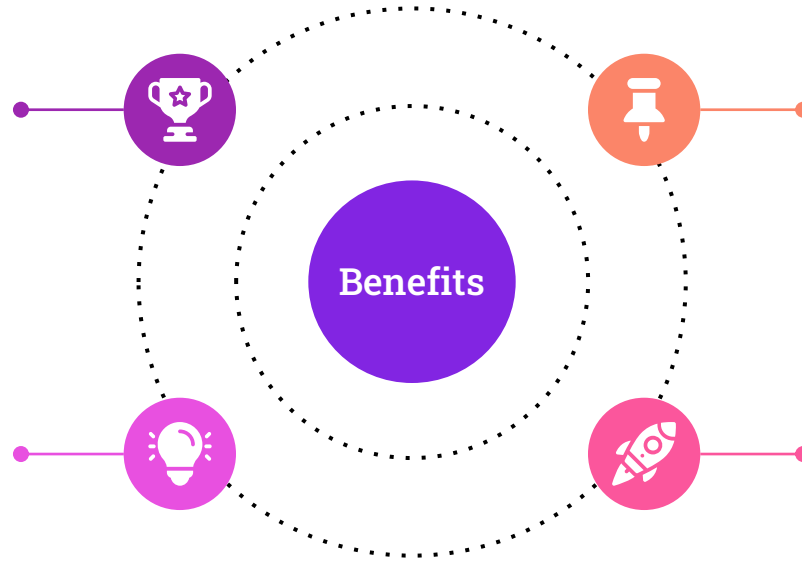
Specialization: Assisted Living Homes

Remote Monitoring

Staff can use our device to monitor the physical status of residents remotely

Databasing

Data collected with our device can be remotely compiled into a database



Continuity

Collect health data at all times, instead of only during physician visits; alert staff of detected conditions

Comfort

Monitor residents' health in a comfortable, stress-free environment

Project Features

Wearable



- HR / SpO2
- Body Temp
- Motion tracking
- Noise level
- Weather
- Air Quality

Smartphone



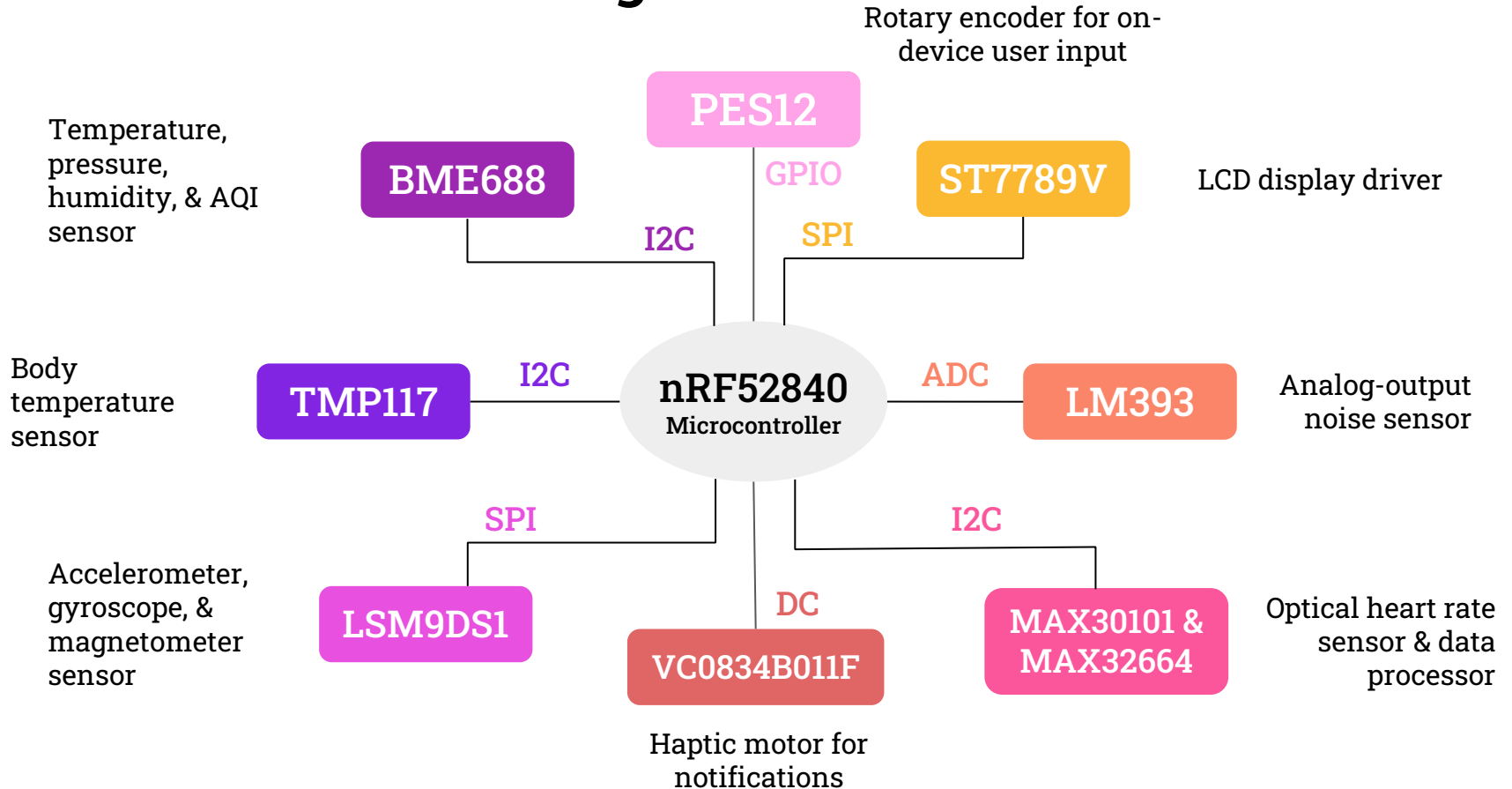
- Machine Learning
- Data visualizations
- Data management

