Wander Watch

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Motivation

- Provide an affordable and reasonably sized device for Alzheimer's patients.
- There are many tracking devices available on the market, but most are too expensive
- Some do not have desirable features

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Goals and Objectives

- To create a product for patients with Alzheimer's that will provide tracking technology in combination with functionality

- The device must be:
  - Wearable
  - Minimal in size
  - Functional for the wearer
  - Include a phone app to monitor and track the patient

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Specifications

Component	Design Specifications
Screen Size	128 x 64 pixels
Weight	≤ 75 grams
Cost	≤ $75 (final product)
Battery Life	1 day
GPS accuracy	≤ 3 meters
Alert Message	≤ 10 seconds after leaving home

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Redesign

Problems	Solutions
• How do we get the data gathered by the GPS to the caretaker's mobile device?	• Replace Wi-Fi with GSM
• Redunant components	• Dual purpose components

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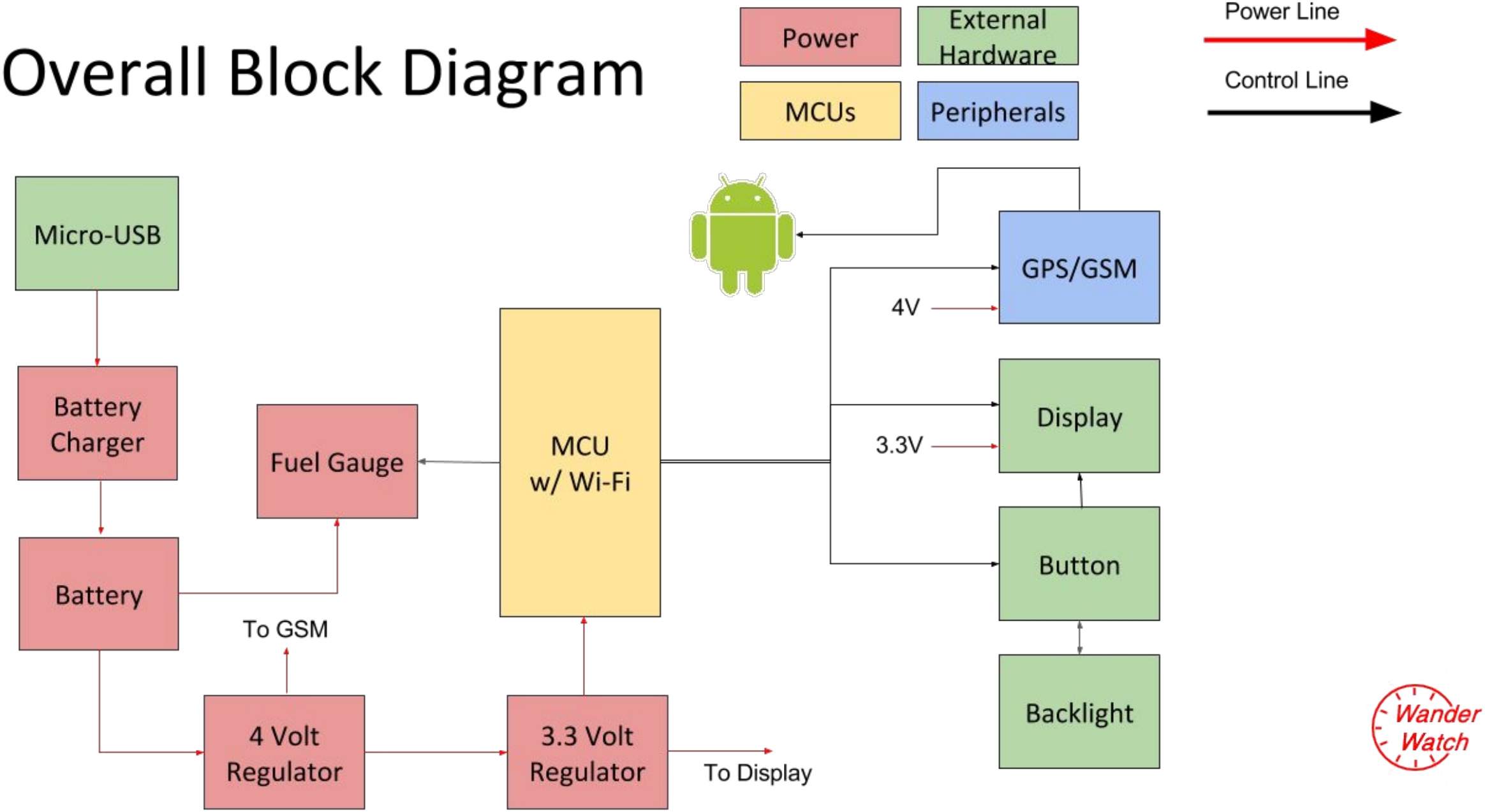
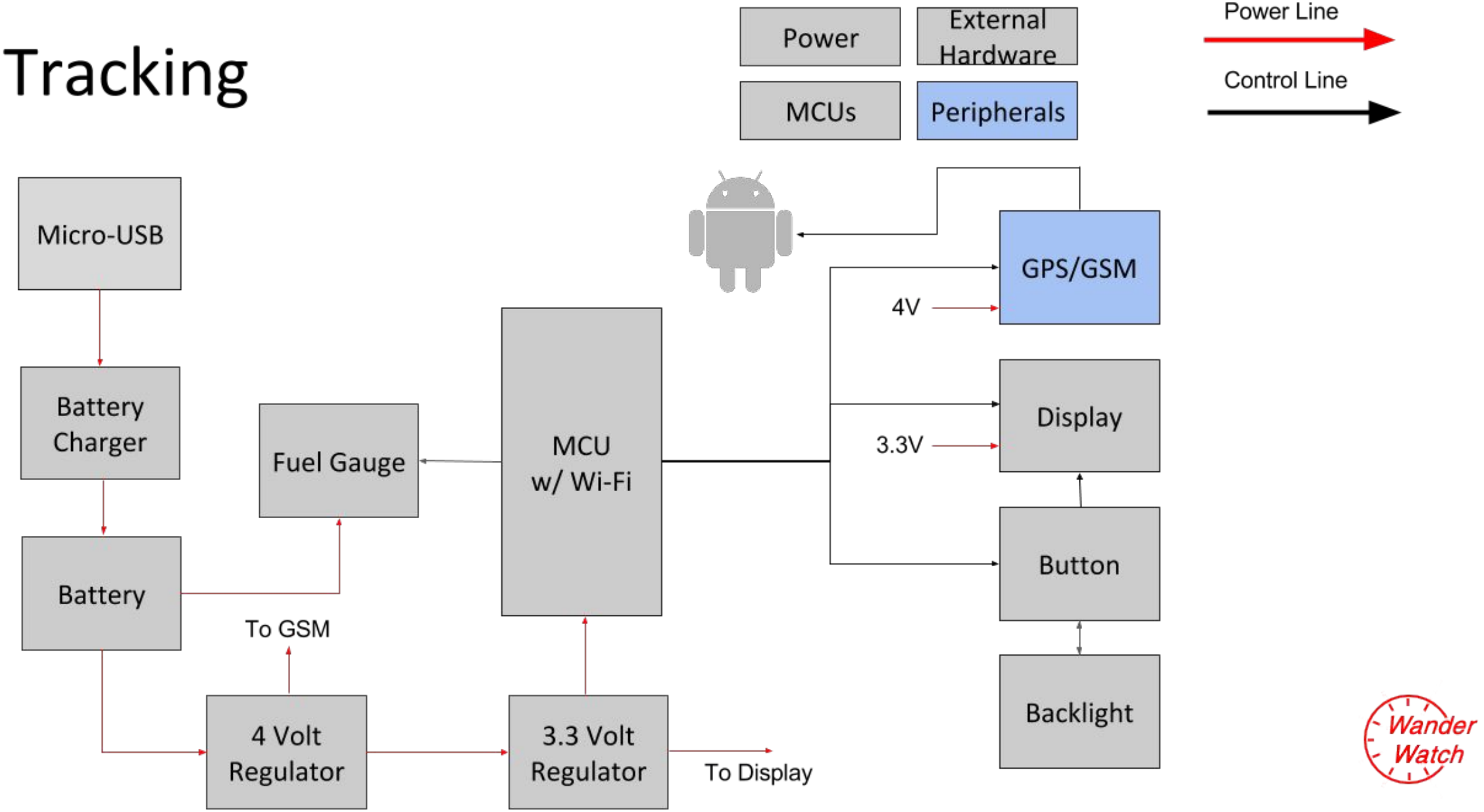
Overall Block Diagram



Tracking


Power
External Hardware
MCUs
Peripherals
Power Line
Control Line
Micro-USB
Battery Charger
Battery
Fuel Gauge
MCU w/ Wi-Fi
GPS/GSM
4V
Display
3.3V
Button
Backlight
To GSM
4 Volt Regulator
3.3 Volt Regulator
To Display
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GPS

Purpose:

1) Determine if the patient left their home, using geofencing
2) Provide caretaker with patient’s location

