



OBI AQSH

Open Bike Initiative Air Quality Sensor Hub



A low cost and portable sensor hub, designed to measure cyclists' exposure to pollutants to be integrated with the Intel OBI unit.

Ali Alavi, Robert Flory, Meng Lei, Pedro Munoz

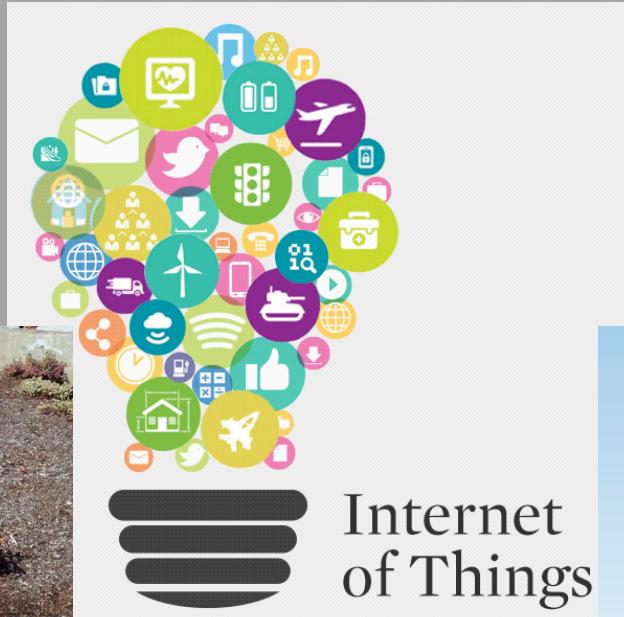
Portland State University

Maseeh College of Engineering & Computer Science

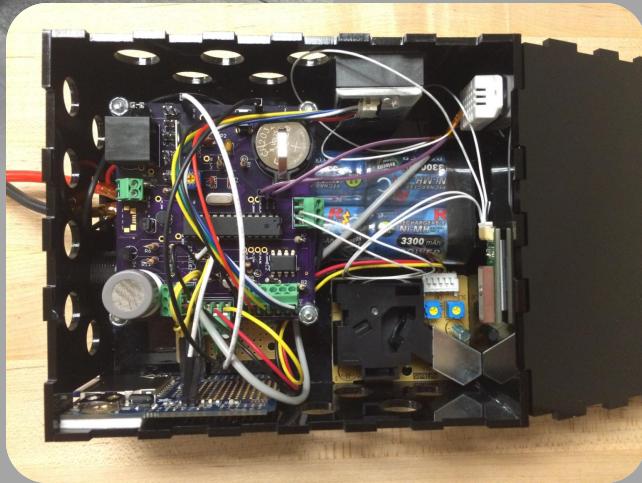
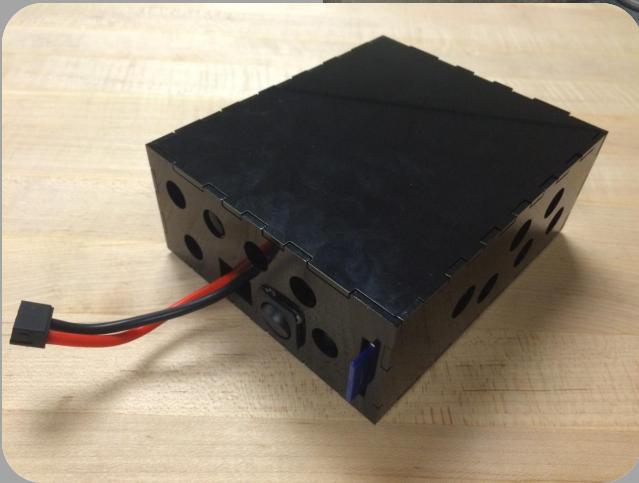
Motive



Use Case



Goal



Pollution

Pollutants:

- Ozone
- Nitrous Oxide
- Sulfur Dioxide
- Lead
- **Particulate Matter**
- **Carbon Monoxide**



