BabyGuard

Wearable & Rich Featured Baby Monitoring and Safety System

Oct 23rd , 2018

Department of Electrical and Computer Engineering

Advisor: Professor Tessier

Group Members

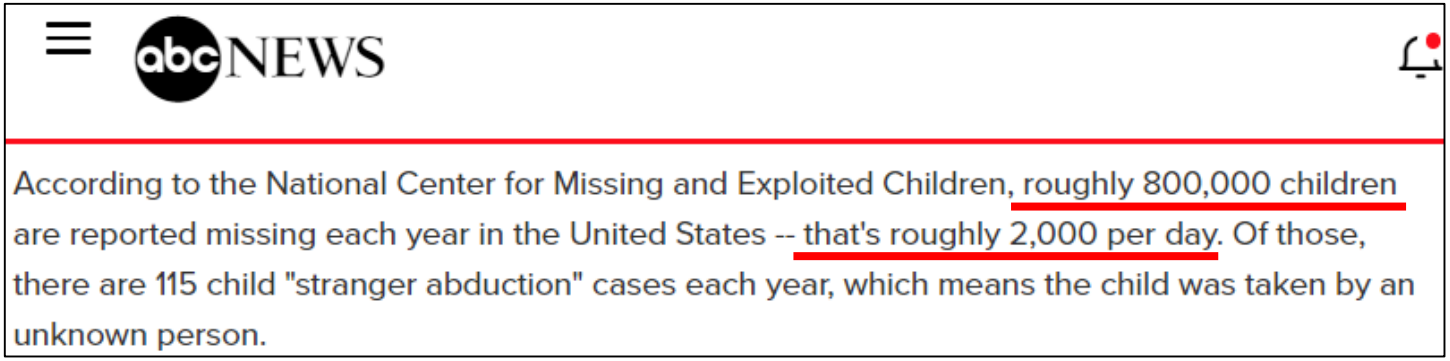
Advisor
Prof. Tessier

Kiran

Yun Shi

What is the Problem?

- Large amount of missing children without instant alert



https://abcnews.go.com/US/missing-children-america-unsolved-cases/story?id=19126967

- Lack of tools for timely detecting the body temperature of a baby
- Current products in the market do not have multi-functional features

Current Solutions and Constraints

- Product A- Wireless Baby Monitor (Vvcare-851)
  - Monitoring ambient temperature / Bidirectional voice and video interaction
  - *Only works with fixed camera location*

https://www.banggood.com/Vvcare-851-3_5-Inch-2_4GHz-Wireless-Baby-Monitor-TFT-LCD-Video-Night-Vision-2-way-Audio-Infant-Baby-p-1256151.html?rmmds=search&cur_warehouse=CN

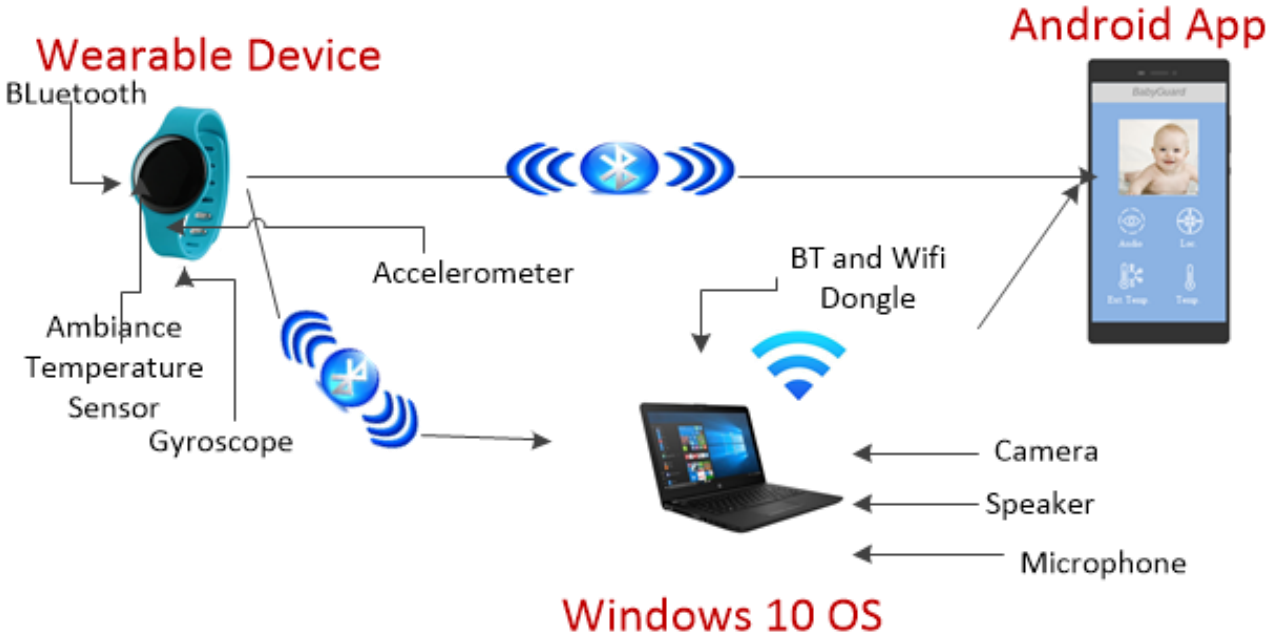
- Product B- Mini Smart Finder (Digoo DG-KF30)
  - Wireless locator for kids
  - *Limited features without interaction*
  - *Too small to be carried by baby and may lead to suffocation*

https://www.banggood.com/Digoo-DG-KF30-Mini-Smart-Finder-Wireless-Bluetooth-Alarm-Anti-Lost-Locator-Kid-Key-Phone-Tracker-p-1241224.html?rmmds=search&cur_warehouse=CN

	Product A	Product B	BabyGuard
Body Temp.	X		X
Camera	X		X
Distance alarm		X	X
Wearable		X	X
Cost	US$74.33	US$ 4.71	To Be Confirmed

What is BabyGuard?