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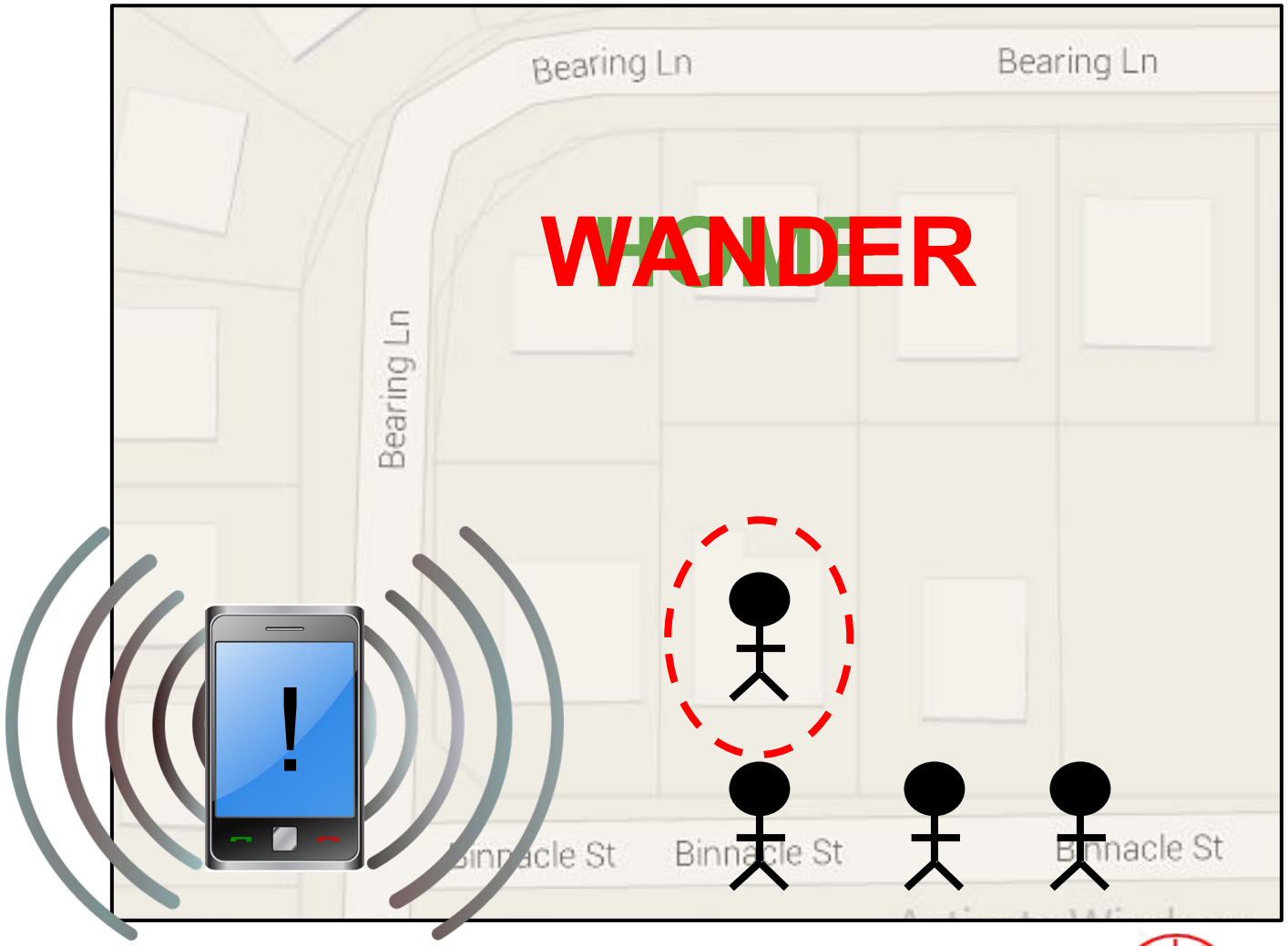
Geofencing

What is it?

A virtual, predefined boundary set up so when a device enters (or exits) the perimeter an alert is sent.

Modes

1) **HOME** - Patient is within the geofence
2) **WANDER** - Patient has left the geofence. Text alert is sent.



Implementation of the Geofence

- Java
- Google Maps Android API v2
- Mark a location of interest using its longitude and latitude
- Add a radius to adjust the proximity for the location
- Specify geofence triggers (entering or exiting)

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GPS Component Comparison

	Original	Current
Key Features	**Venus638FLPx-L**	**SIM808**
Functionality	GPS	GSM/GPS
Cost	$39.95	$29.95
Power Consumption	2.8 - 3.6 V	3.4 - 4.4 V
Update Rate	≤ 20 Hz	≤ 5 Hz
Positional Accuracy	≤ 2.5 m	≤ 2.5 m
Communication	UART	AT Command

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Why GSM?

- Allows for communication on 2G mobile network which is compatible with device chosen
- Device is able to send SMS messages to the caretaker of the patient's whereabouts
- Device is able to be tracked so that the patient can be found

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GSM Comparison

	Original	Current
Features	**Quectel M66**	**SIM808**
Price	Unknown	$29.95
Dimensions	17.7 x 15.8 x 2.3 mm	24 x 24 x 3 mm
Weight	1.3 g	3.2 g
Quad-band	850/900/1800/1900 MHz	850/900/1800/1900 MHz
Connects to SIM	Yes	Yes
GPS Capability	No	Yes

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Implementation of GSM

- Activate account with Ting (T-Mobile)
- Use breakout board for testing
- Use AT Commands to program device
- Verify that is sends a message to caretaker's phone

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Why use a SIM card?

- Needed for authorization on T-Mobile network
- Allows for network to be used on different device if necessary

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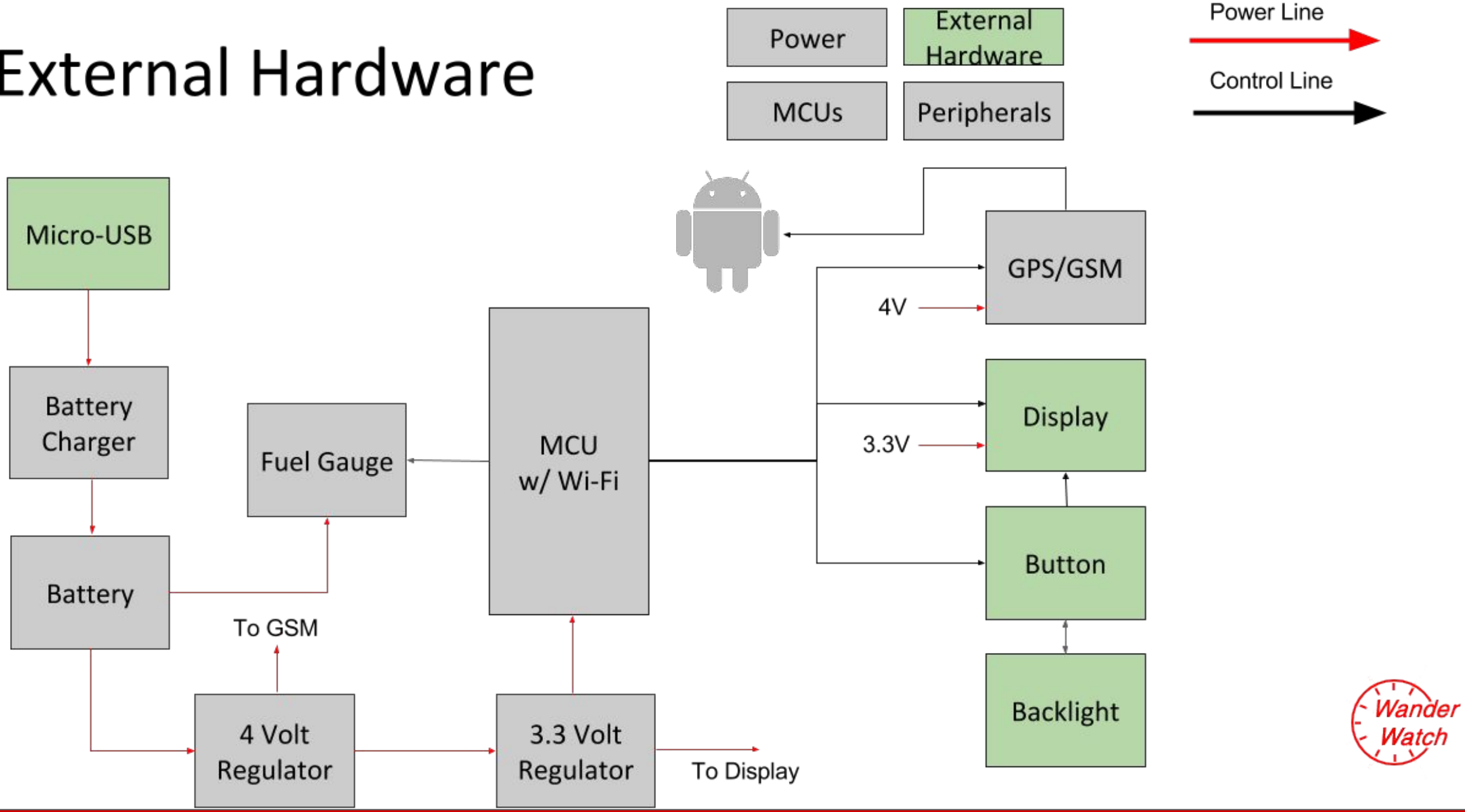
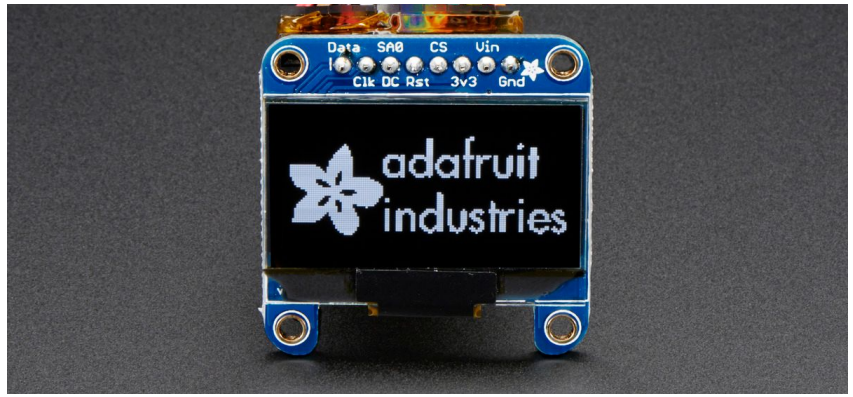
External Hardware



Display

- Using a 1.3” OLED display
- OLED is slim and looks nicer than LCD
- LCD needs a backlight while OLED’s brightness can be controlled
  - Controlled with button on the side of the watch