Initial Requirements

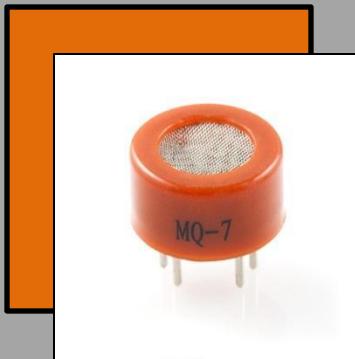
2-pin terminal blocks or 2-pin header to pass power to the motor driver. This will allow for better airflow. System will be cost effective.

through the V AC + and V AC - lines from a dynamo.

Final Requirements

System must be built for public safety, security, and System will be cost effective.
random access for capturing video, and for prioritizing implementation.

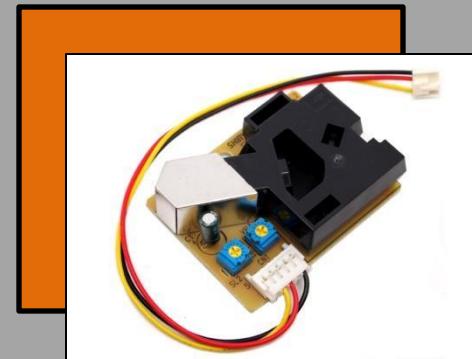
Sensors



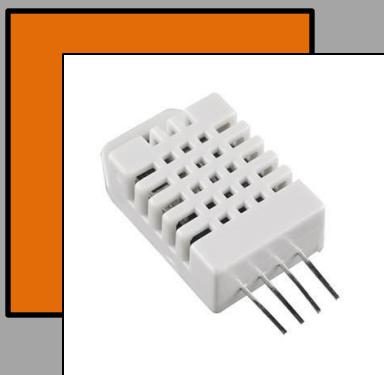
MQ-7
(CO)



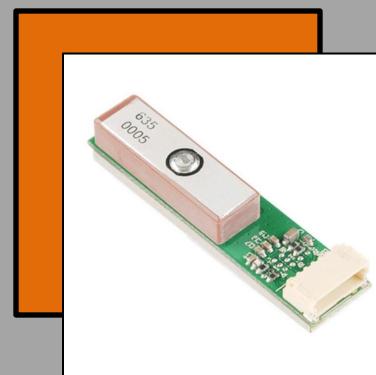
COM--
09689
(Dust)



SEN-12291P
(Dust)