- Low cost array of wearable sensors collects a baby's body temperature
- Provides real-time feedback and tracks long term physical movement and temperature data
- Uses a home-mounted server to provide interaction between parents and a baby



System Requirements

Wearable Device

- Mounted with sensors and connects to Android app or Home Server via BT
- Real-time capture for temperature, acceleration and orientations sensor data
- Exposes SDK and ports for programming and development

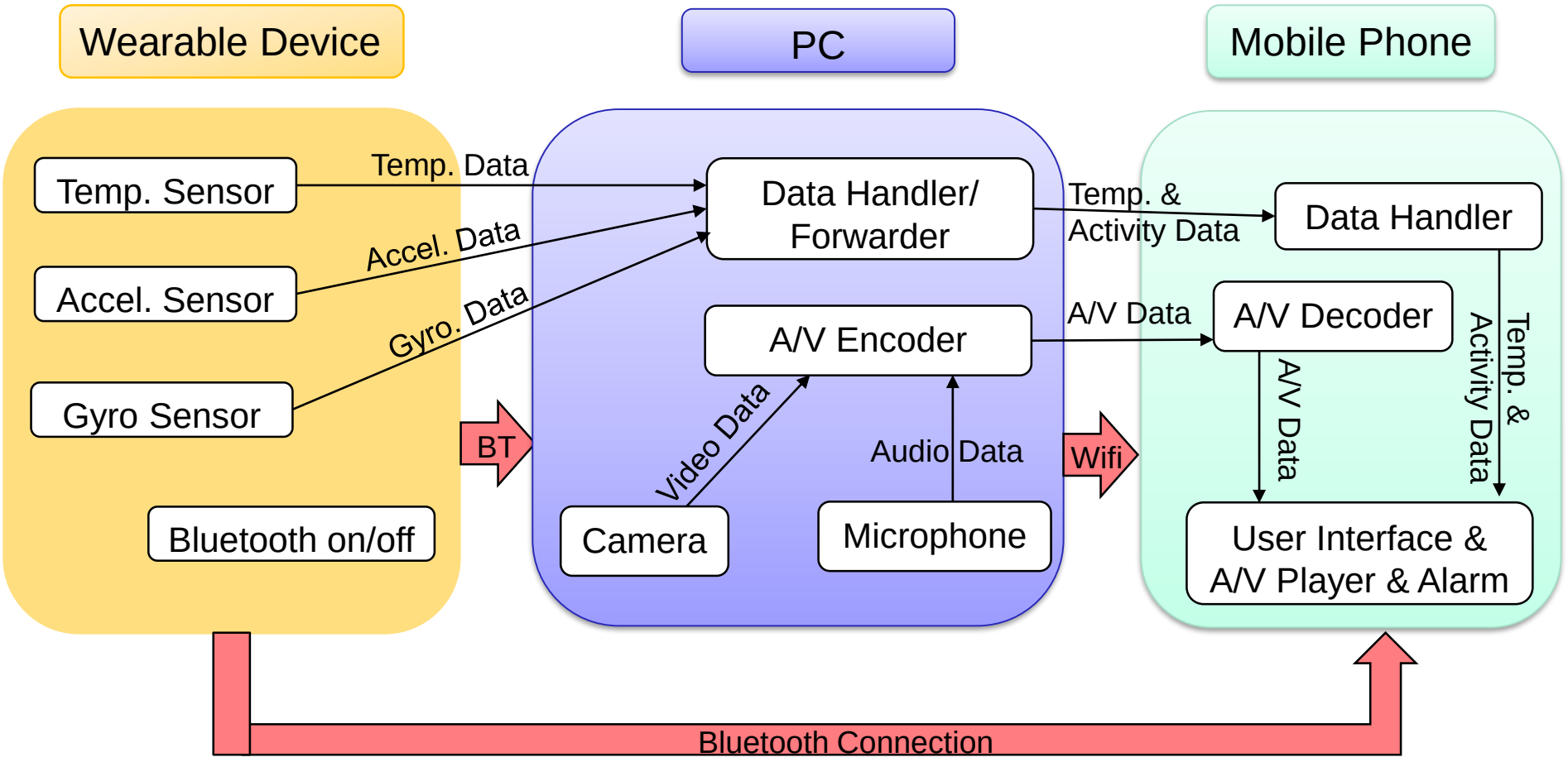
PC

- Connects with wearable device to download sensor data
- Mounted with camera, speaker, LCD and microphone for interaction

Android App

- User interface to monitor and control wearable device
- Interacts with Wearable Device/PC to send/receive data from various sensors