Vendor	Adafruit
Voltage	3.3V
Size	128 x 64 px

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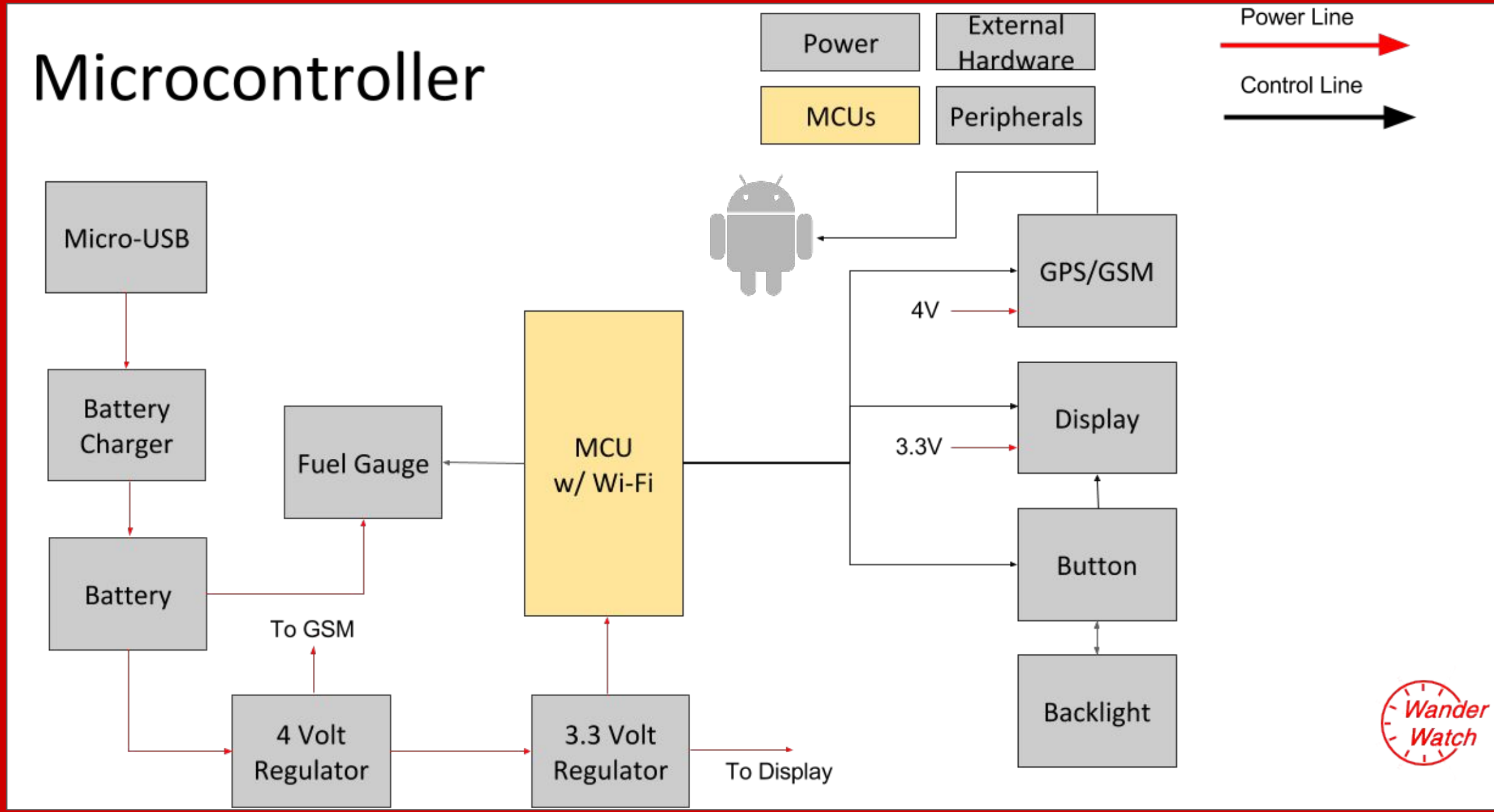
Microcontroller



TI CC3200

Selection Process

- Assists with localization of geofence
- Enough peripherals to communicate with other devices

Manufacturer	Texas Instruments
Part No.	CC3200R1MXRGCR/T
Price	$7.99
Operating Voltage	3.3V
I/O Lines	27 GPIO Lines
Peripherals	1 I2C, 1 SPI, 2 UART
Memory	256KB

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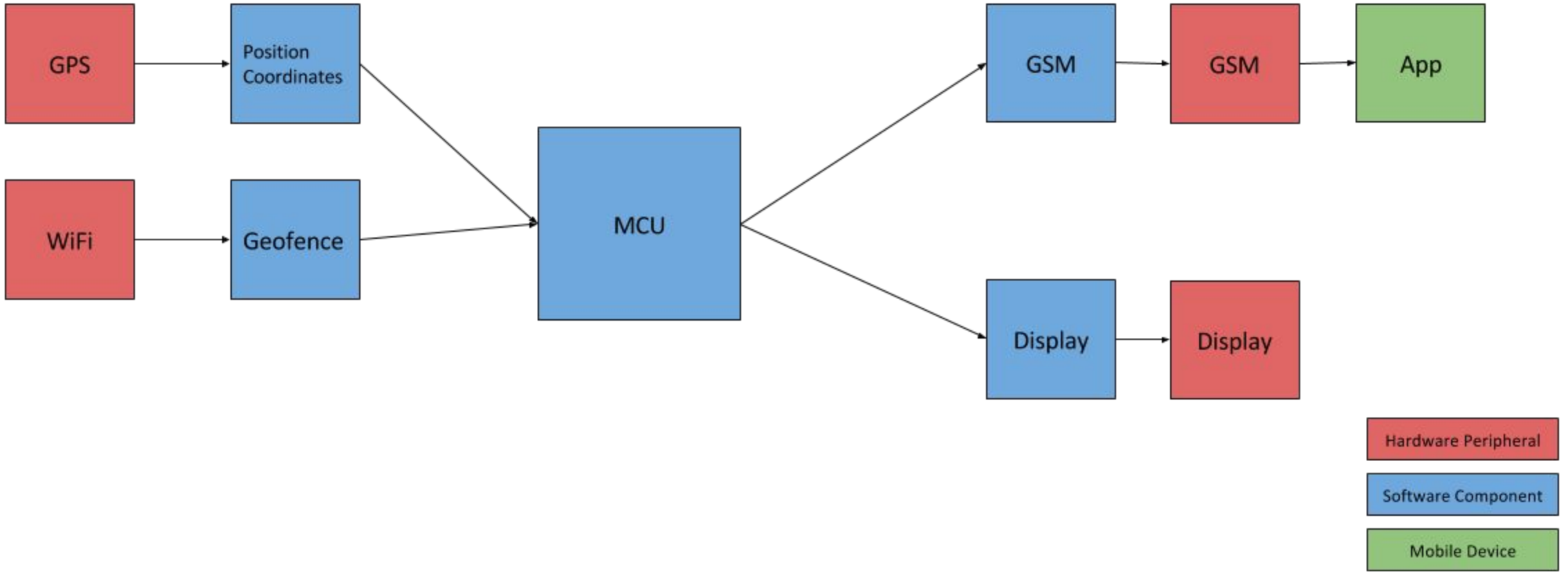
MCU Software



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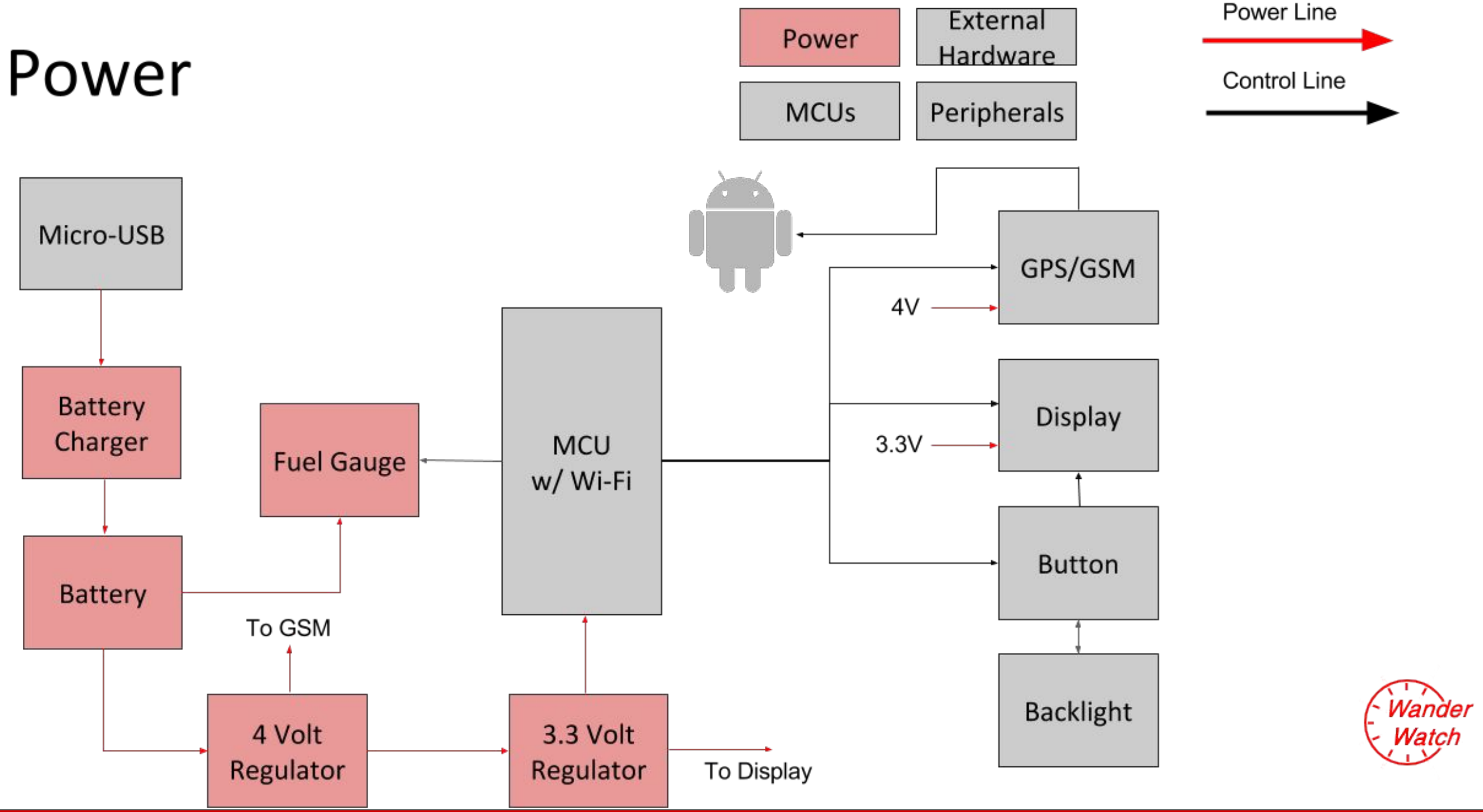
Power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Battery Charger
Battery
Fuel Gauge
MCU w/ Wi-Fi
To GSM
4 Volt Regulator
3.3 Volt Regulator
To Display
4V
3.3V
GPS/GSM
Display
Button
Backlight
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Battery