User Interface



- Rotary encoder
- Haptic motor
- LCD display
- Android App

Wearable Block Diagram



Microcontroller

Specifications

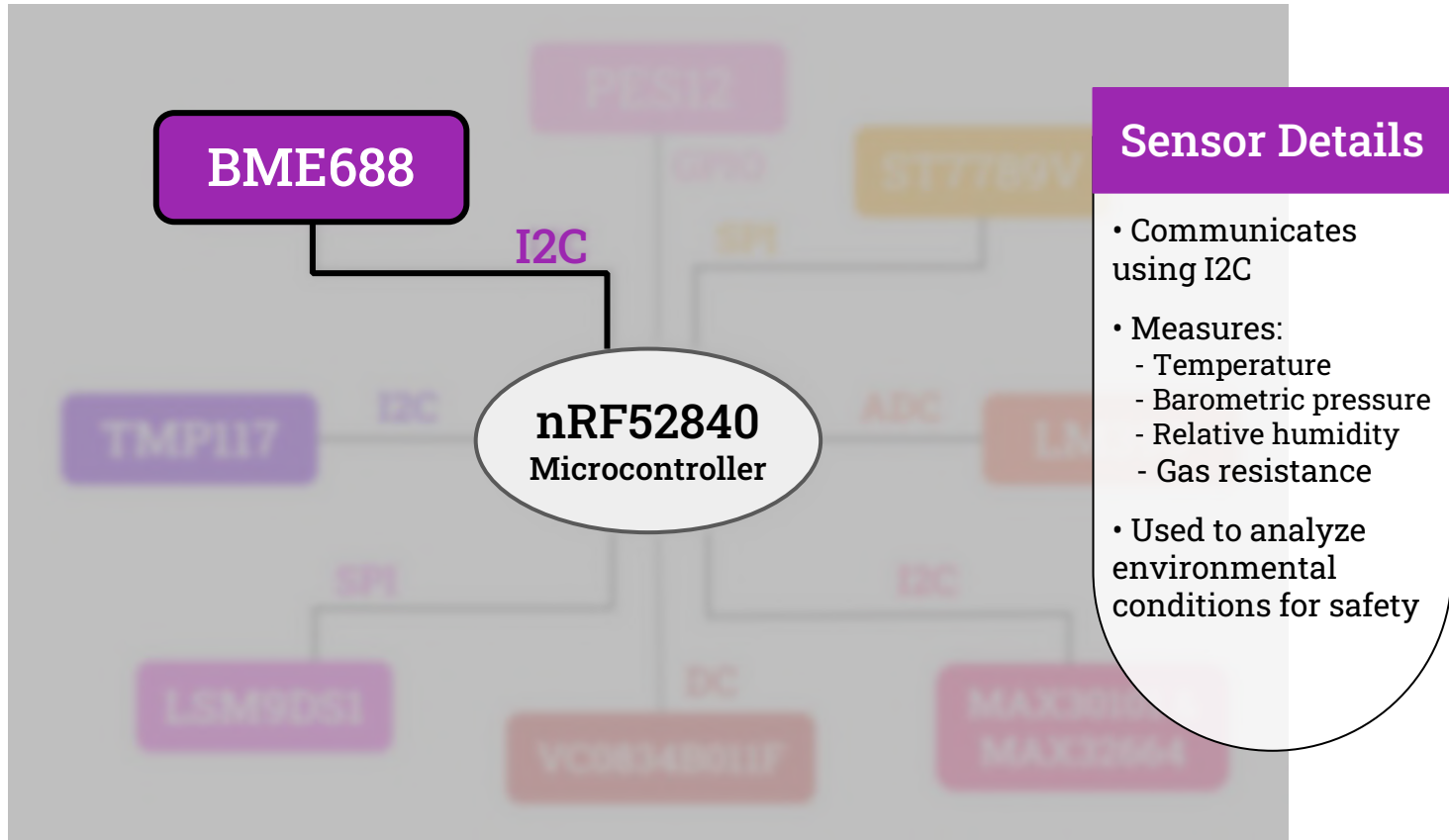
- On-board Bluetooth
- Several low-power operating modes
- Supports I2C, SPI, UART, and GPIO Communications

nRF52840
Microcontroller

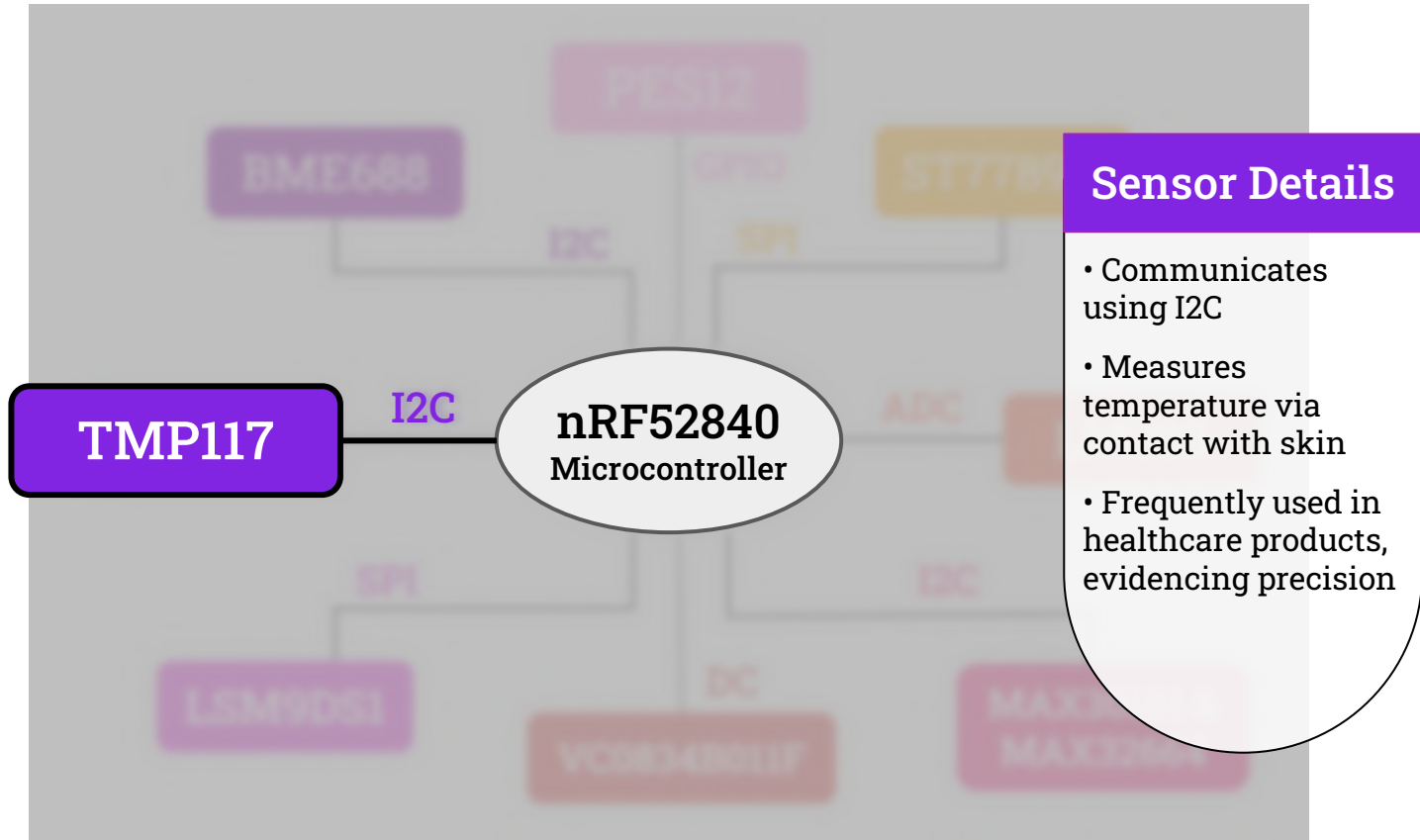
Key Features

- Speed facilitates multiple concurrent measurements
- Bluetooth 5 makes smartphone communication straightforward
- On-board memory is sufficient for local data storage