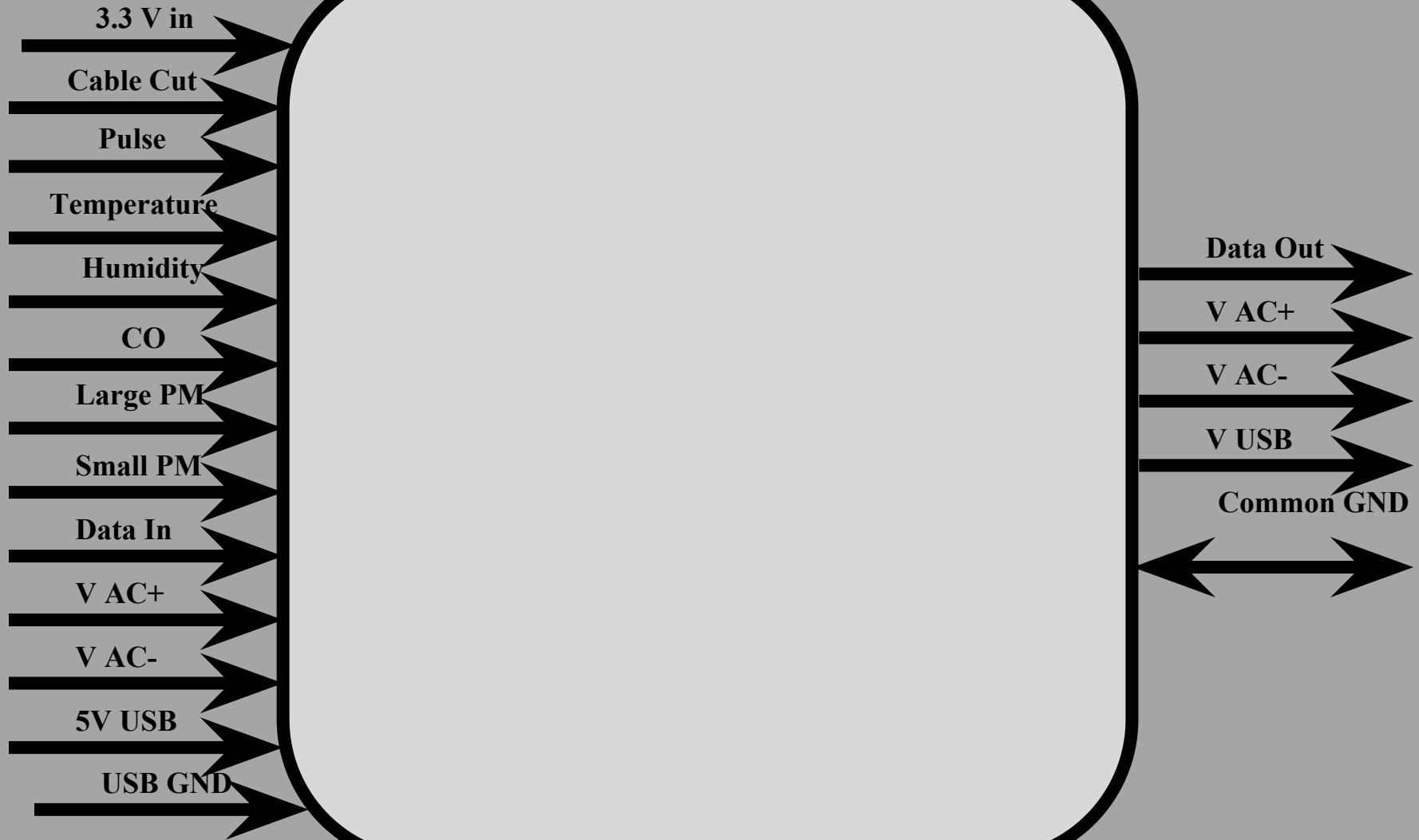
SEN--10167
(TEMP+HUMIDITY)