- Li-Po battery for recharging capabilities
- Small in size relative to overall product specifications

Vendor	SparkFun
Voltage	3.7V
Capacity	2000mAh
Size	54mm x 60mm x 5.8mm

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Battery Charging

- Fully USB Compliant
- Designed for the 3.7V Li-Po battery
- High input voltage
- Customer will be able to use any wall adapter available to them

Manufacturer	Texas Instruments
Input Voltage (max)	10.2V
Charging Voltage	4.2V
Charge Current	0.5A

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Fuel Gauge

- Designed with handheld devices in mind
- Communicates with the MCU to display battery life on screen

Manufacturer	Texas Instruments
Battery Capacity (max)	6000mAh
Communication Interface	I2C

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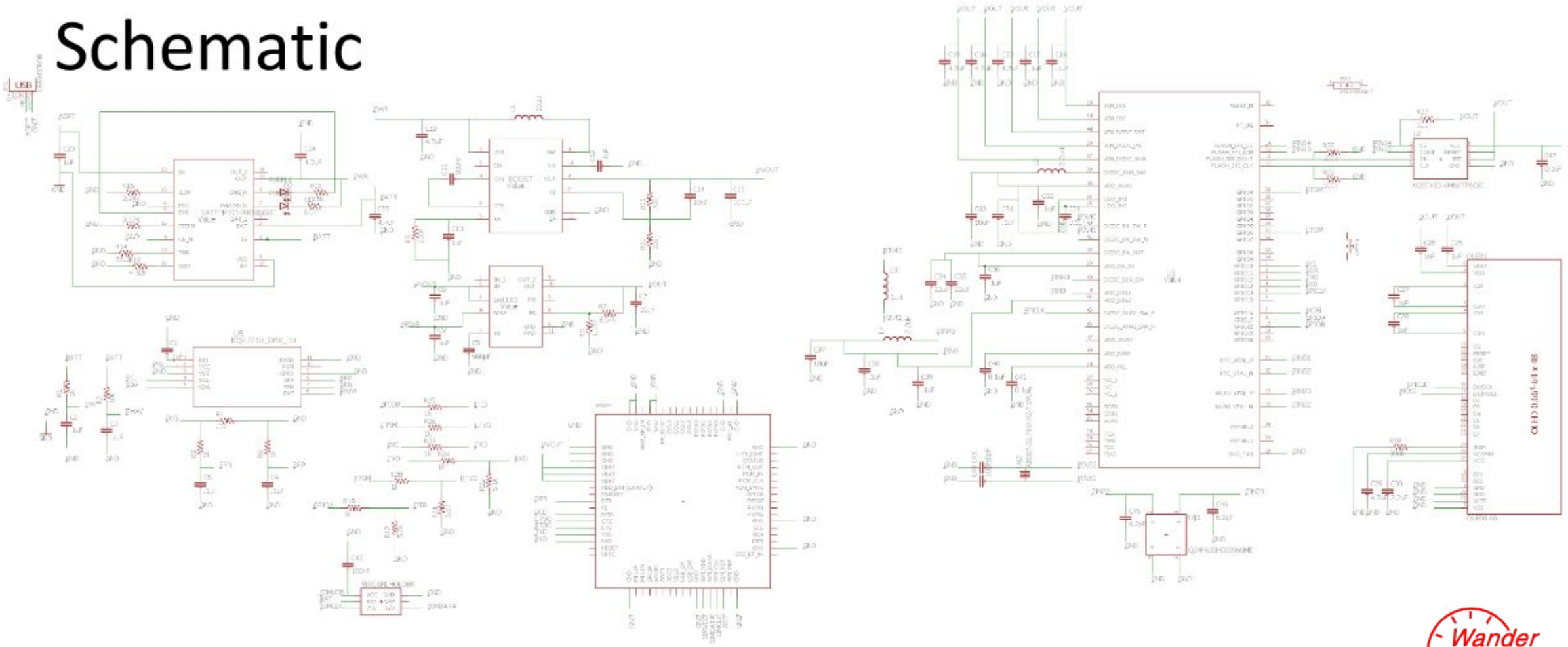
Regulators

- Will use both LDO and Boost Converter
- MCU and Display need 3.3V to power on
- GPS/GSM needs 4.0V to power on

Manufacturer/Part	TI / LDO	TI / Boost Converter
Input Voltage	0.8 - 5.5V	1.6 - 6V
Output Voltage	0.8 - 3.6V	1.7 - 17V
Quiescent Current	1mA	0.9mA

Schematic



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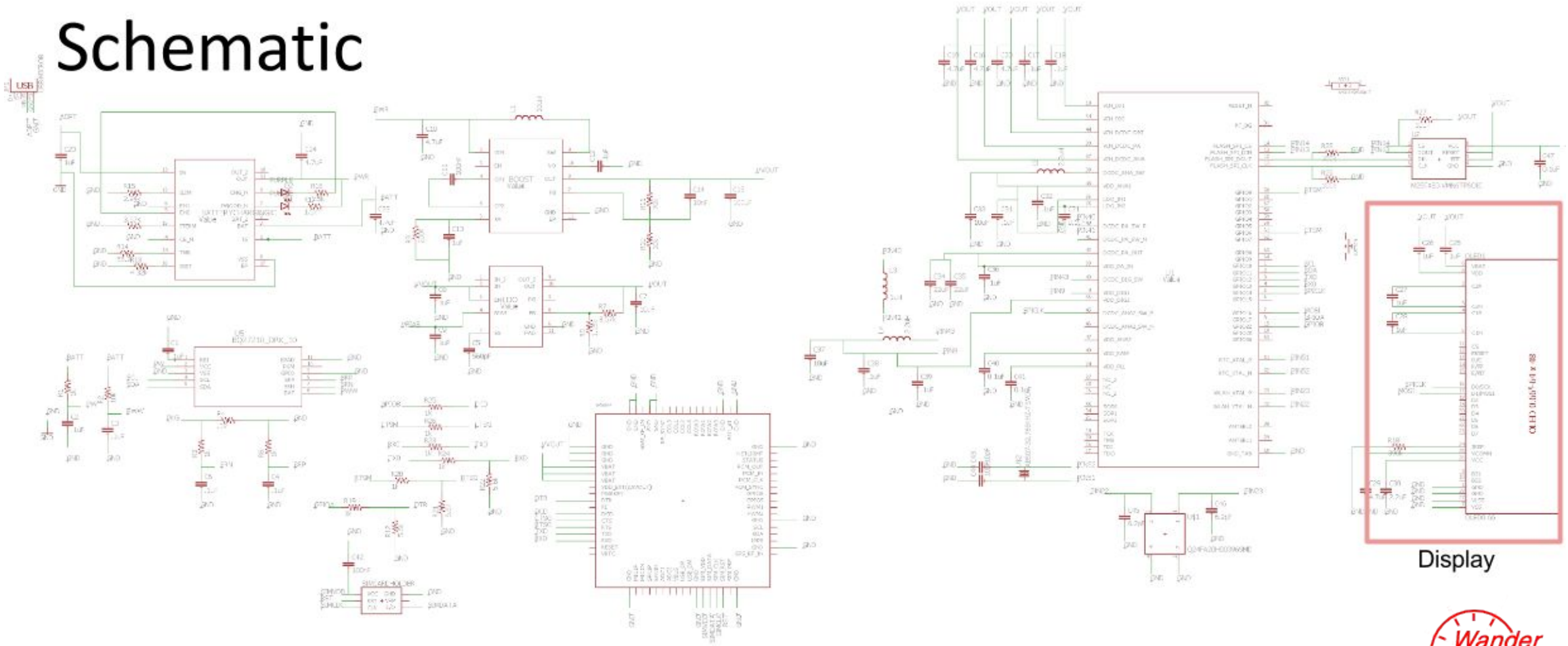