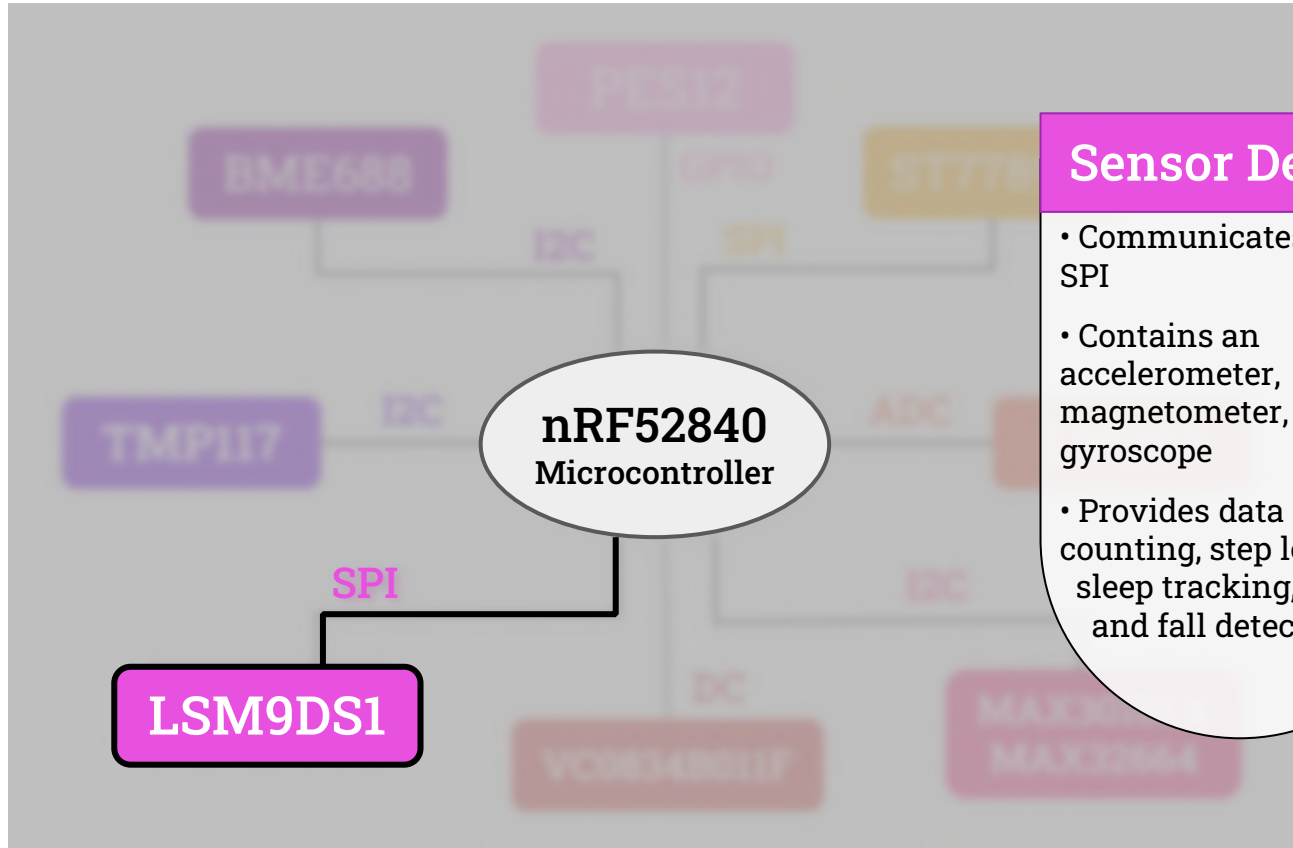
Weather Sensor



Skin Thermometer



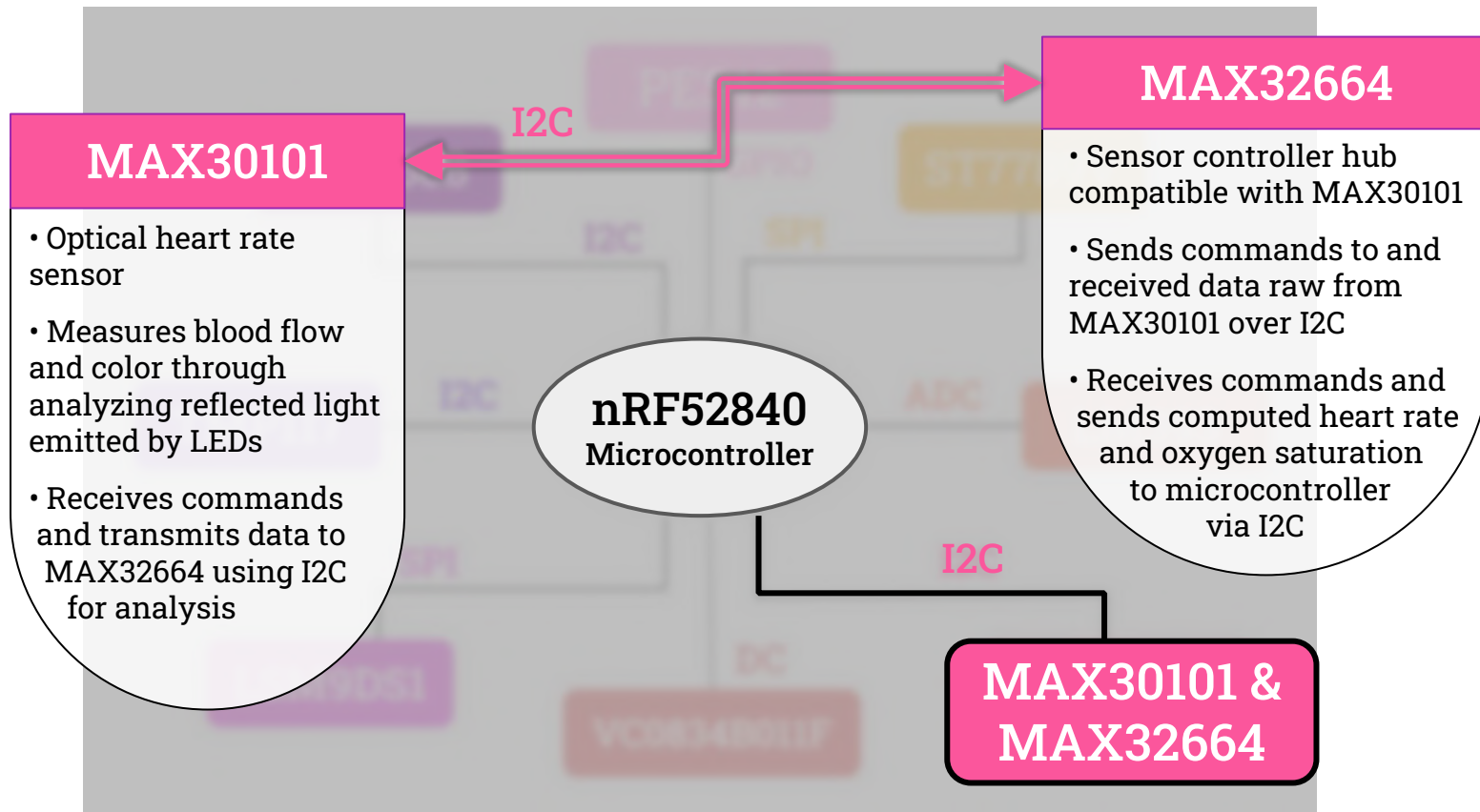
Inertial Measurement Unit (IMU)



Sensor Details

- Communicates using SPI
- Contains an accelerometer, magnetometer, and gyroscope
- Provides data for step counting, step length, sleep tracking, and fall detection