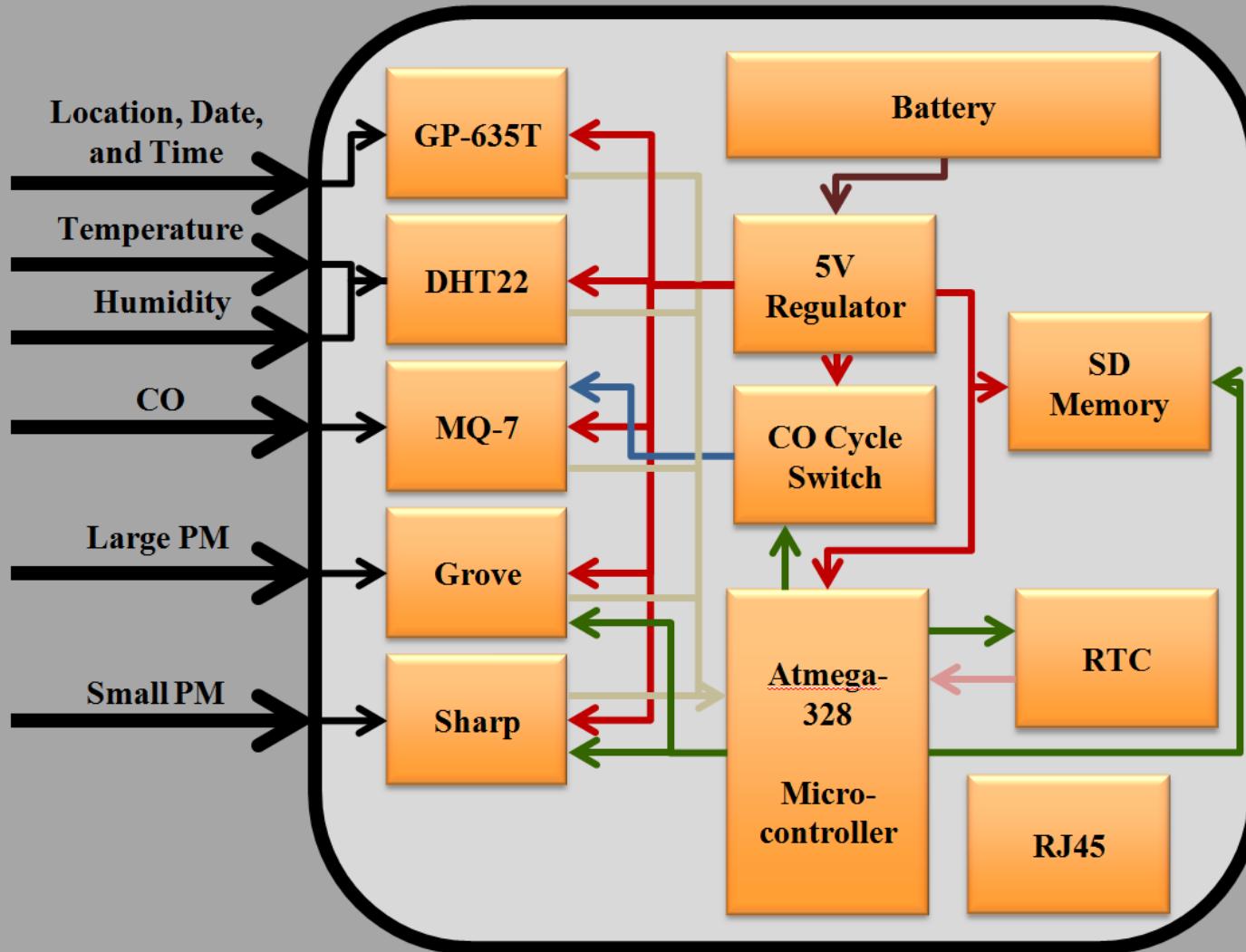
GP-635T
(GPS)

System Overview

(Level 0 -- Initial Design)