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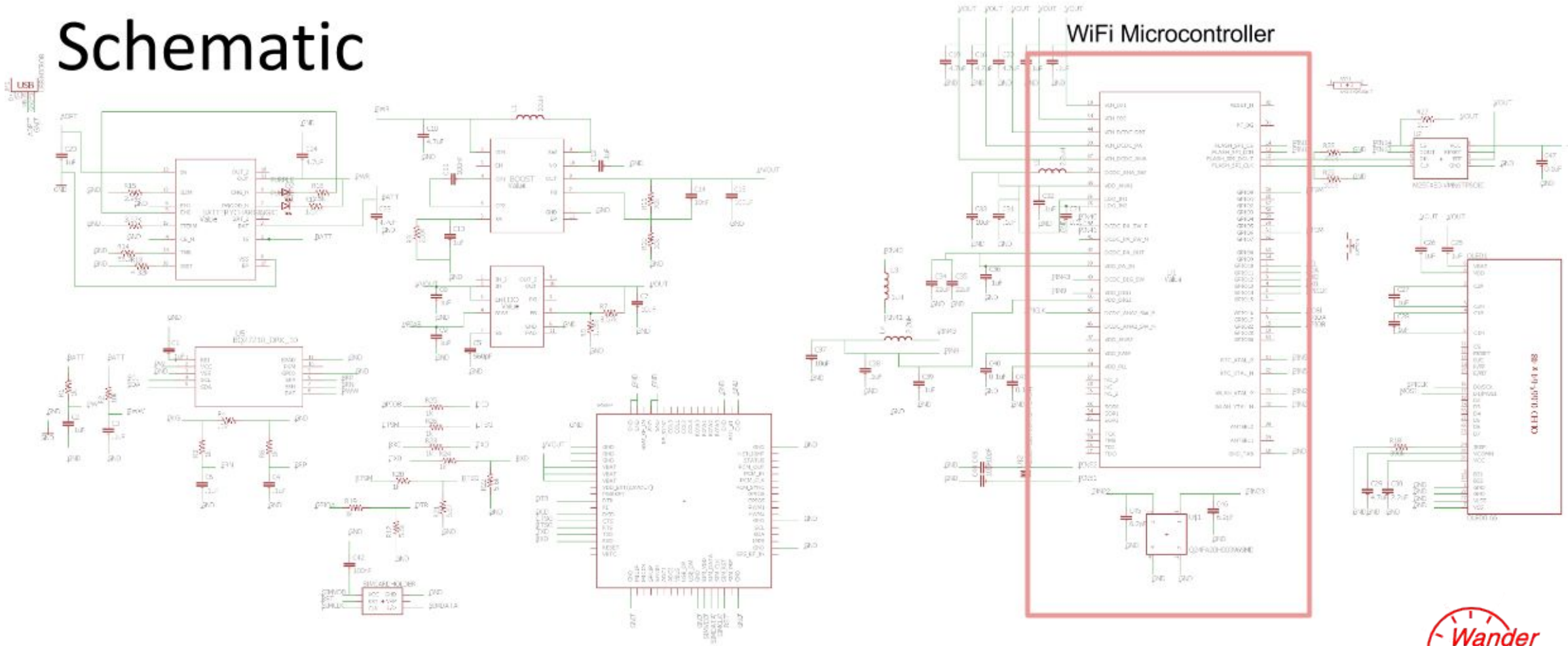

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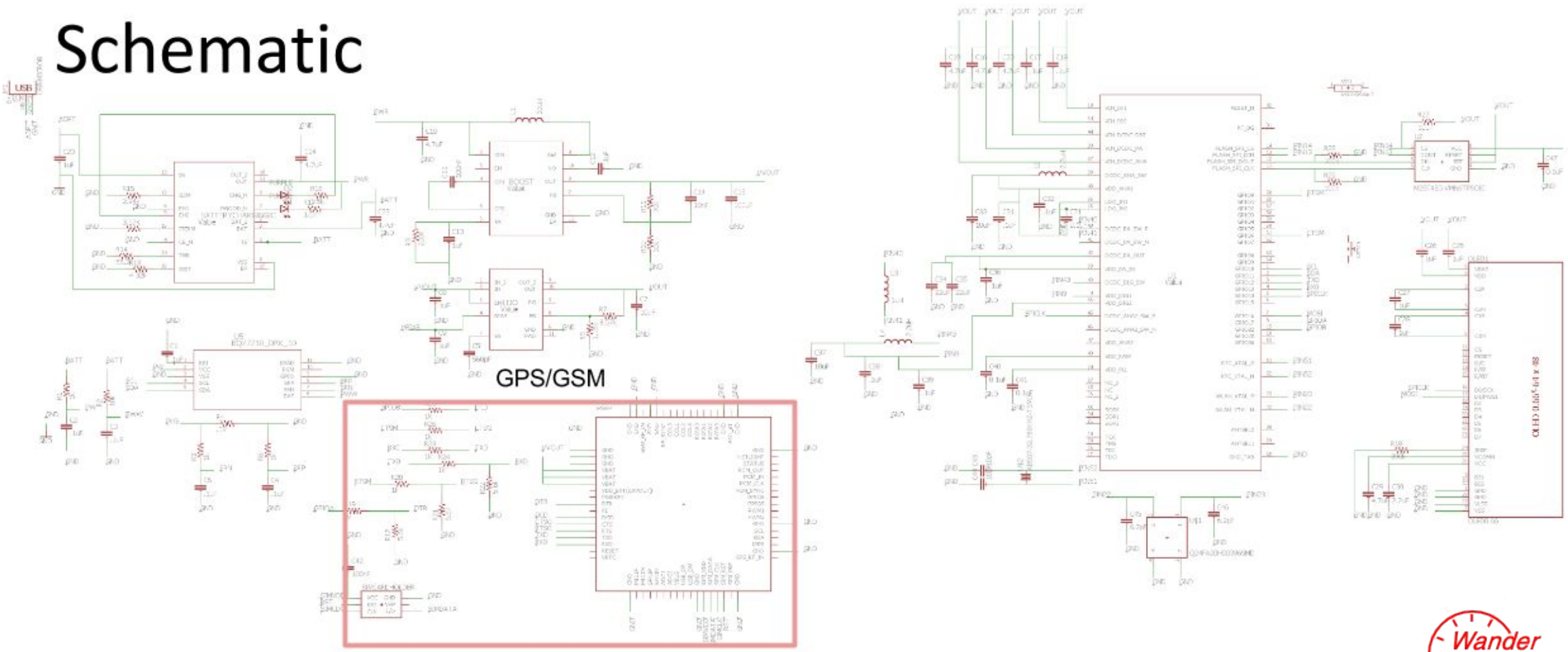

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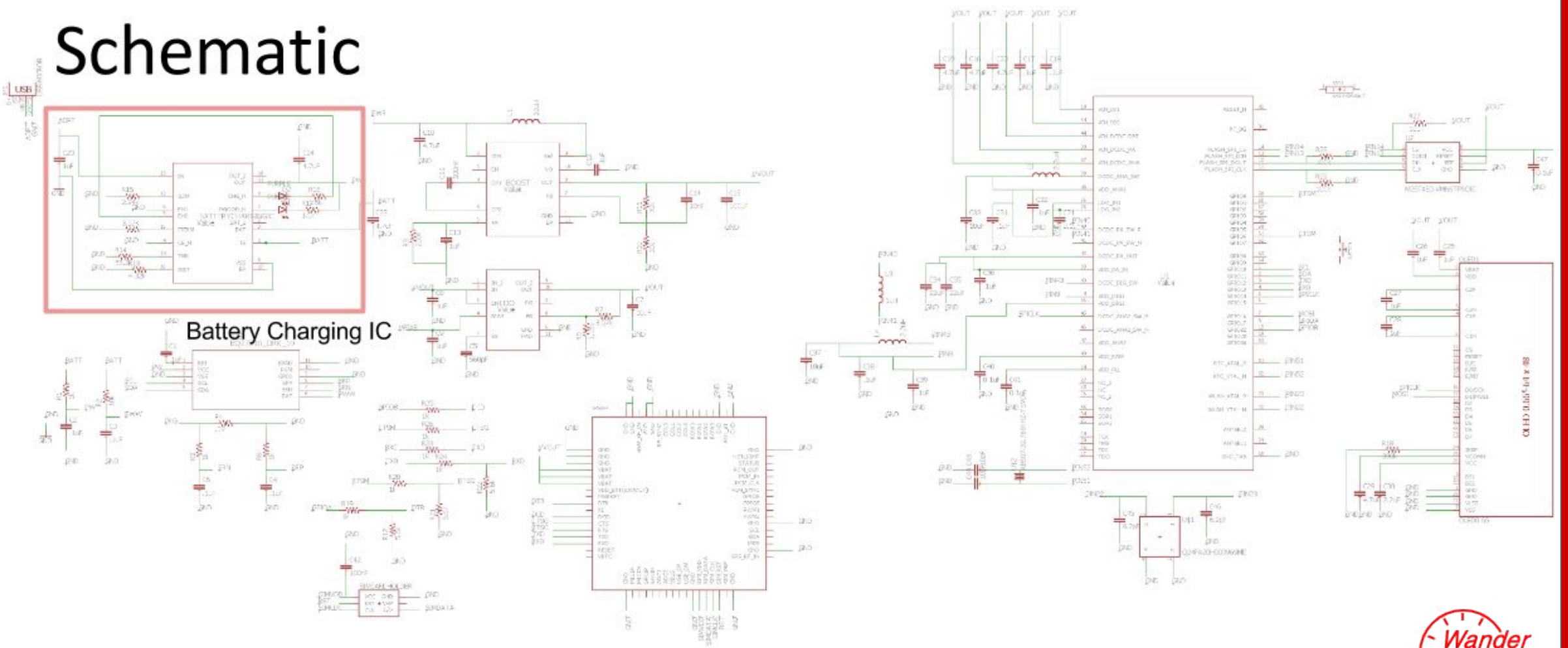

