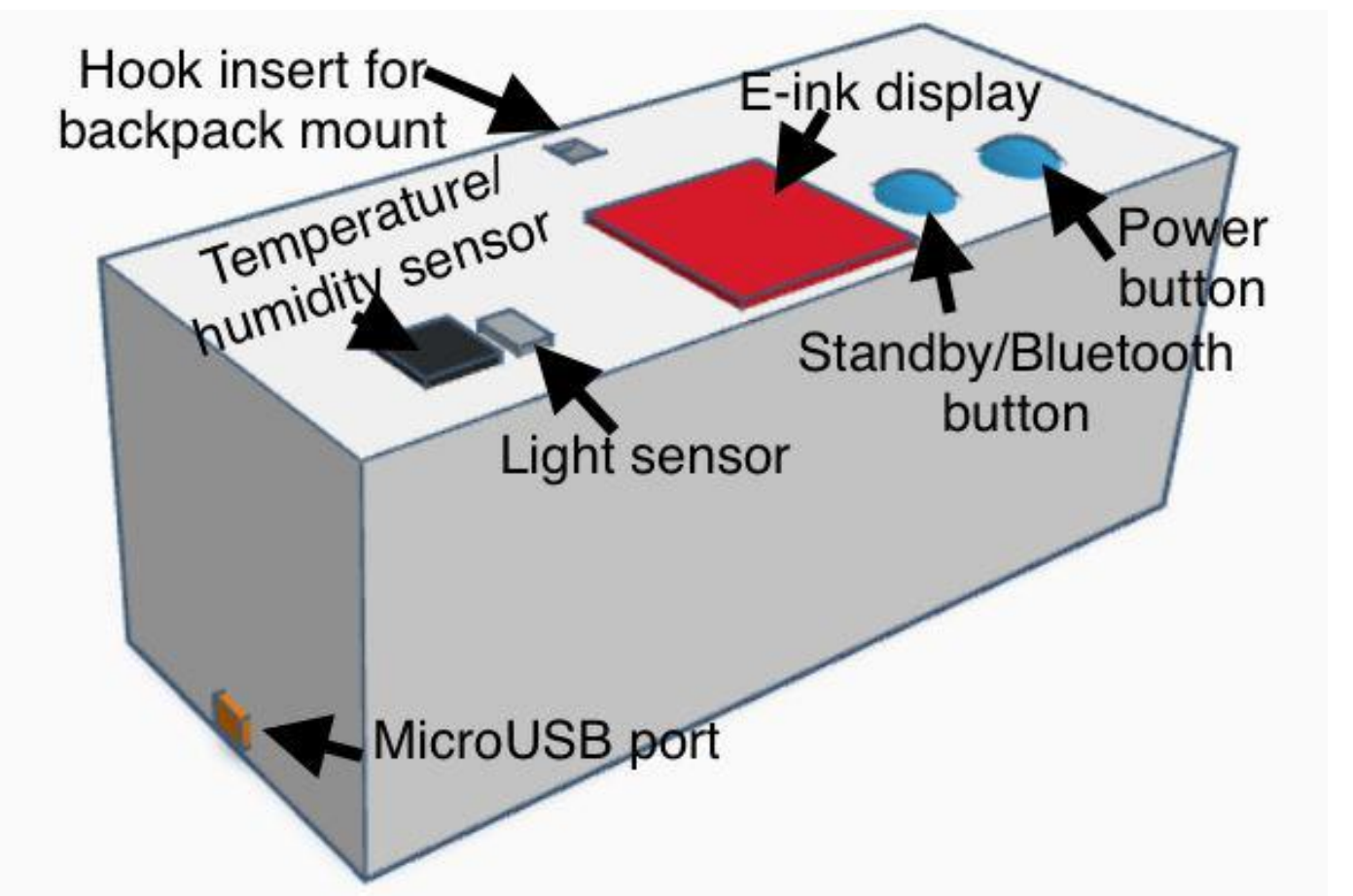


E1.10 - Heat Island Mapping 2

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 Texas State University



Background

Urban heat islands result in metropolitan areas having a higher temperature as compared to surrounding areas. Our project is a portable data logging device that aims to map heat islands by recording ambient temperature, humidity, light intensity, and the user's geographic position. The data collected will be exported to either a mobile device or PC for data visualization.