Block Diagram



Solution Design – PC

Detailed functionality of home server

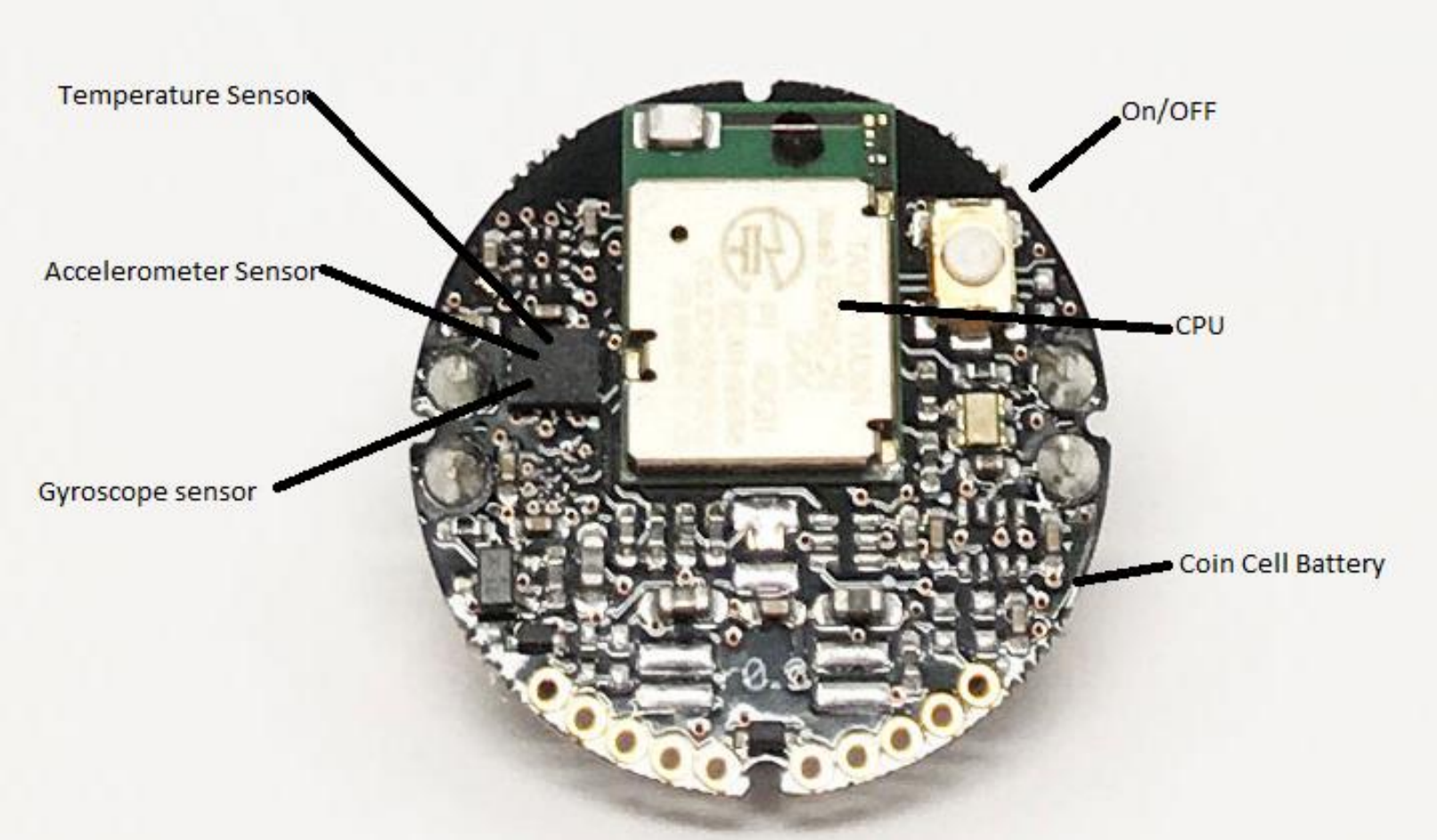
- Installed inside baby room and connects to wearable device via Bluetooth and to the mobile phone via WIFI.
- Server sends video/audio of baby to parent's mobile phone through WIFI/Cloud
- Wearable device sends temperature of baby's body temperature through Bluetooth to board

Solution Design - Wearable

Detailed functionality of wearable device.

- Small and compact device worn on wrist or ankle.
- Connect via Bluetooth to the mobile phone or home server and transmit temperature data of the body temperature periodically (1s) to the mobile app or home server.
- Alarm if Bluetooth connection broken with mobile phone and home server not reachable by **flashing light/sound*.

Solution Design - Wearable

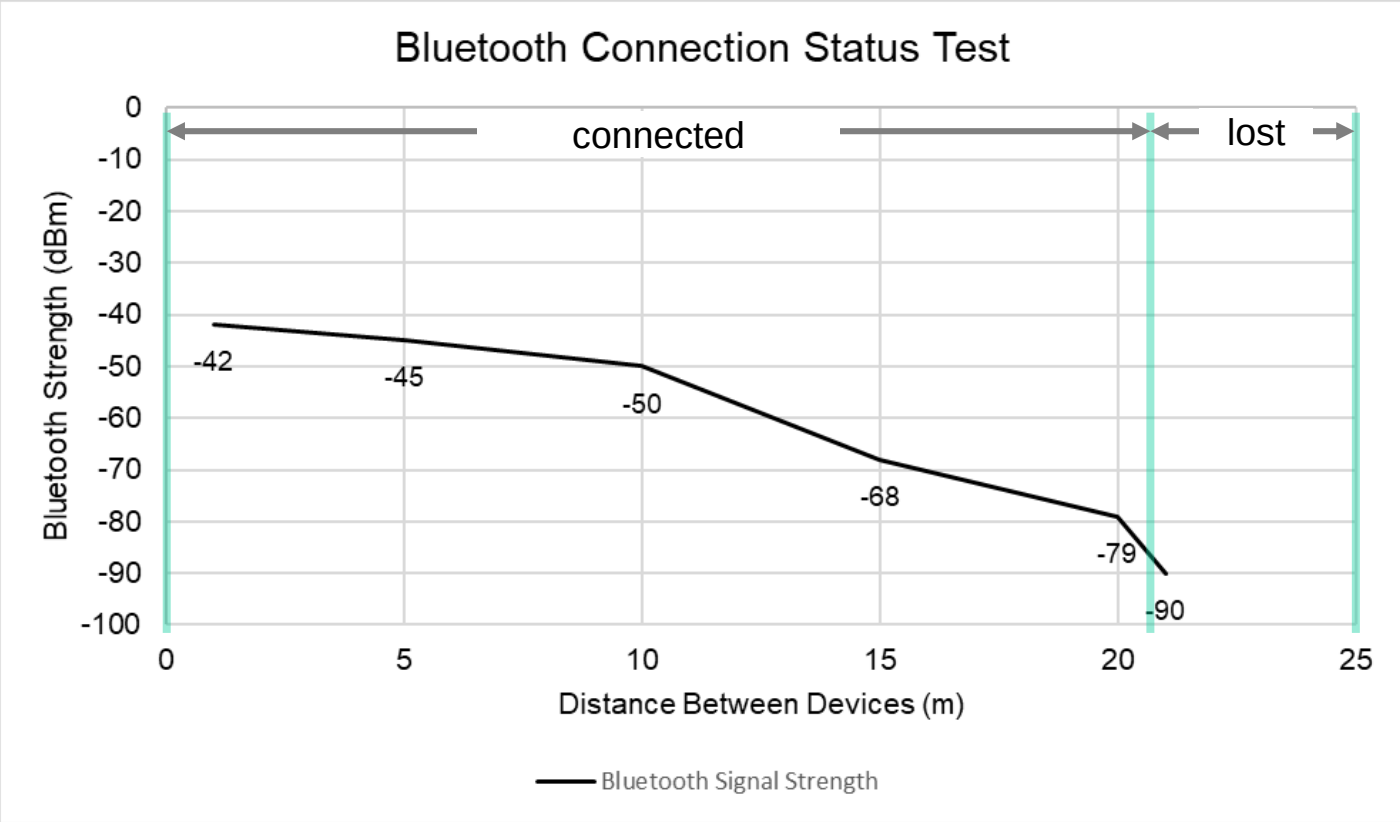


Hardware Specification Table

Wearable Device*	Dimension	– Diameter: 0.94in / 24mm
		– H: 0.24in / 6mm
	Weight	– 5.6gms
	Connectivity	– Bluetooth LE 4.0 – 2.4Ghz
		– Up to 100ft of range – typical 10m
		– Stream sensor Data from 1 Hz to 100 Hz
		– Log sensor Data from 1 Hz to 400 Hz
	Temperature	– -40…85° C Range
	Battery	– 200 – 220mAH CR2032 Coin cell battery
Home server	Windows PC	Windows 10 OS
Mobile Device	Android	Android 4 and above