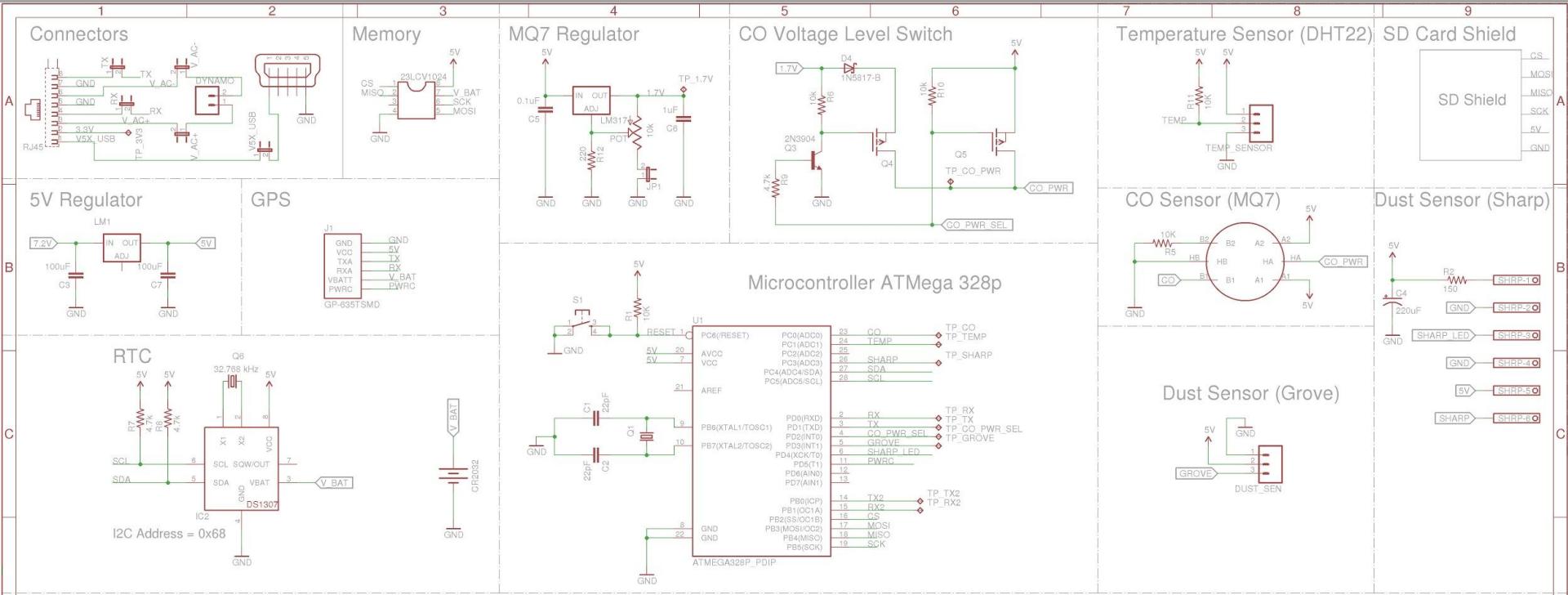
System Overview (Level 1--Implemented Design)



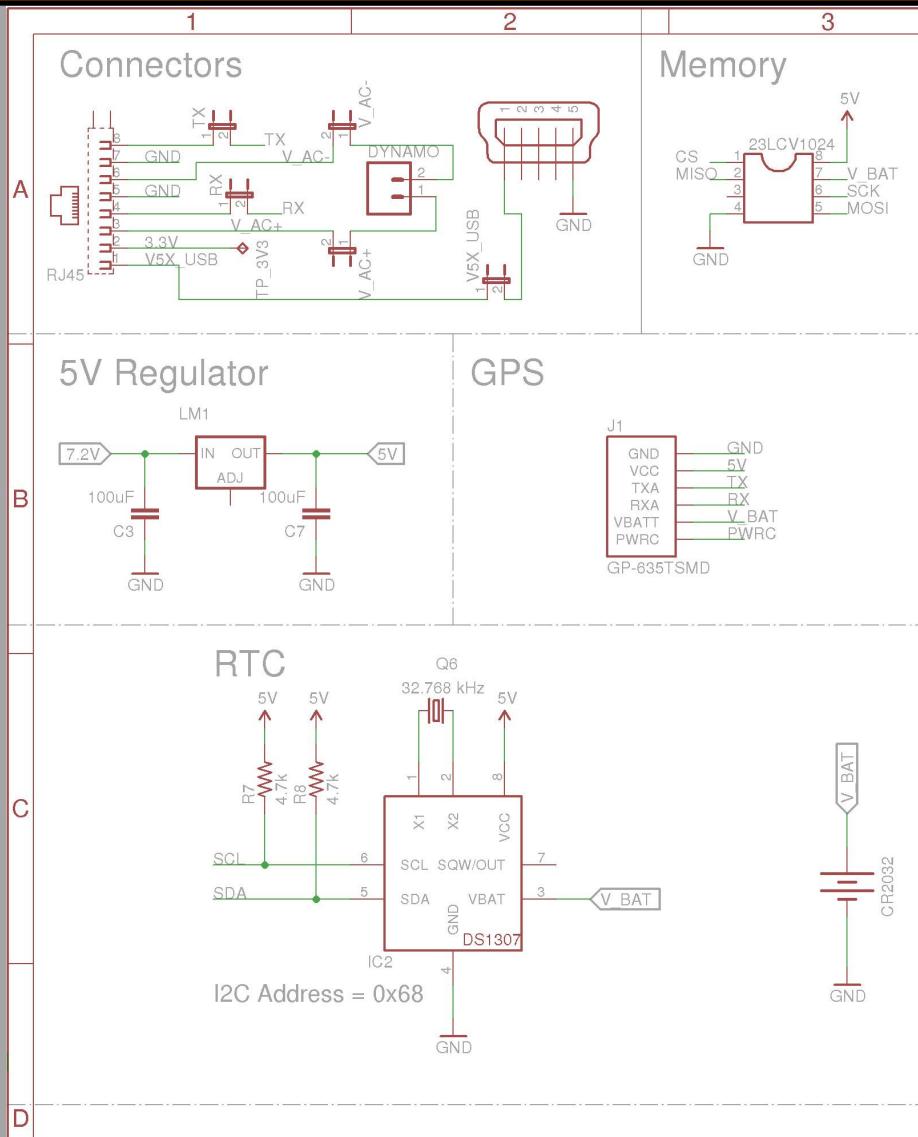
RJ45
Connections:
-3.3V in
-Rx
-Tx
-Common GND
-Pass through
from 2-pin
header (for
dynamo)
-Cable Cut