Heart Rate / Blood Oxygen Sensor



Volume Sensor

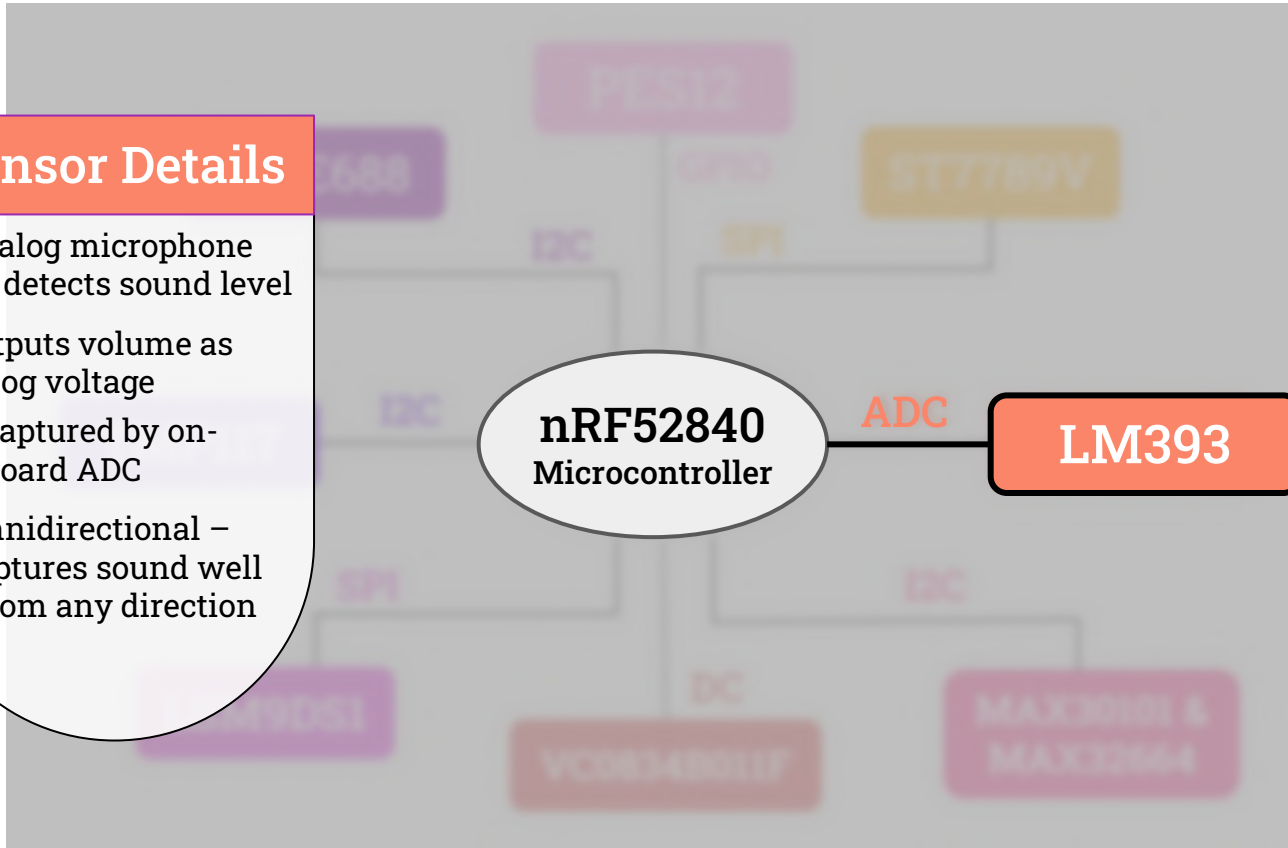
Sensor Details

- Analog microphone that detects sound level
- Outputs volume as analog voltage
 - Captured by on-board ADC
- Omnidirectional – captures sound well from any direction

nRF52840
Microcontroller

ADC

LM393



Display Module

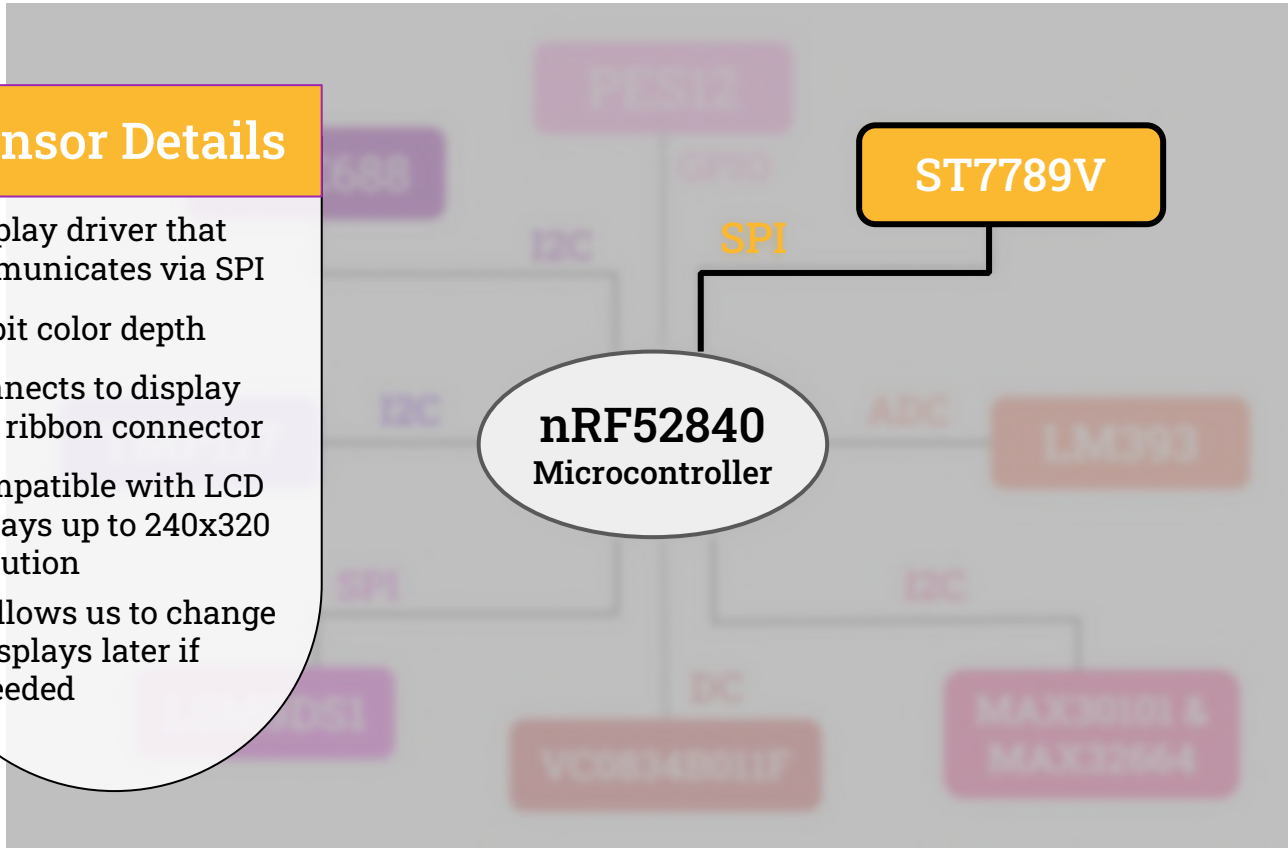
Sensor Details

- Display driver that communicates via SPI
- 16-bit color depth
- Connects to display with ribbon connector
- Compatible with LCD displays up to 240x320 resolution
 - Allows us to change displays later if needed