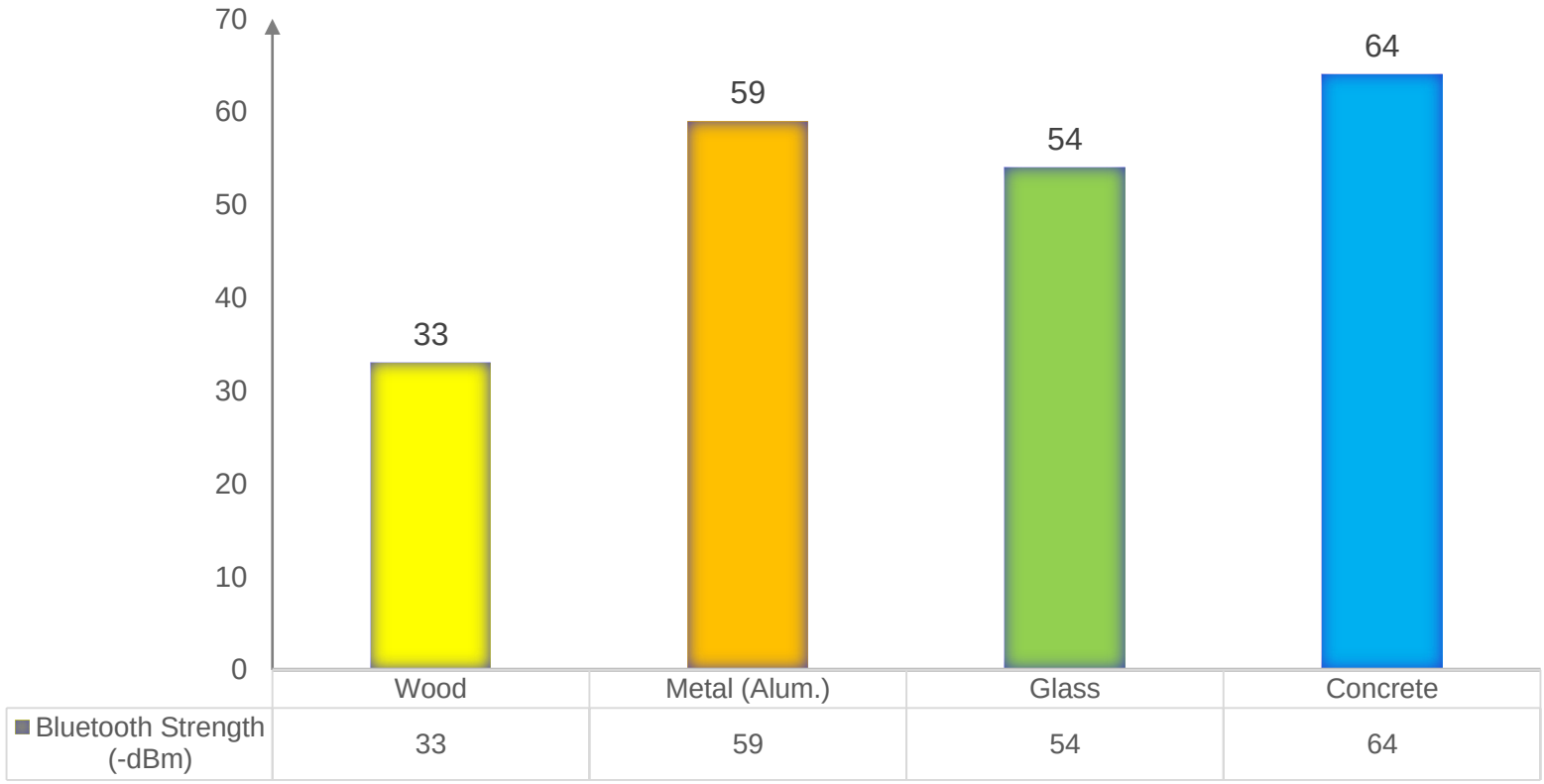
*Specification are from product description chart of Metawear C device

Bluetooth Signal Strength Test (W/O Objection)