Requirements

- Record temperature, humidity, time, position
- Max size of 40 x 40 x 100 mm
- Max weight of 150g; backpack mountable
- Able to store 4hrs of data collected daily for a month
- Active battery life minimum of 4 hrs
- Stand-by battery life minimum of 48 hrs
- Max recharge time cannot be longer than 2 times the run time
- Rain/Water resistant

BOM Cost

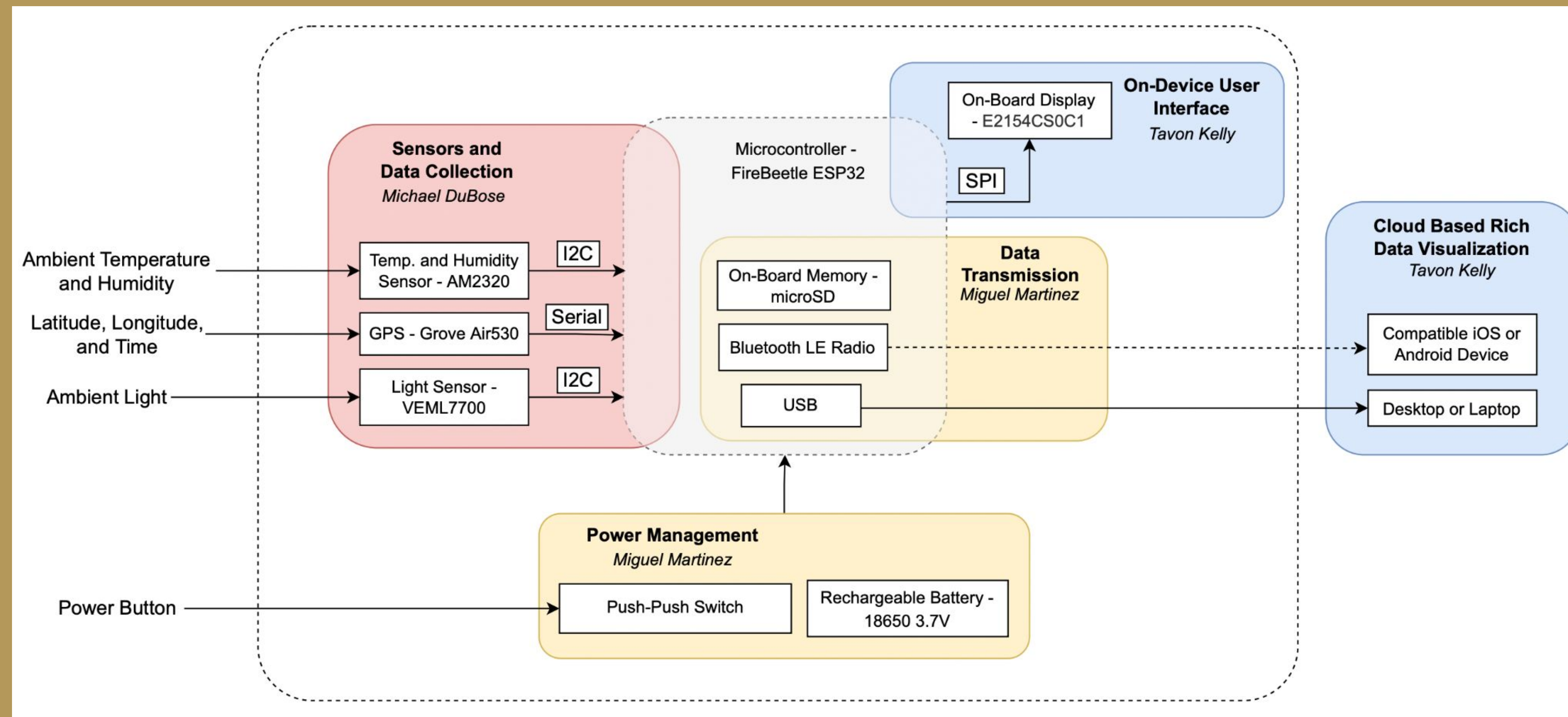
Budget: \$30

Current Cost: \$34.95

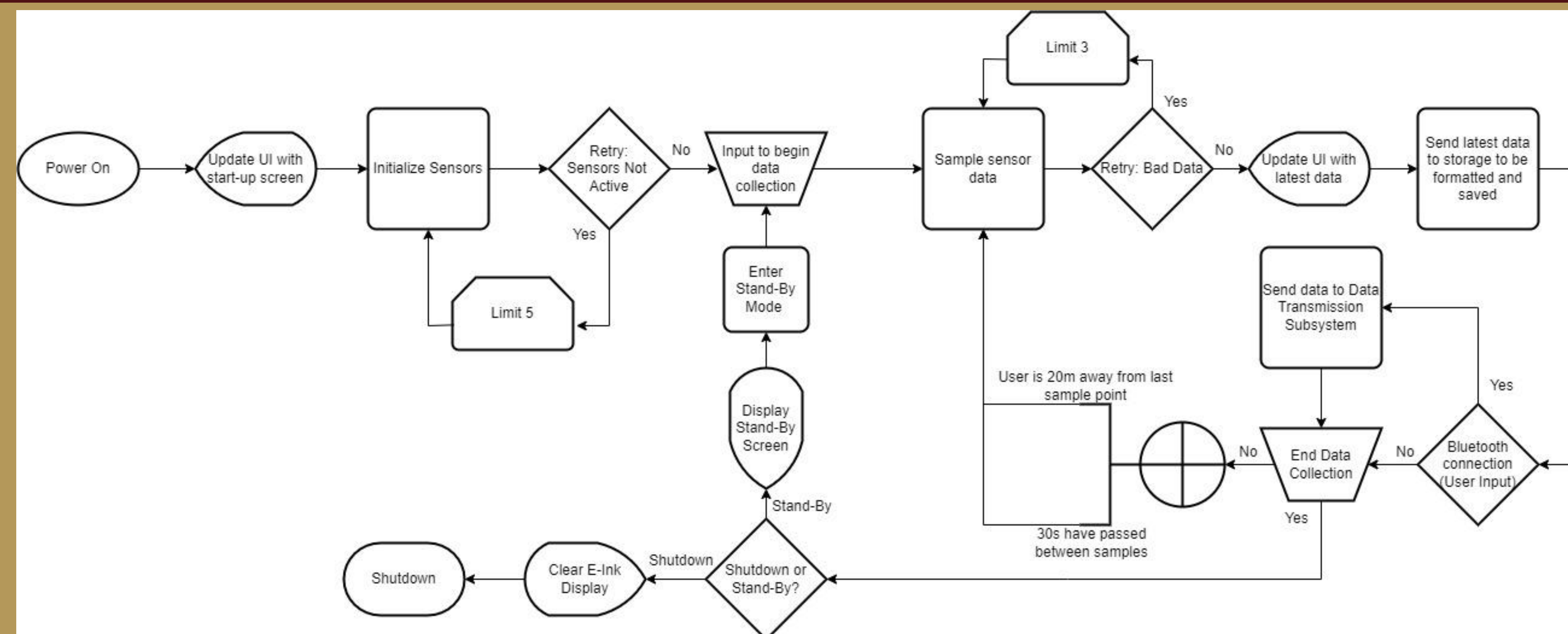
D2 Plan

D2 Milestones	Date
Battery Recharge Time Tests Complete	2/10/23
Characterization of Sensors Complete	2/10/23
Subsystem Prototypes Constructed	2/17/23
Subsystem Prototype Testing Complete	3/03/23
Subsystem Prototype Debugging Complete	3/10/23
Waterproofing Design Complete	3/10/23
Webpage and Mobile App Visualization Complete	3/15/23
Stand-By Mode Complete	3/15/23
System Integration: Prototype Device Constructed	3/17/23
System Integration: Software Prototype Compiled	3/17/23
Stand-By Mode Testing Complete	3/21/23
Active State Battery Life Testing Complete	3/24/23
Data Transmitted off the Device and Visualized	3/24/23
Drop and Water Tests Complete	3/24/23
Prototype Unit Debugging Complete	3/31/23
2 Units for Design Day Constructed	3/31/23
2 Weeks of Data Collected with the Devices	4/14/23
Visualization of Collected Data Analyzed	4/21/23
Final Design Review	4/21/23
D2 Senior Design Day	5/5/23