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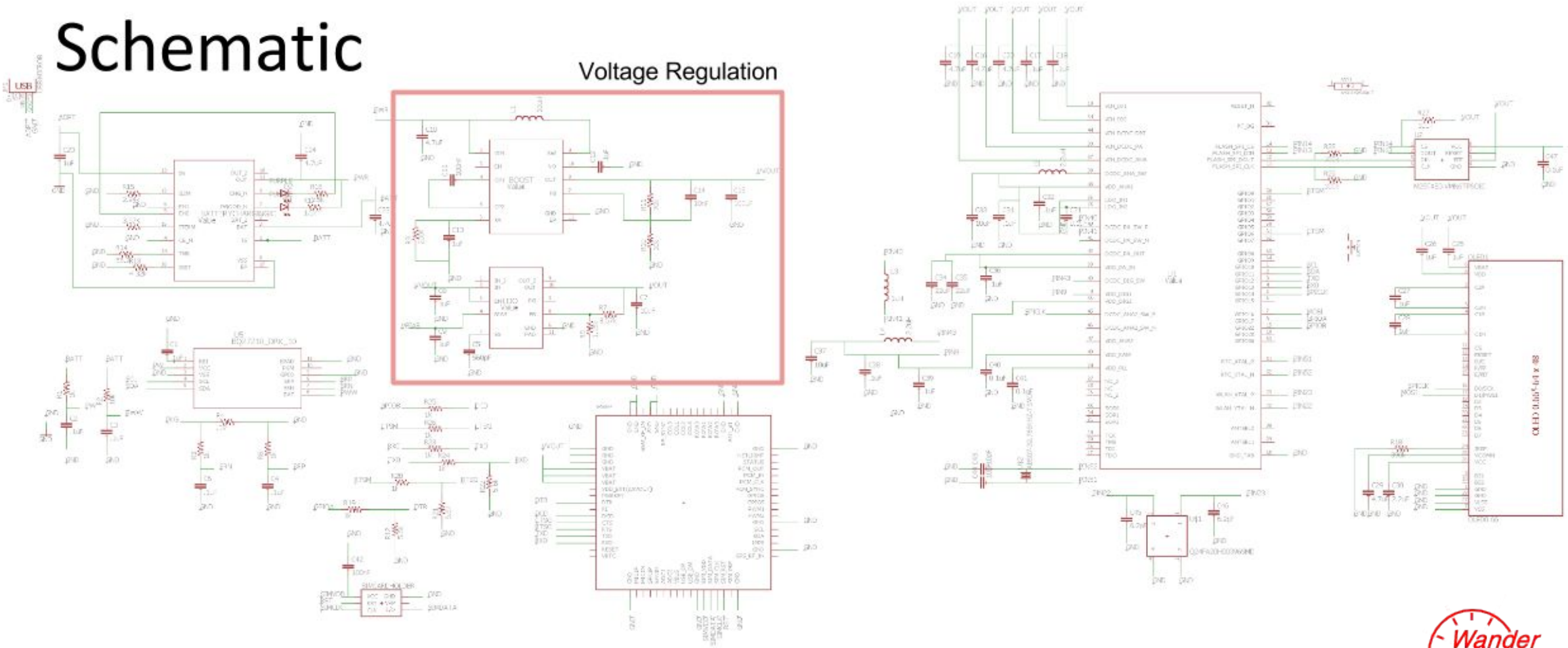

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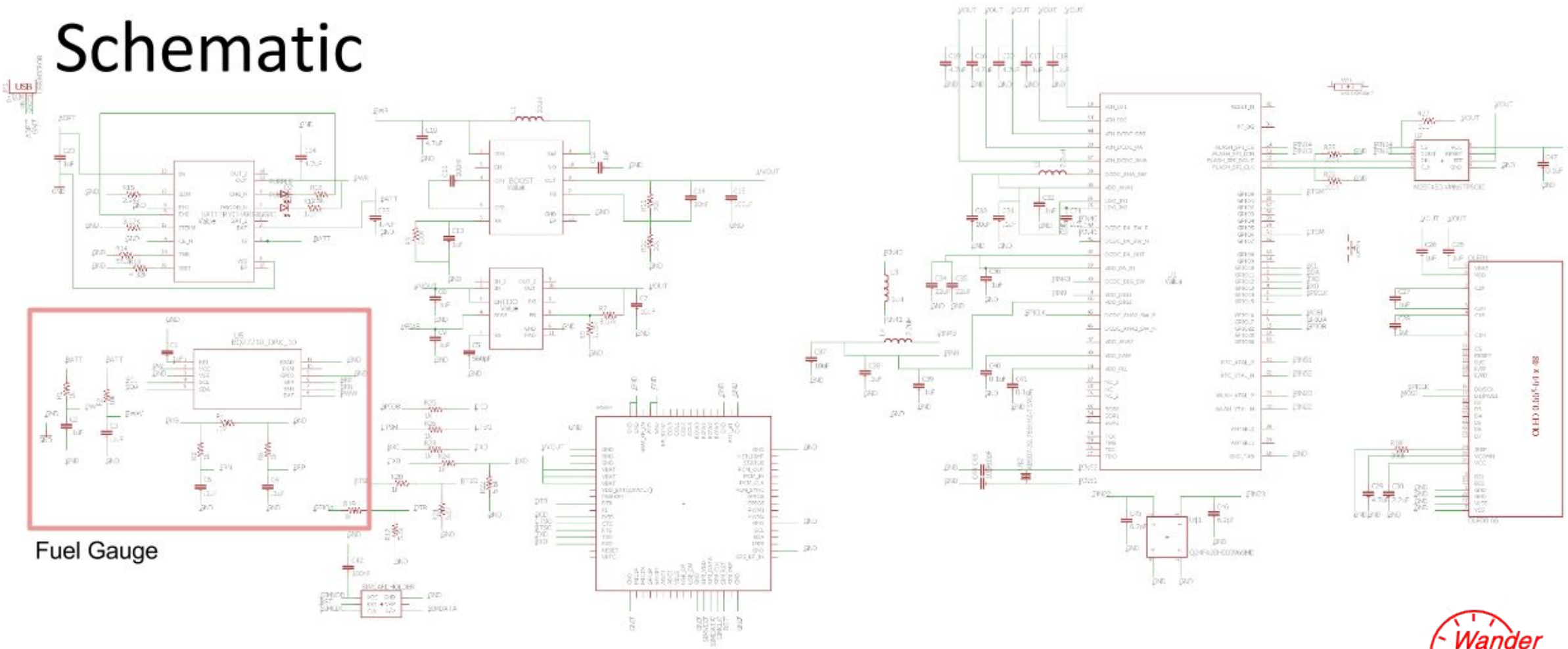

Fuel Gauge

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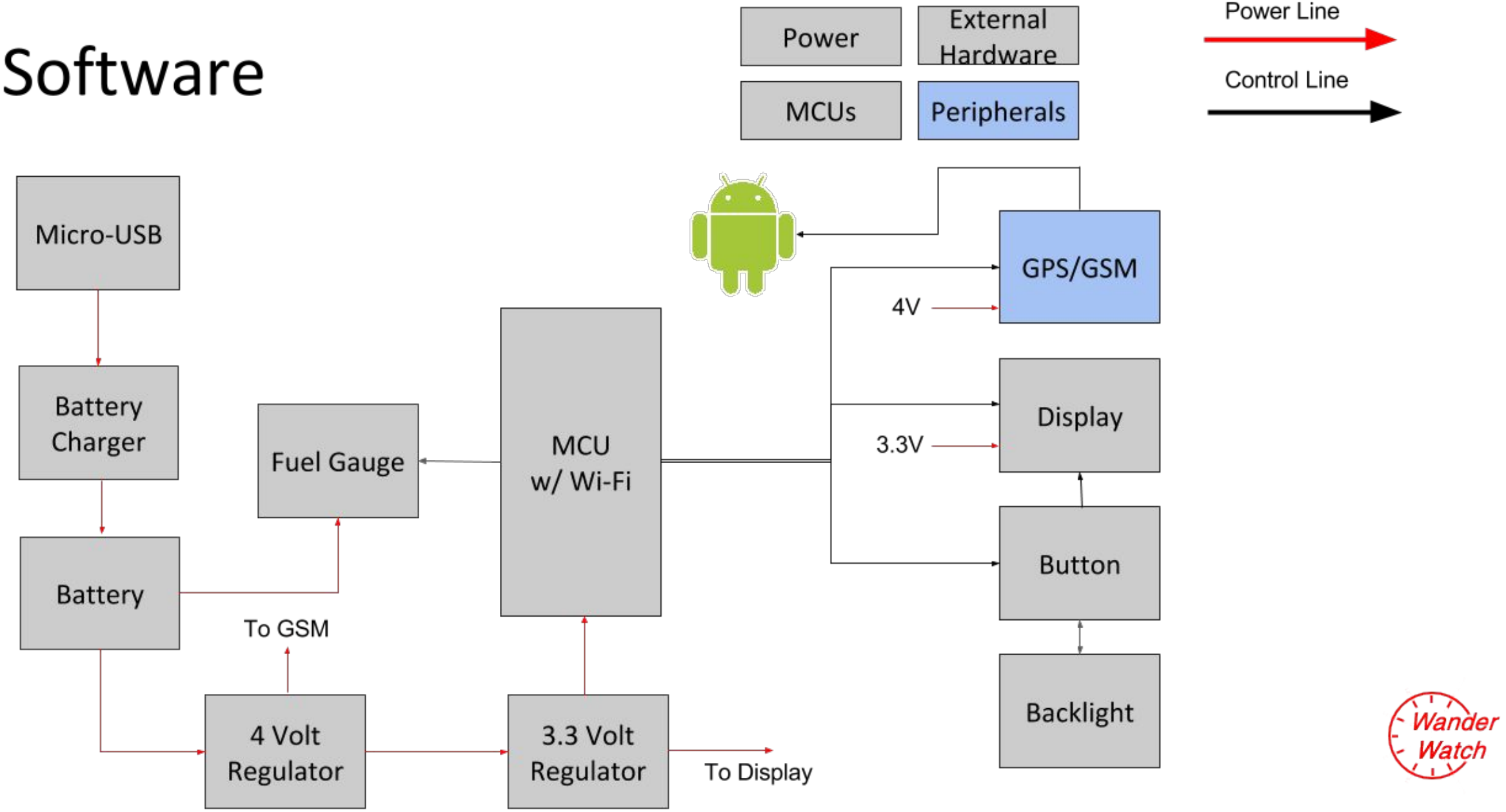
Software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Why Android?