Ability to add
microUSB
connector for 5V
pass through via
RJ45

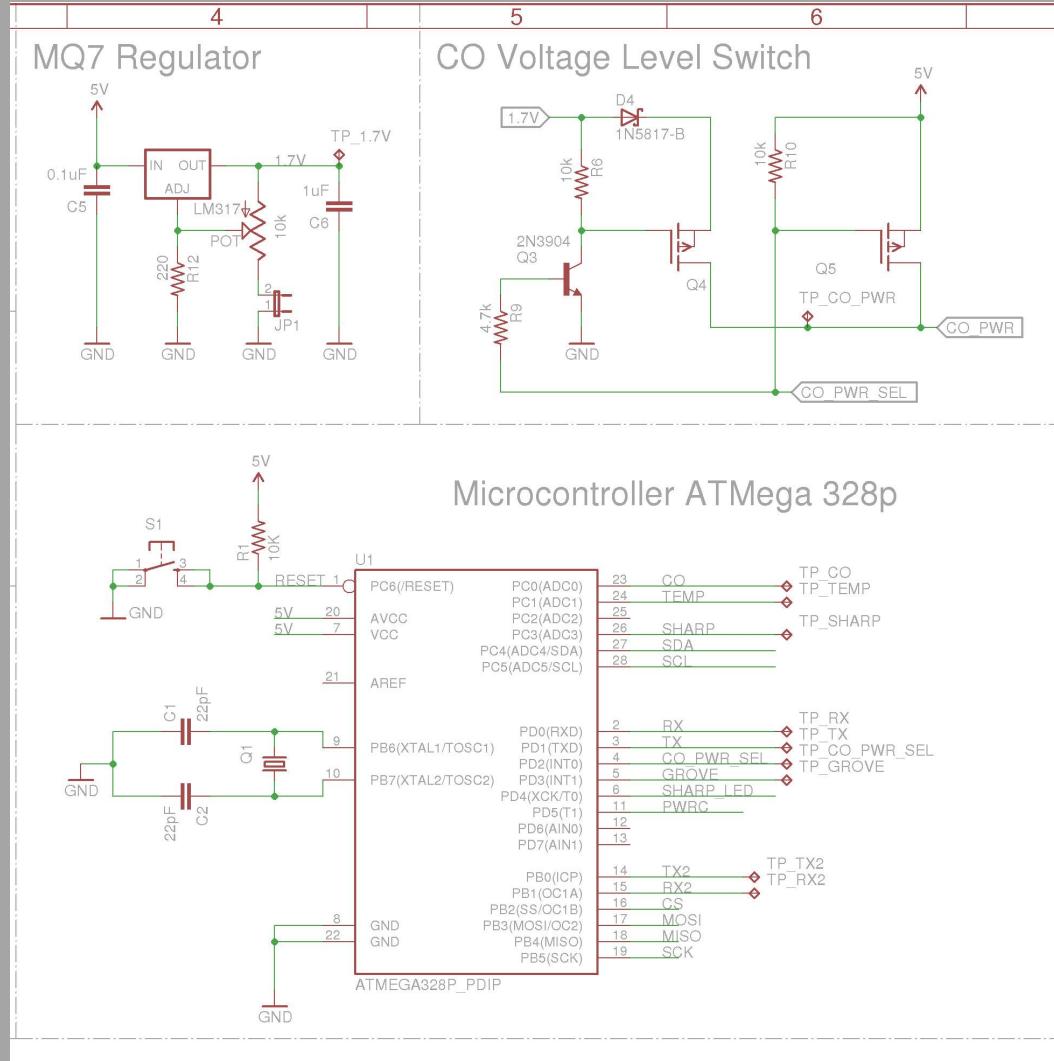
Schematic



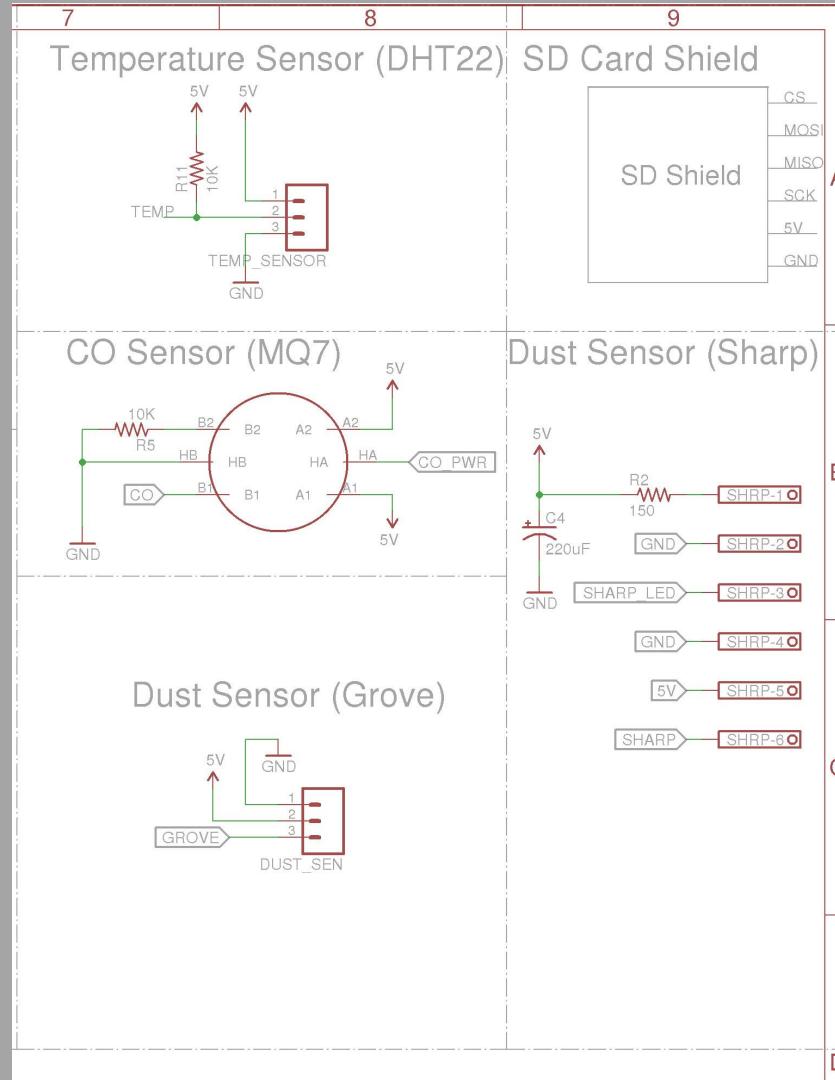