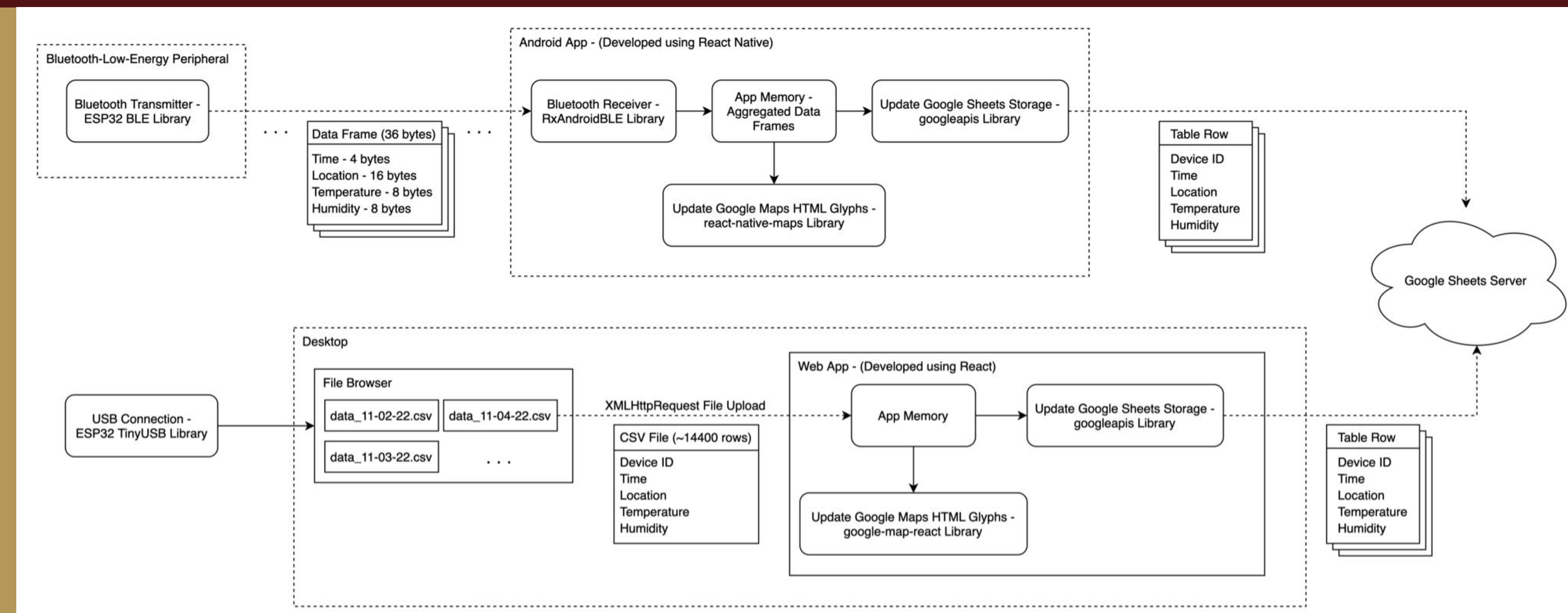
Overall Block Diagram



Main System Scheduler Flowchart



Data Pipeline



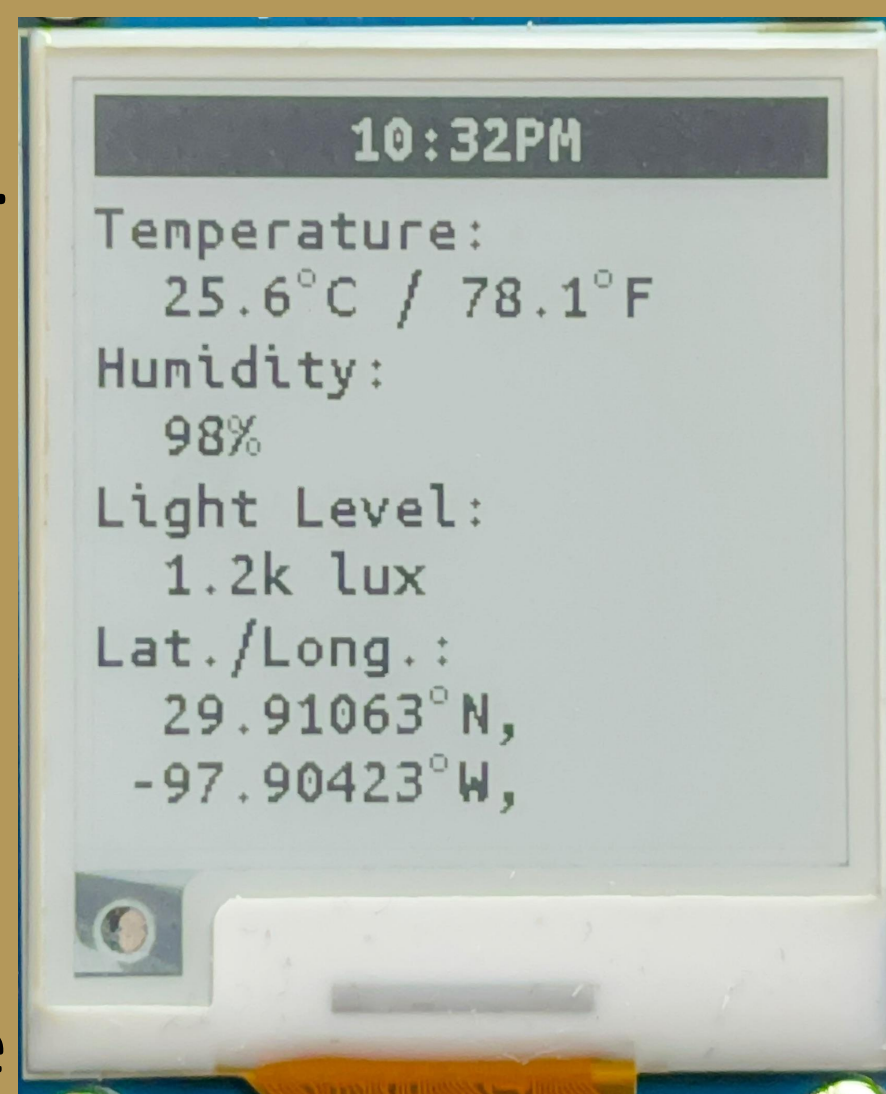
Power Budget

Device/Component	Voltage max (V)	Current max (mA)	Power (mW)
Firebeetle ESP32	5.0	80.00	400.00
Temperature/Humidity Sensor	5.5	0.95	5.23
Lux Sensor	3.6	0.05	0.16
GPS	5.0	60.00	300.00
E-ink Display	3.6	3.75	13.50
SD card reader	3.0	100.00	300.00
Total Power (mW)			0.171
Amp hours needed (Ah)			1.10

Using a 3.7 V 2200mAh battery will give us about 8 hours of active data collecting battery life and the device will recharge in about 4.4 hours.

Device User Interface

- Power On:
 - Displays a start up message.
- Active State:
 - Displays current readings.
- Stand-By:
 - States that device is in stand-by and prompts user-input.
- Power Off:
 - Displays shutdown message and clears screen.



Miguel Martinez | Tavon Kelly | Michael DuBose

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