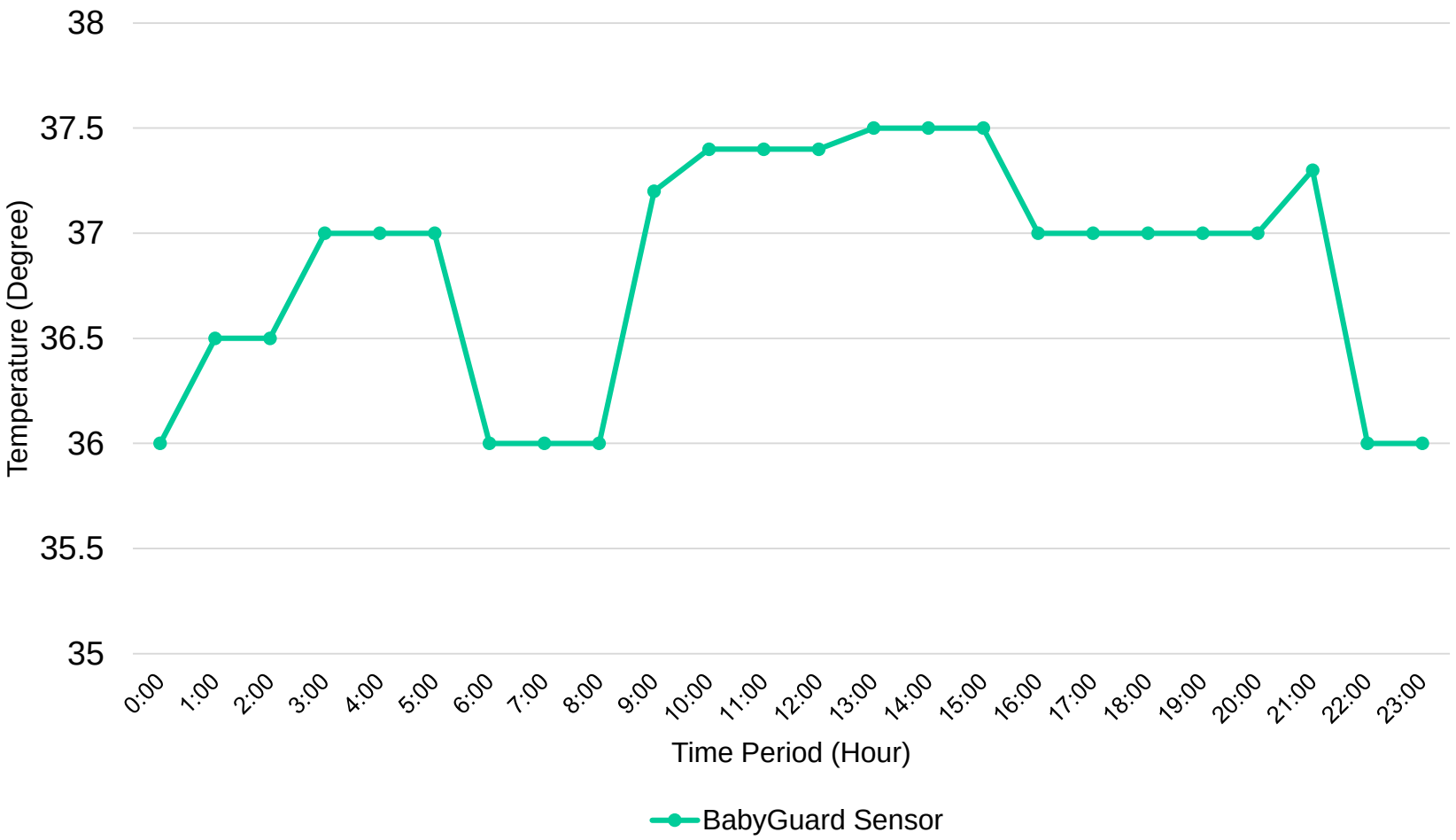


*dBm is the power ratio in decibels of the radio power per one milliWatt. A signal of -60dBm is nearly perfect, and -112dBm is call-dropping bad.

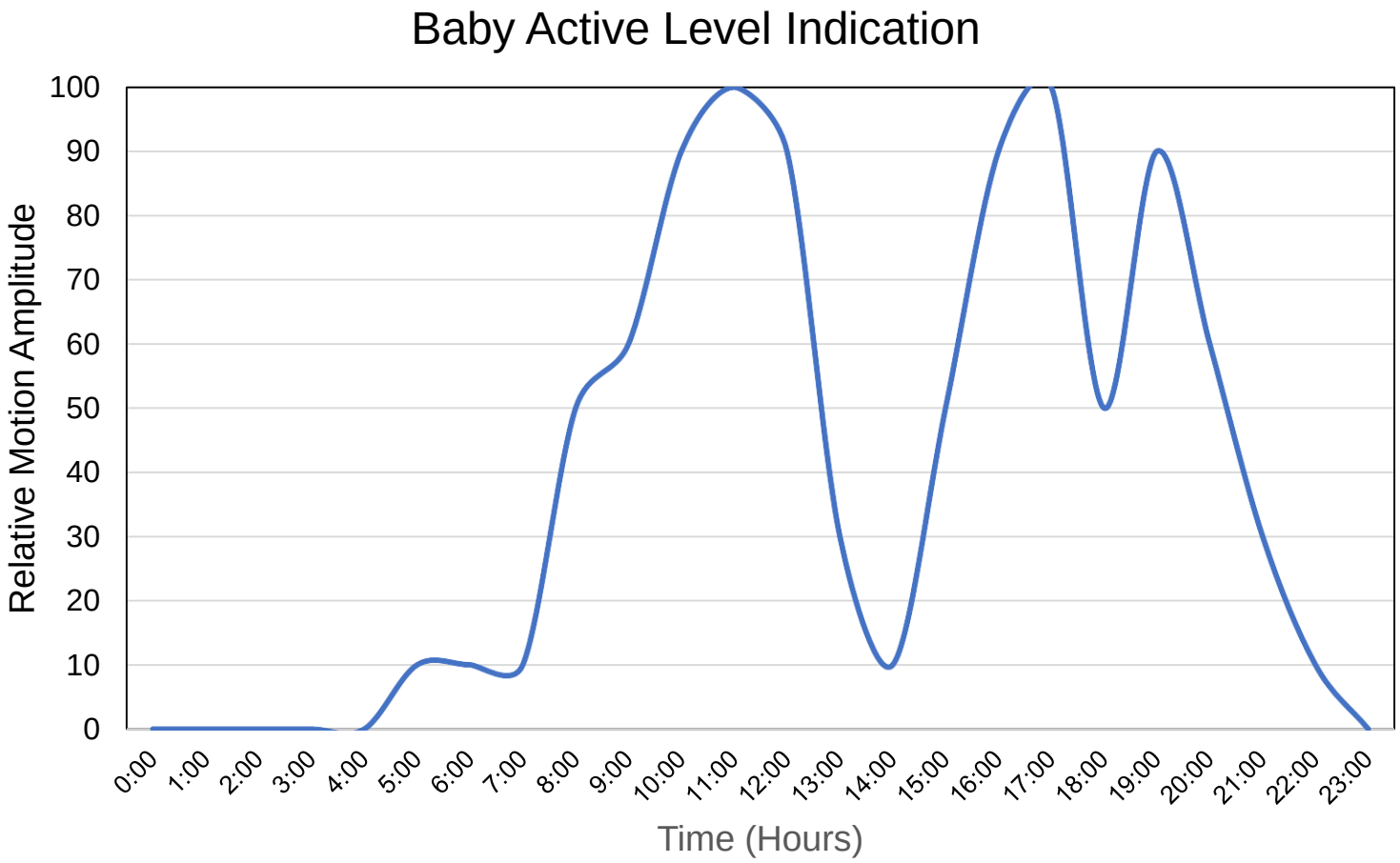
Bluetooth Signal Strength Test (With Obstructions)