- Larger user base than Apple
- More experience with Java and Android app development
- Plenty of tutorials and references to help with issues
- Easier to debug
- Various features available in Android can be used for this app

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Android Application Features

- One account for each phone
- View watch's location
- View alerts about watch's battery and location
- Change settings for handling alerts and account

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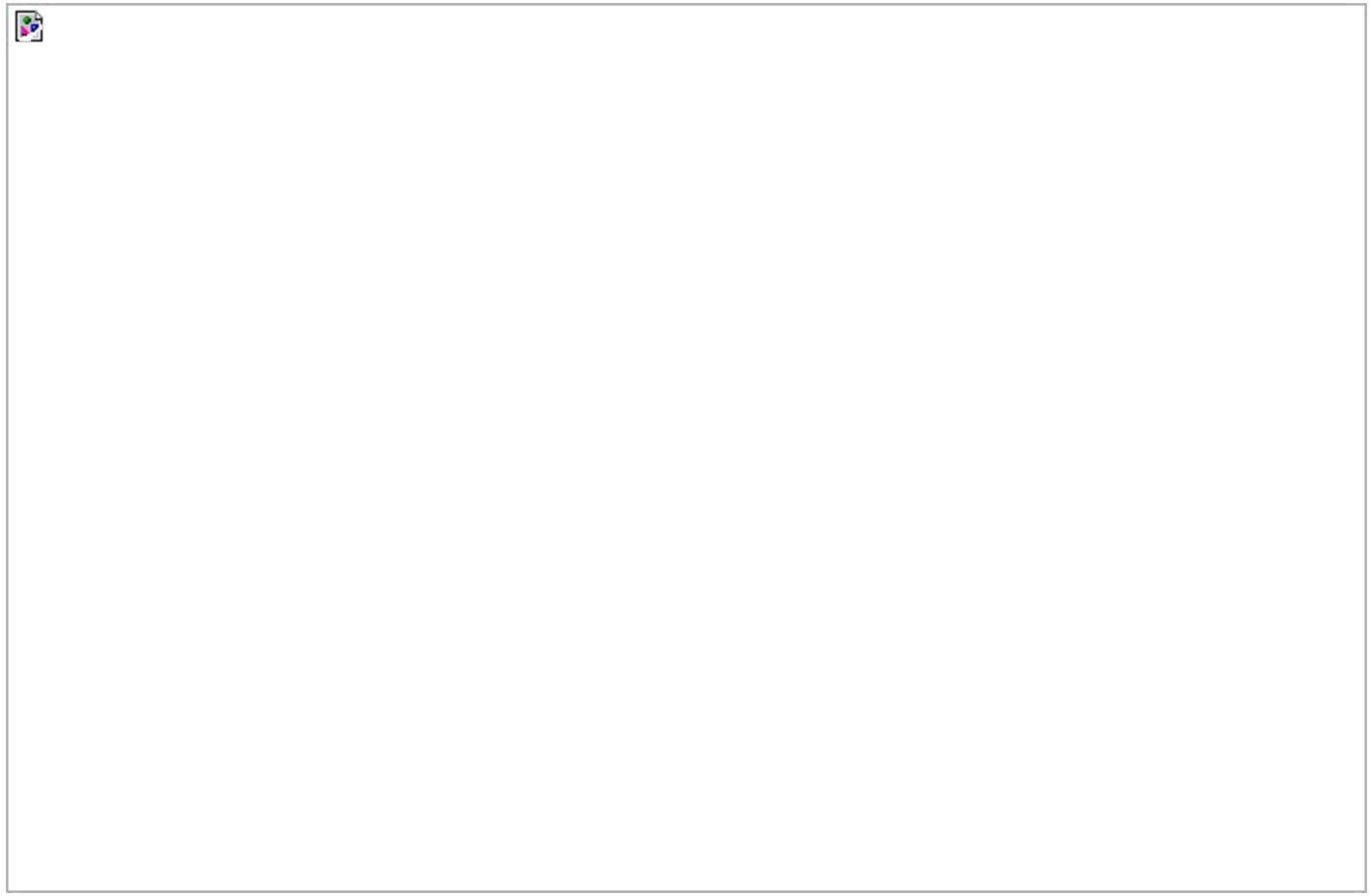
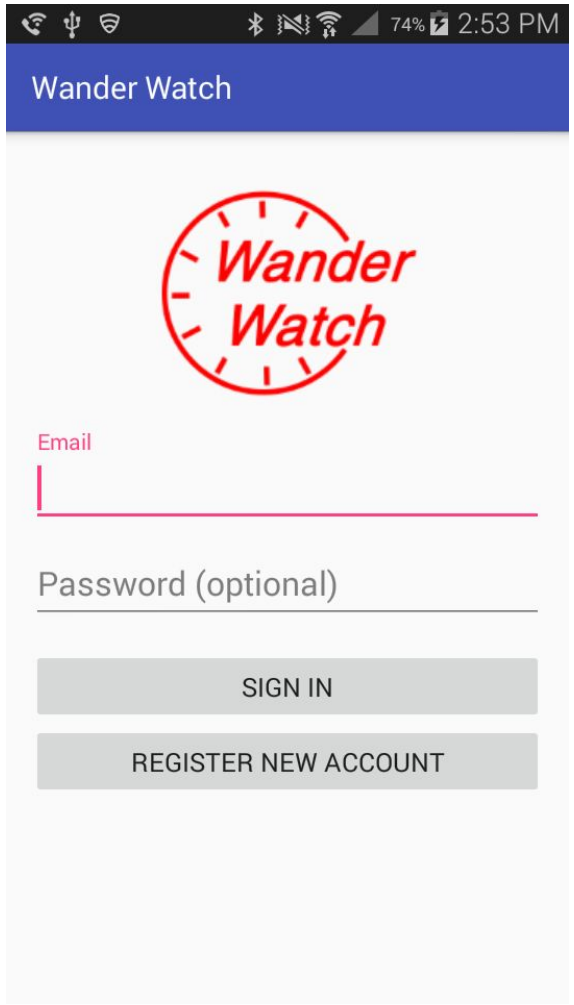
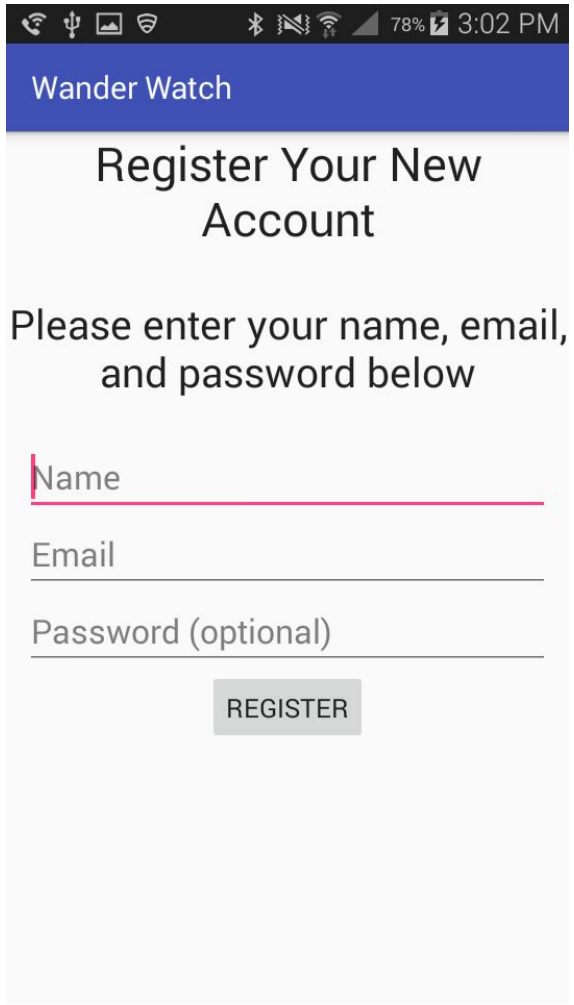
Use Case Diagram