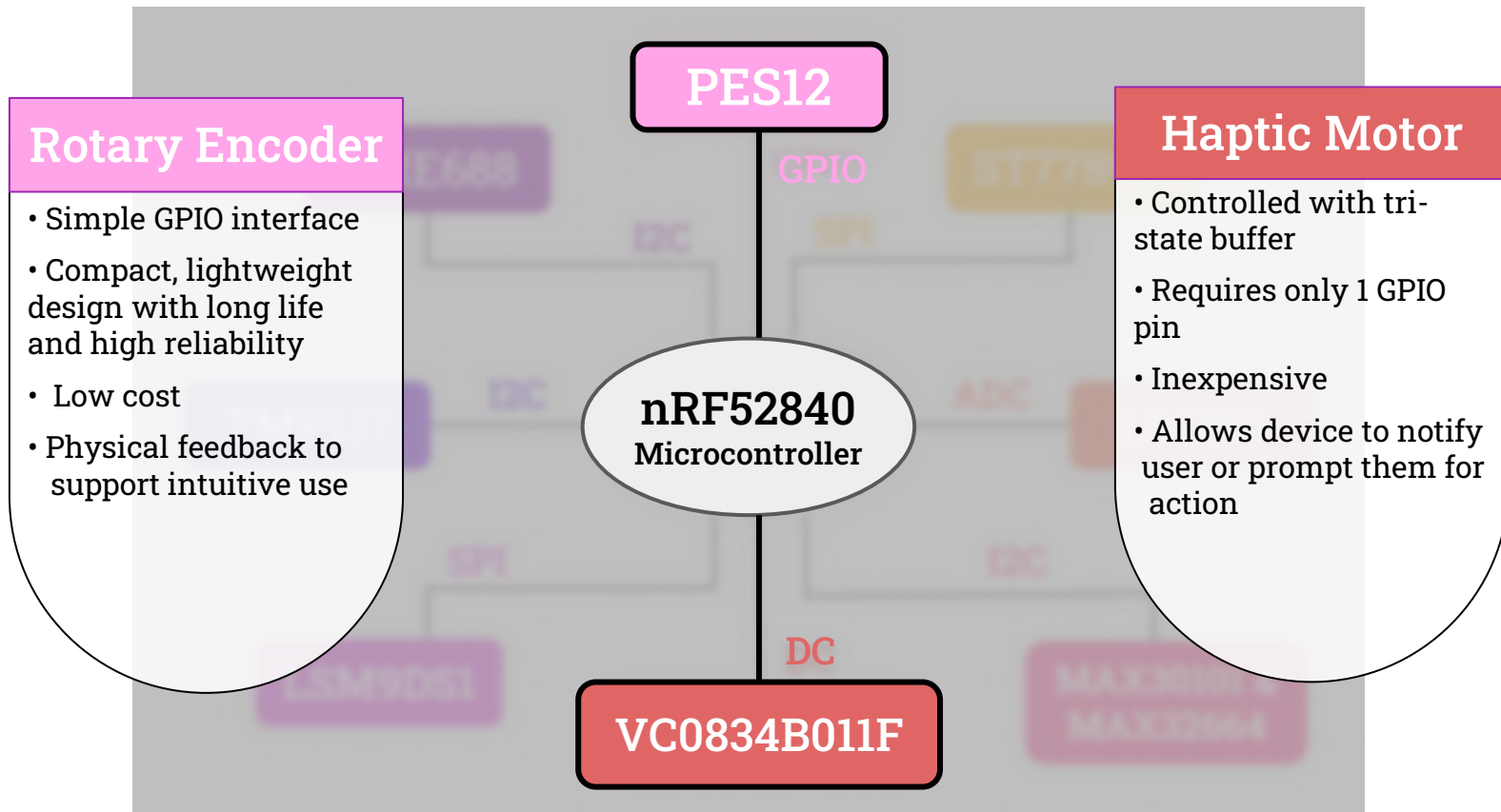
nRF52840
Microcontroller

ST7789V

SPI



UI Components



Progress So Far

PCB Design

Selected and acquired all necessary components, almost done with schematic.

Device Drivers

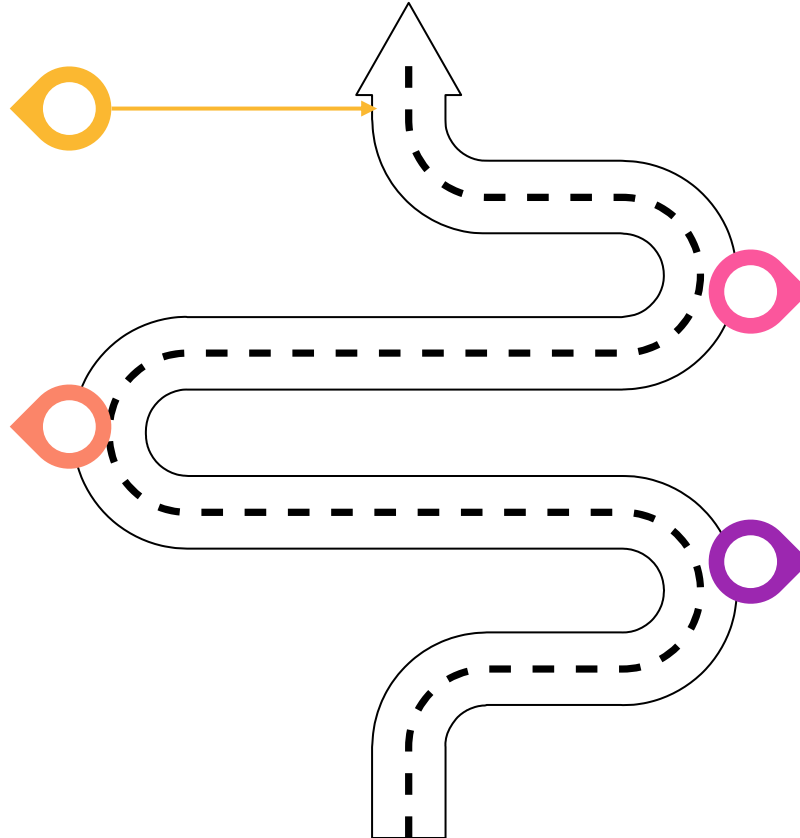
Wrote driver code to interface with all devices

System Test

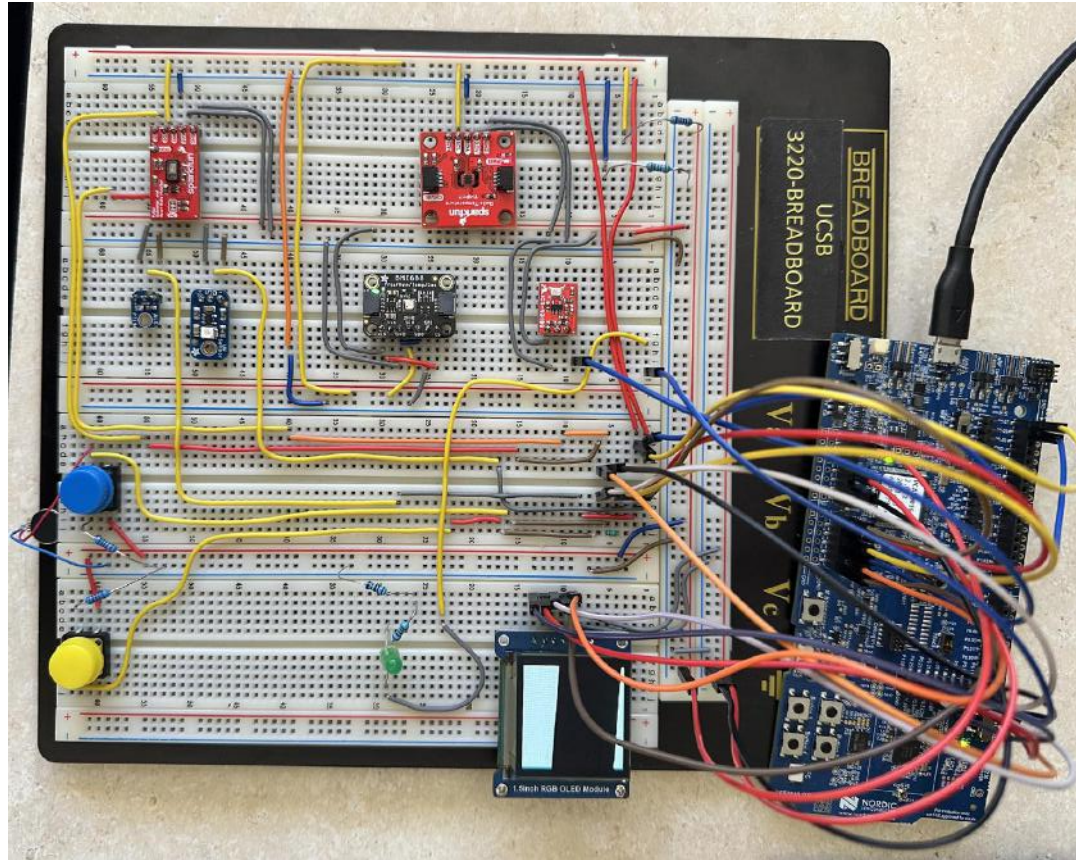
Built circuit to confirm functionality of all components