IoT Device Data Accuracy Test - Temperature



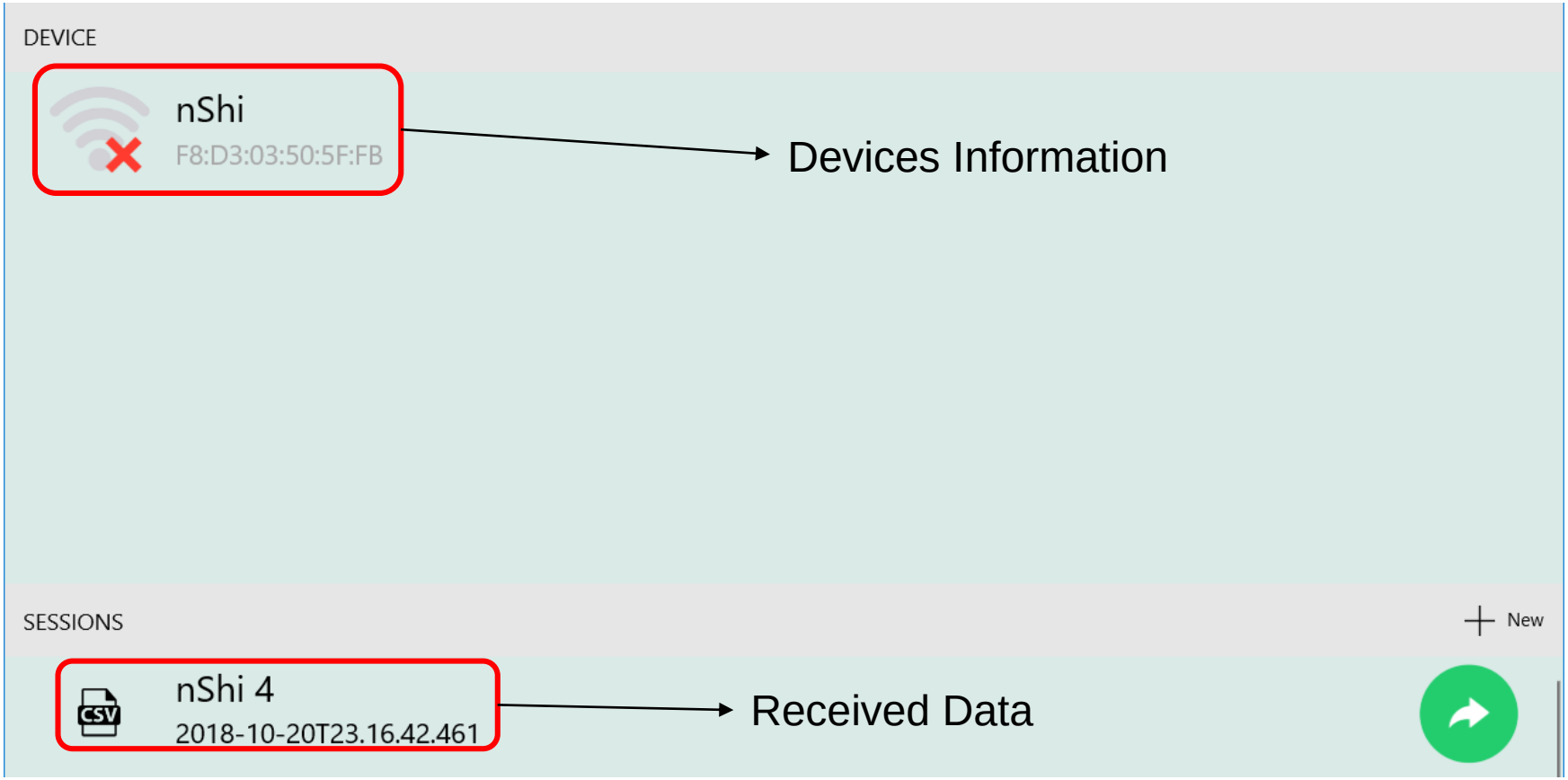
IoT Device Data Accuracy Test - Activity