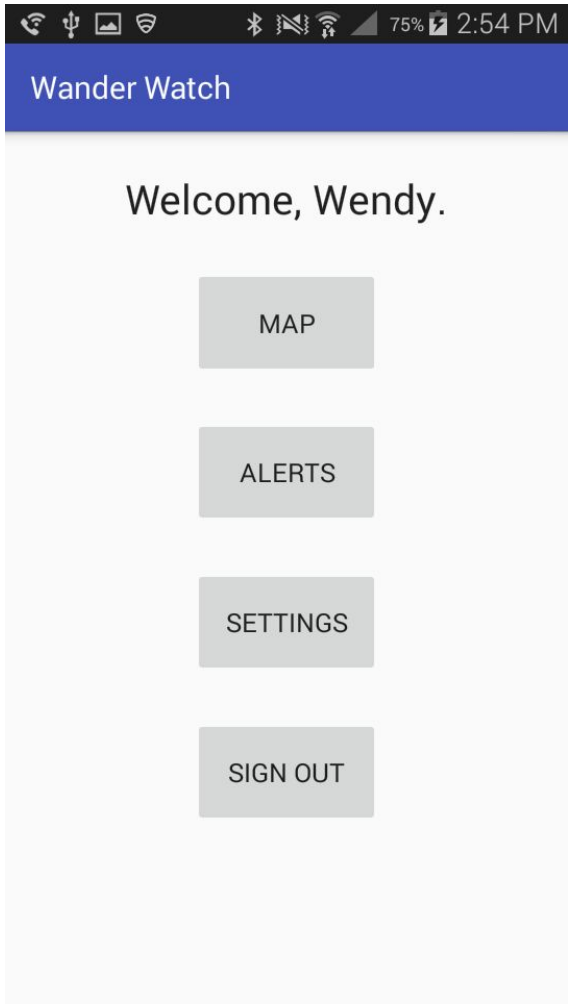


Class Diagram

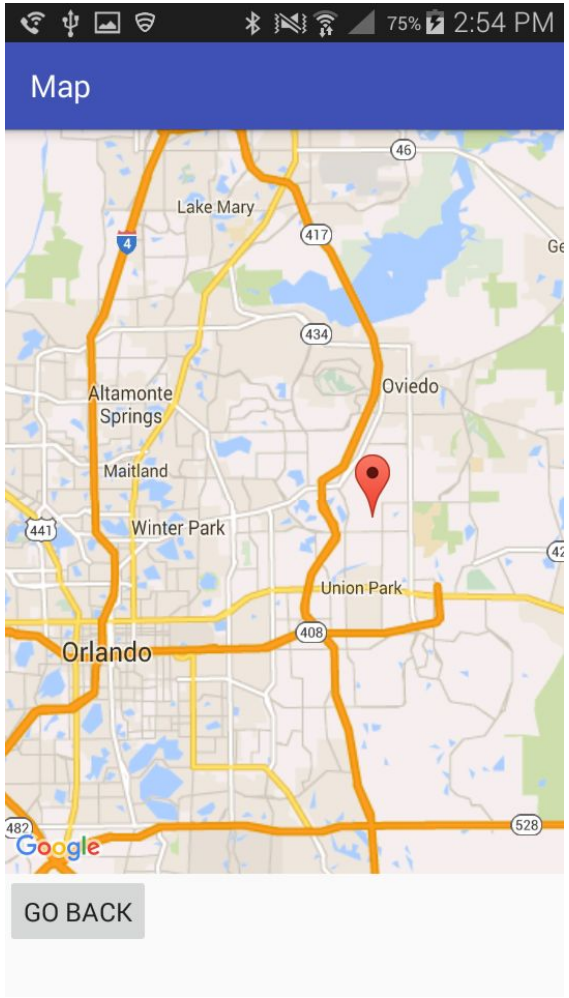
Login Screen, Register, and Main Menu

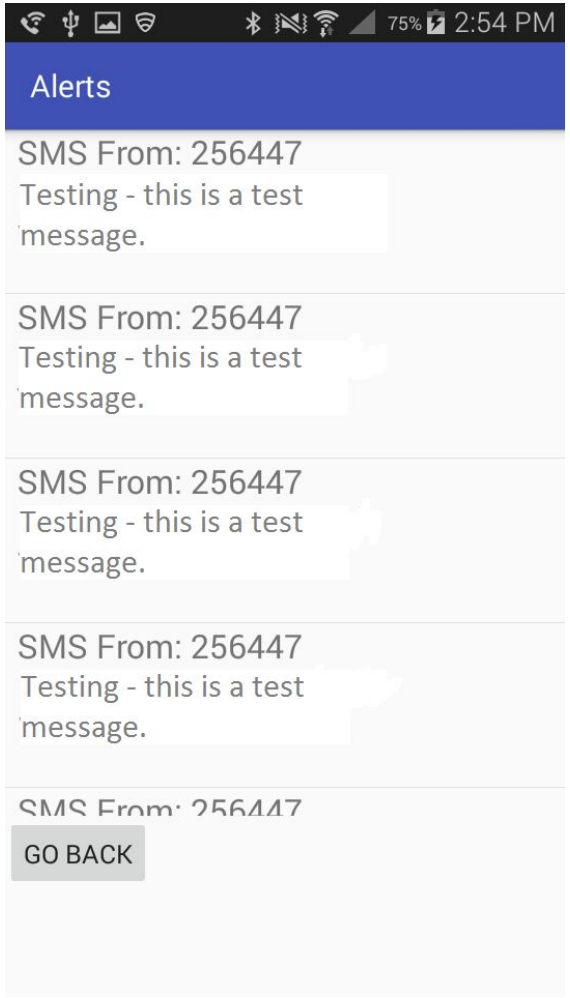


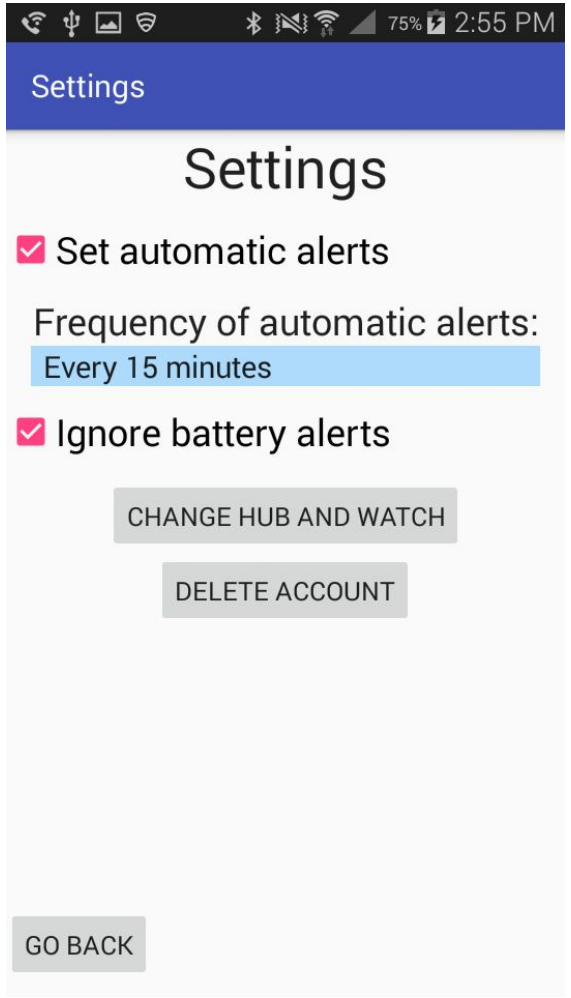




Map, Alerts, and Settings Menus







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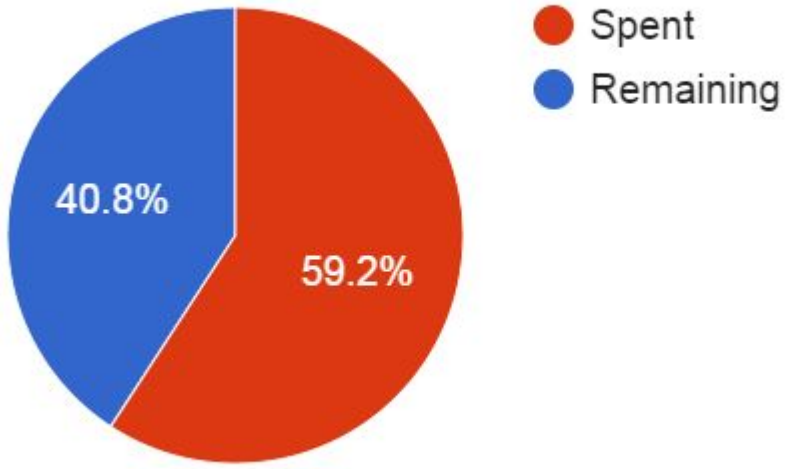
Administrative Content

Budget/Financing

- Sponsors: Group 16 members
- Total Budget: $300

Item	Amount	Cost ($)	Total ($)
Display	1	9.95	9.95
SIM808	1	29.95	29.95
SIM Card Holder	1	1.95	1.95
SIM Card	1	9.00	9.00
500 mAH Battery	1	7.95	7.95
Slim Sticker GSM Antenna	1	2.95	2.95
Hardware Components	1	115.85	115.85
Total			$177.60



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Division of Work

Category	Primary	Secondary
Power	Jeff	Sarah
GPS/Tracking	Alexis	Wendy
GSM/Bluetooth	Sarah	Alexis
Software/App	Wendy	Jeff

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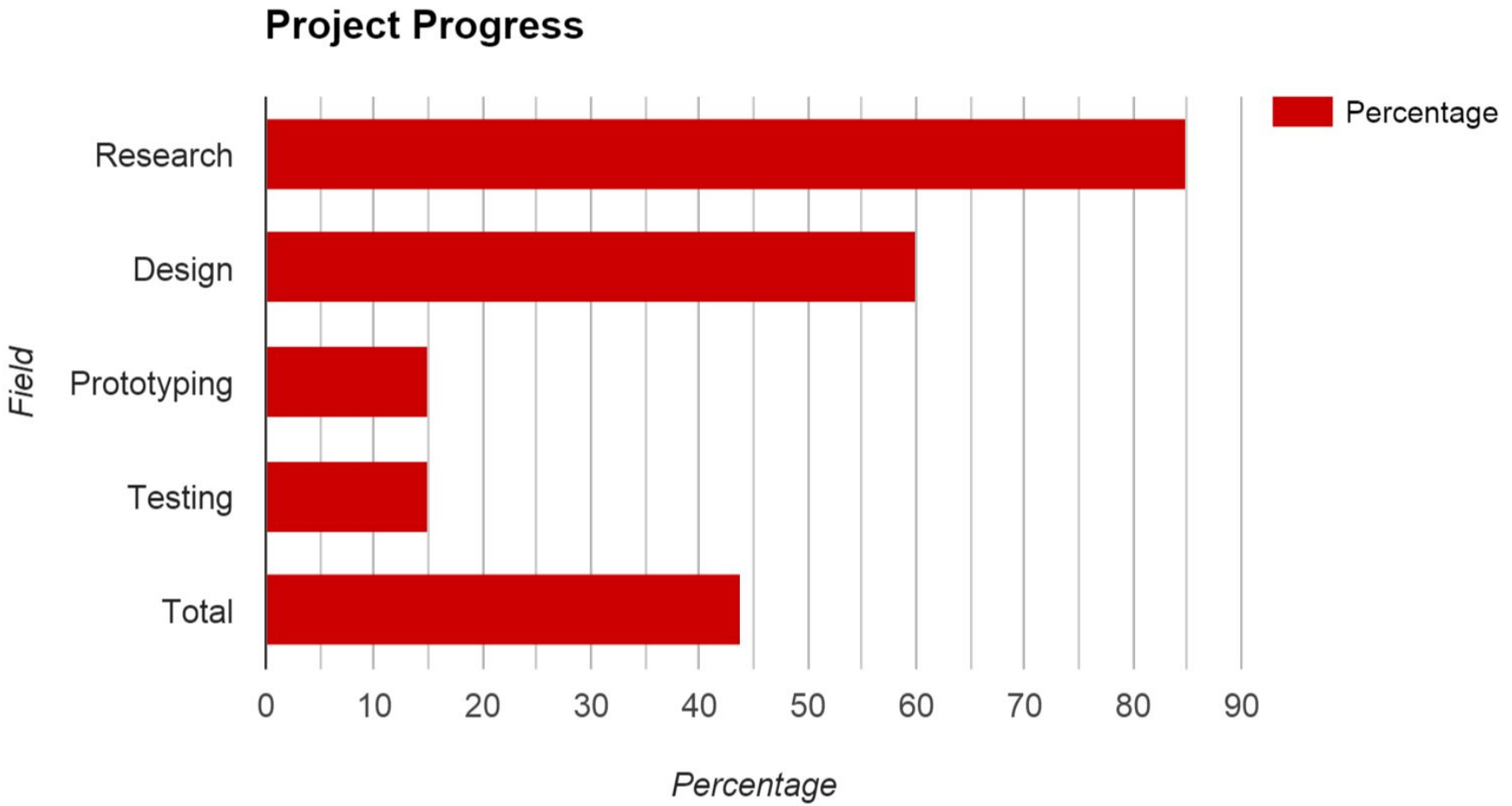
Current Progress



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Questions?