Components

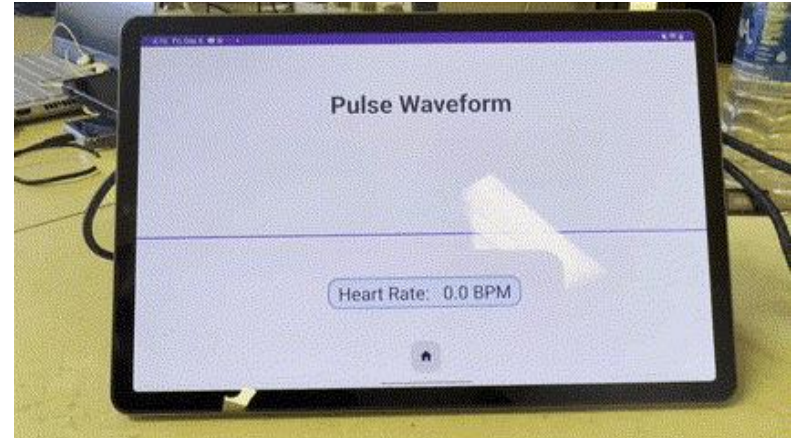
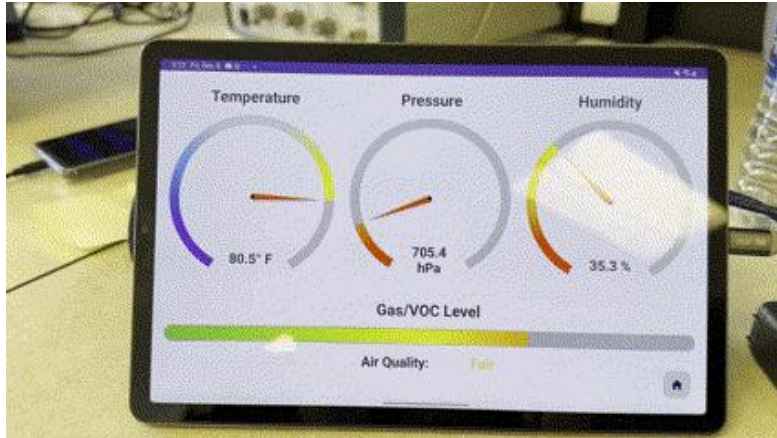
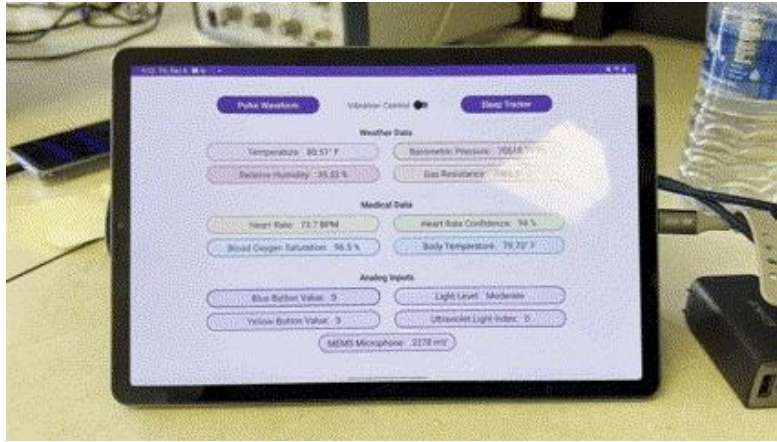
Selected and acquired all required components