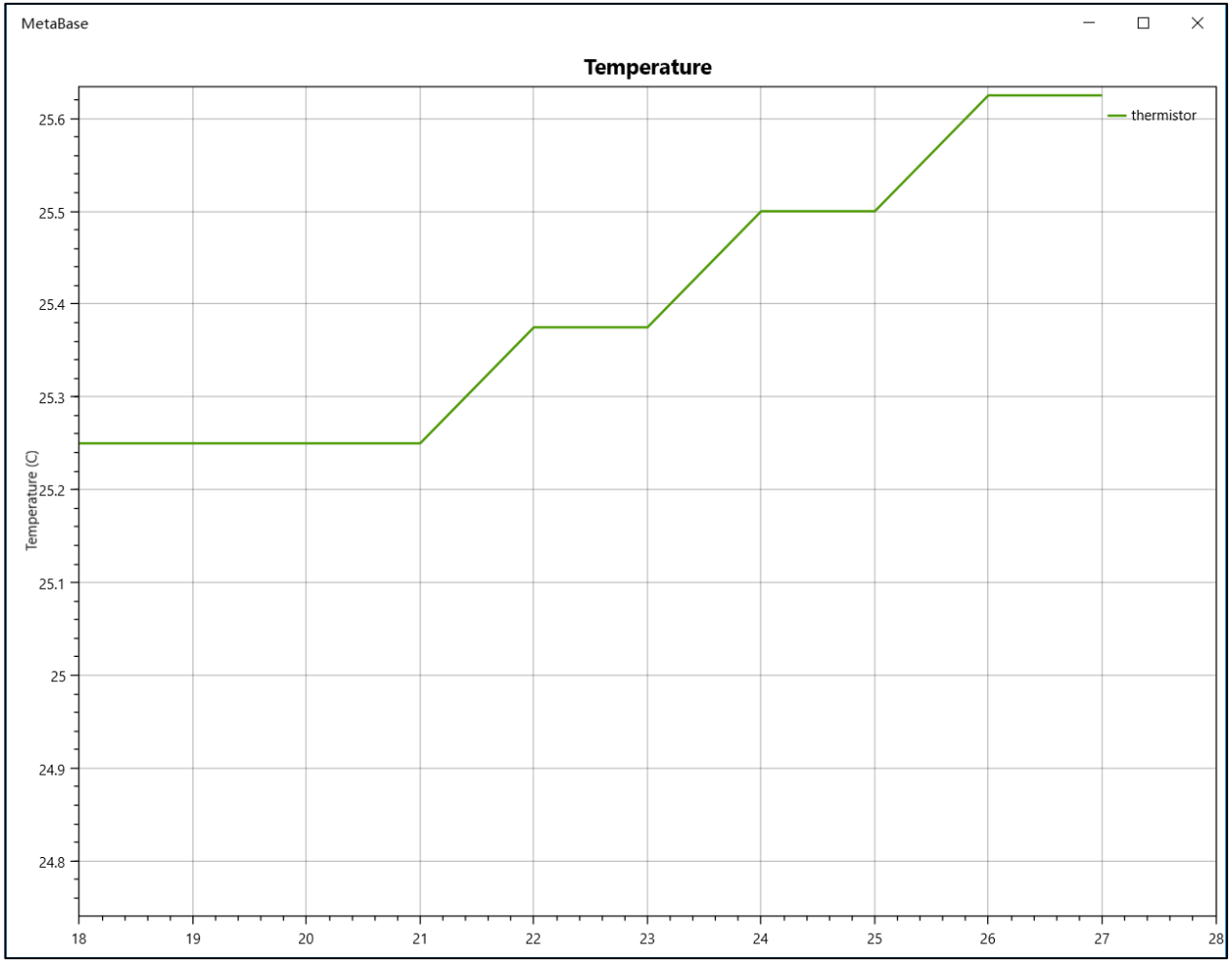
IoT Device Battery life Testing

Streaming	Battery Lifetime	Remark
Continues	7days	Realtime streaming to App/PC
Intermetant	10days	Connected to device but intermittent data streaming
Idle	30days	Connected to App/PC but no streaming

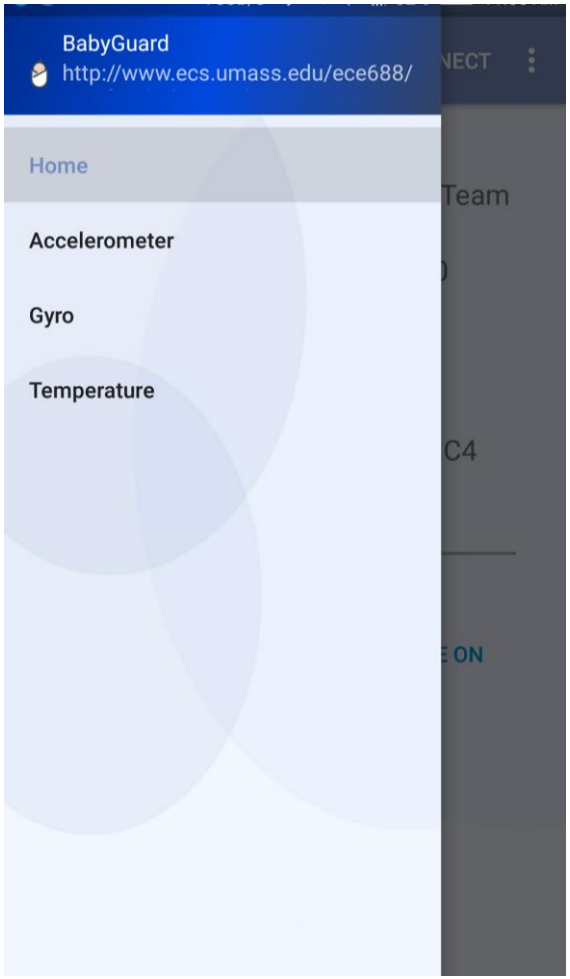
Solution Design – PC Interface



Solution Design – PC Interface

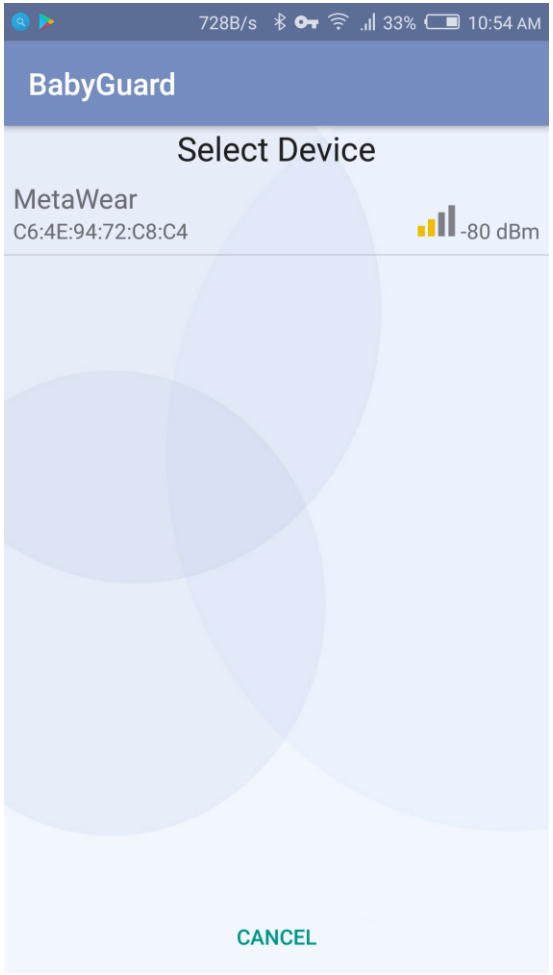


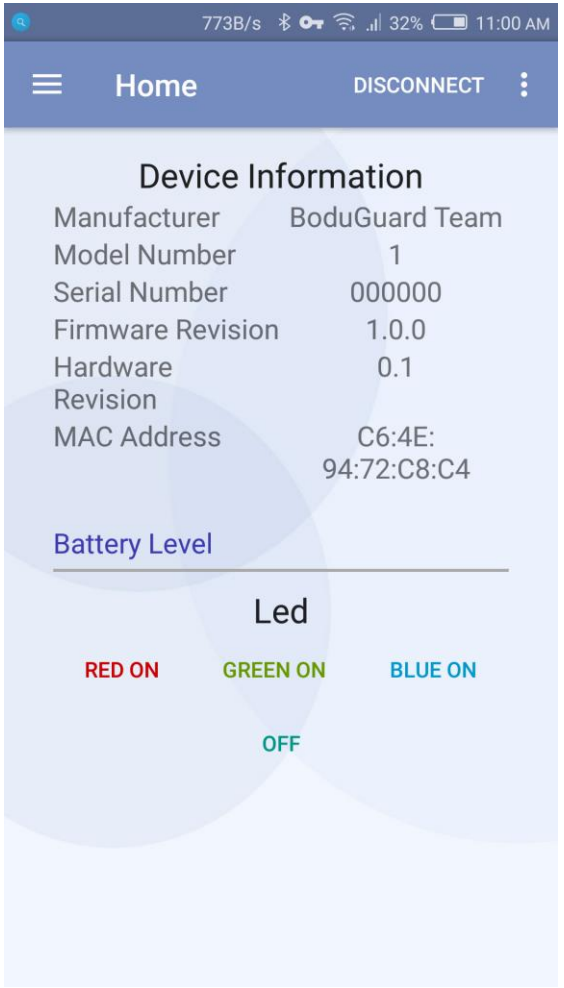
Solution Design - Android APP



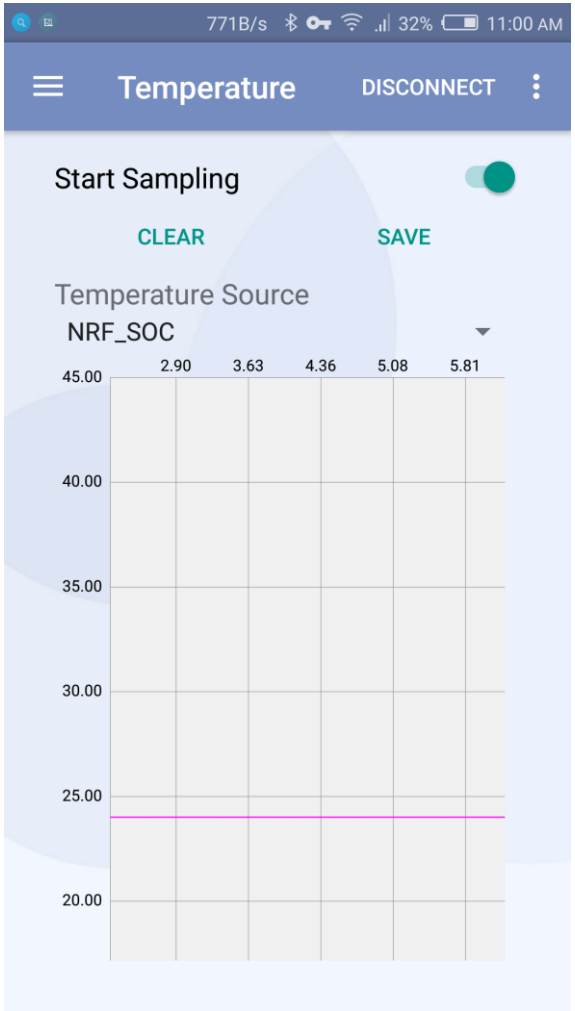
- Android application designed in Android Studio
- Retrieves real-time data from wearable
- Contains 3 pages
  - Accelerometer
  - Gyro
  - Temperature

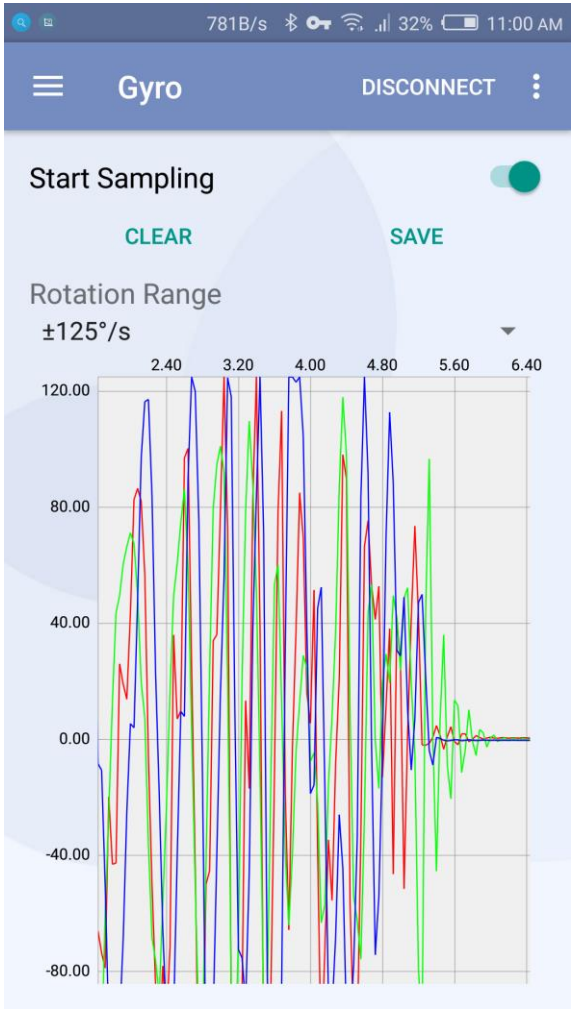
Solution Design - Android APP





Solution Design - Android APP





Proposed CDR Deliverables

- Wearable device connects main server and send temperature data periodically. 
- Security implementation for data transmitted between wearable & phone.
- Home server/base station send monitoring image to cloud server.

Distribution of Responsibilities

Kiran

- Wearable hardware design
- Wearable device development, interfacing and programing
- Determine technical feasibility of the solution.

Yun Shi (Jackie)

- Establish connection detection among wearable and phone
- PC sever interface
- Create mobile app that displays the monitoring status
- Implement a website to illustrate BabyGuard

Thank you

Questions?