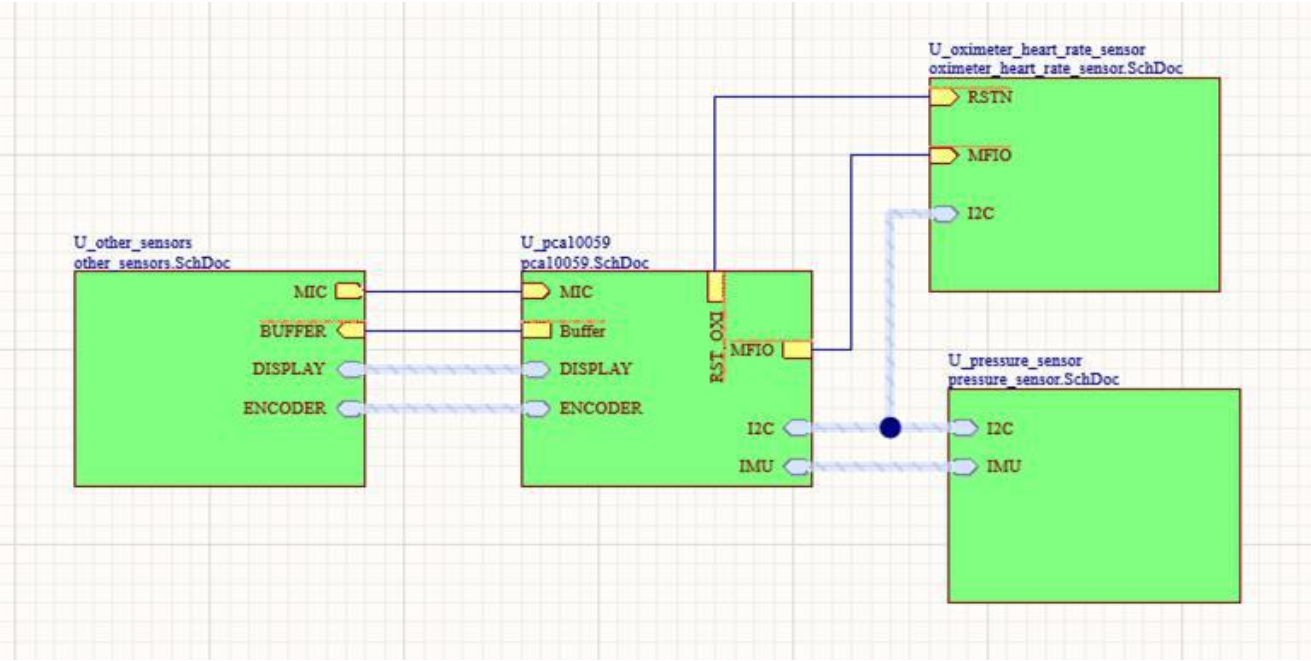
Prototype Circuit



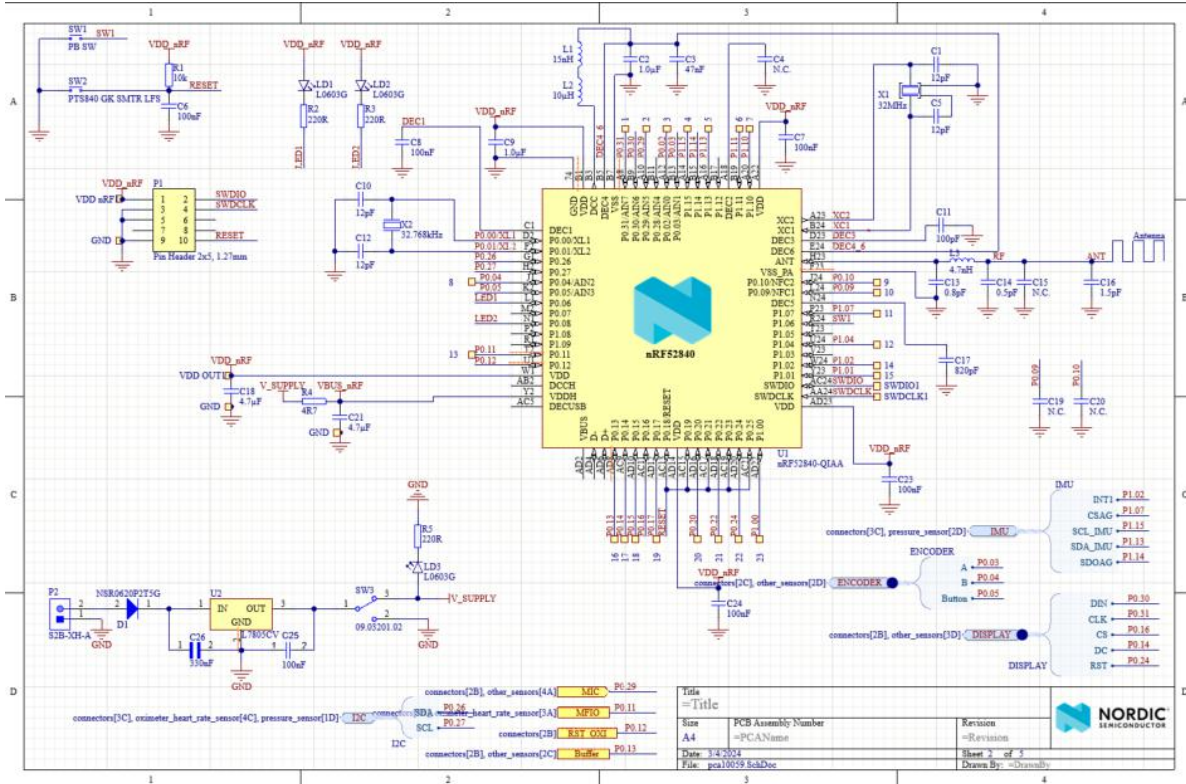
Current Circuit and App Demonstration



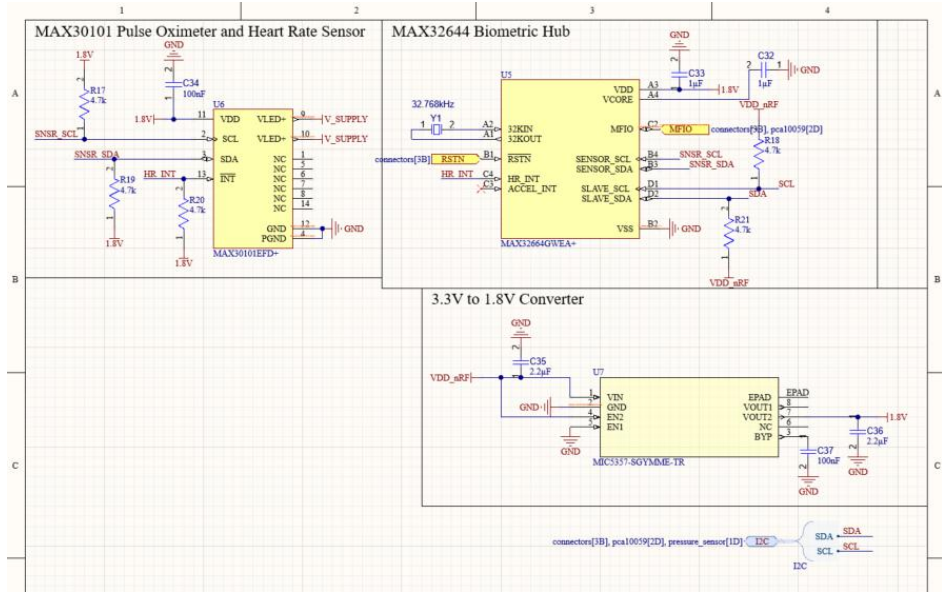
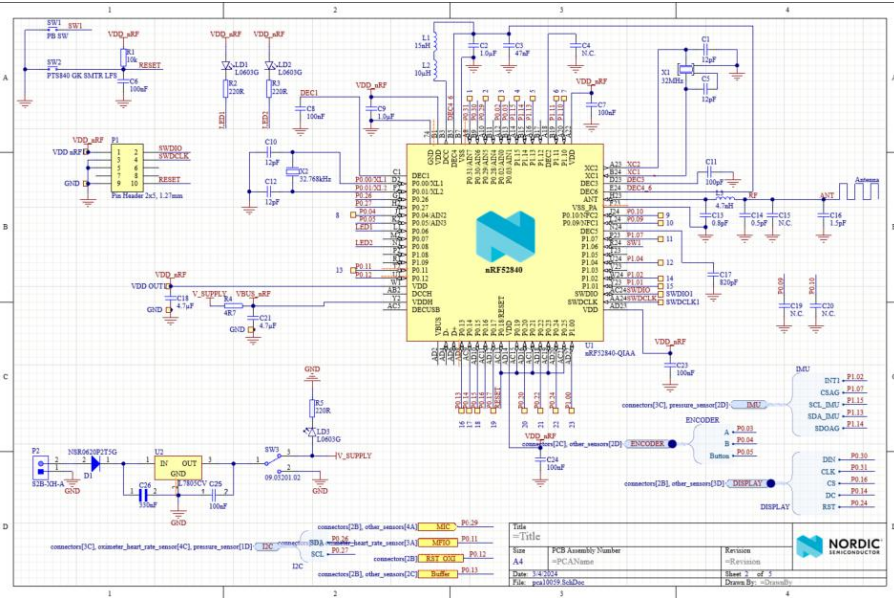
PCB Progress



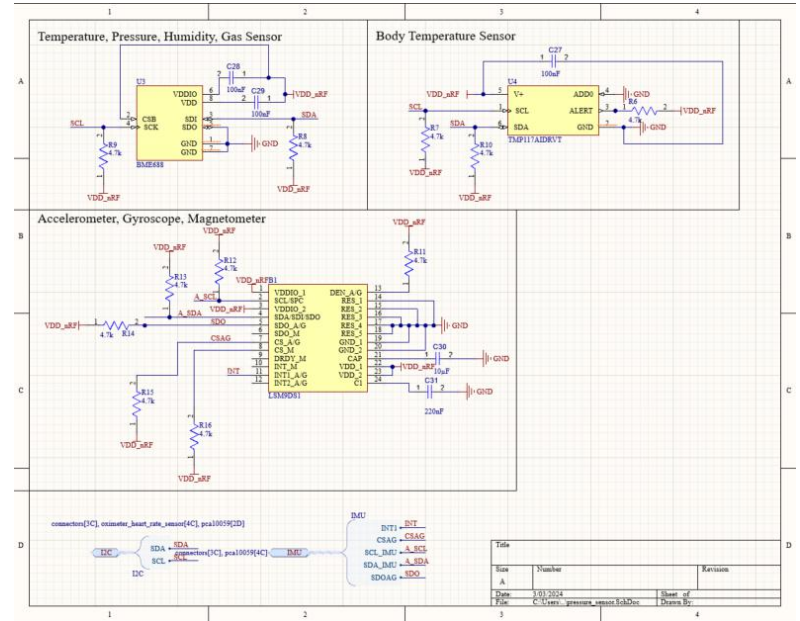
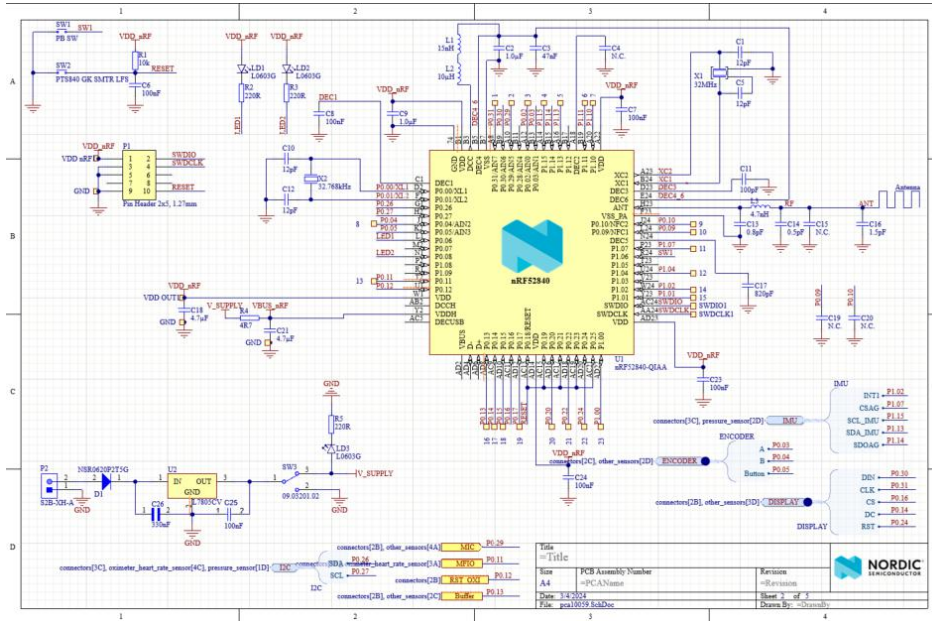
PCB Progress



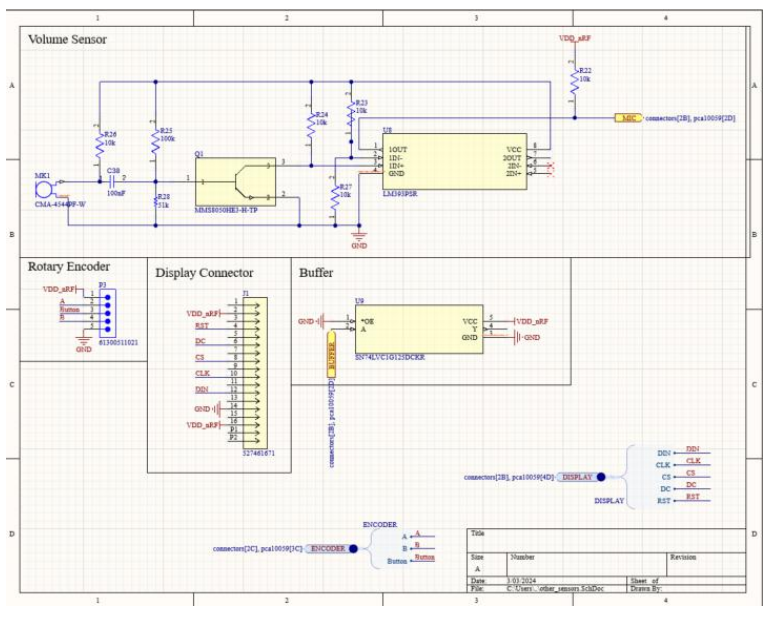
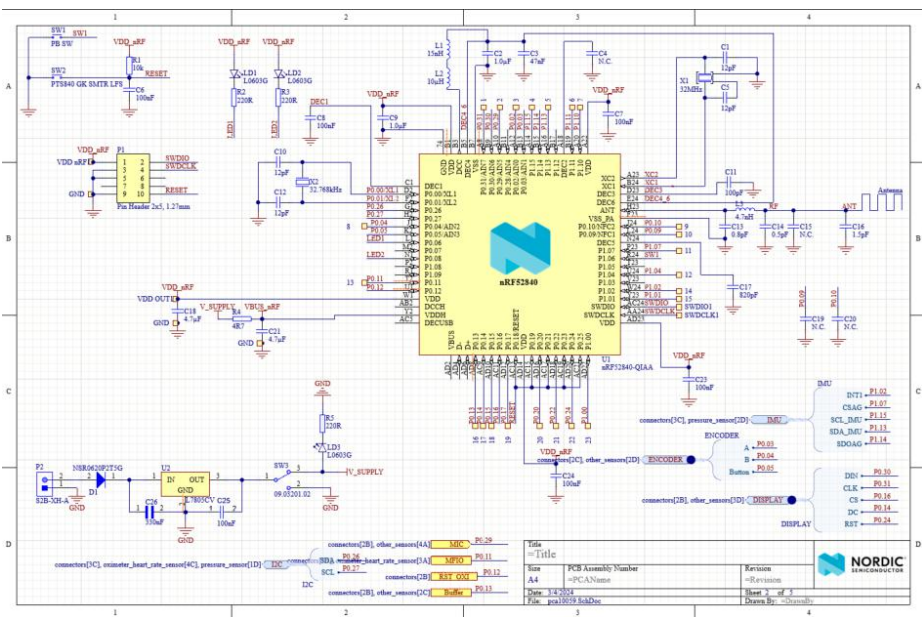
PCB Progress



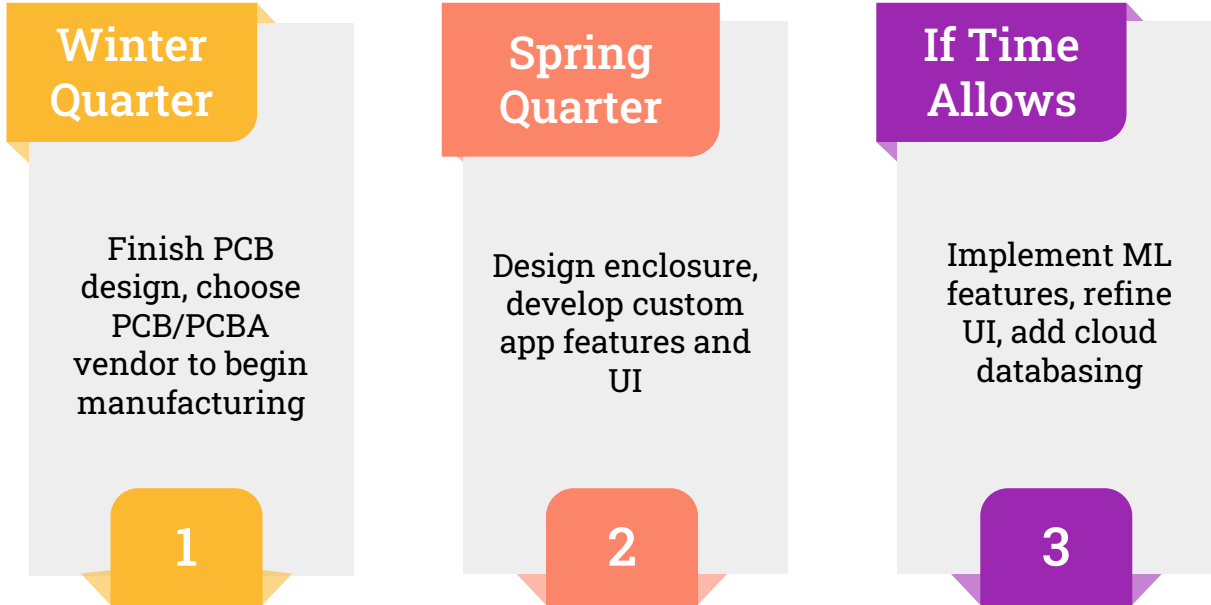
PCB Progress



PCB Progress



Timeline



Winter Quarter

Finish PCB design, choose PCB/PCBA vendor to begin manufacturing

1

Spring Quarter

Design enclosure, develop custom app features and UI

2

If Time Allows

Implement ML features, refine UI, add cloud databasing

3

Risk Analysis

PCB Design

Our intended design is small in size

Data Analysis

We may face difficulties in processing and extracting meaningful conclusions from our collected data



Enclosure Design

No team members have experience in this area

Battery Life

Excessive power consumption and poor resource management could drain the battery

Thank You!

Special thanks to: Our sponsor IFT, and to
Dr. Yoga and Brian Li for the guidance