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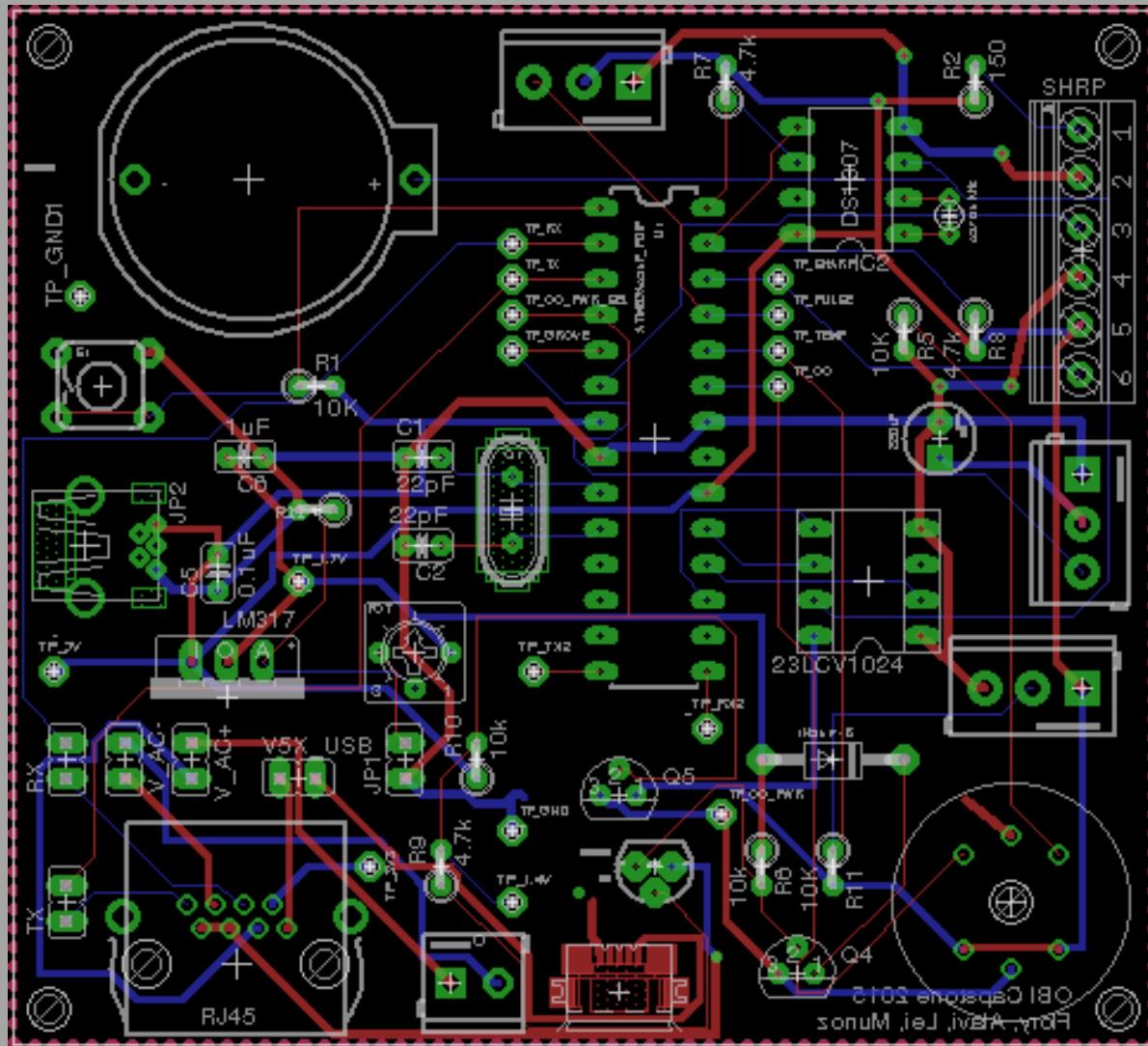
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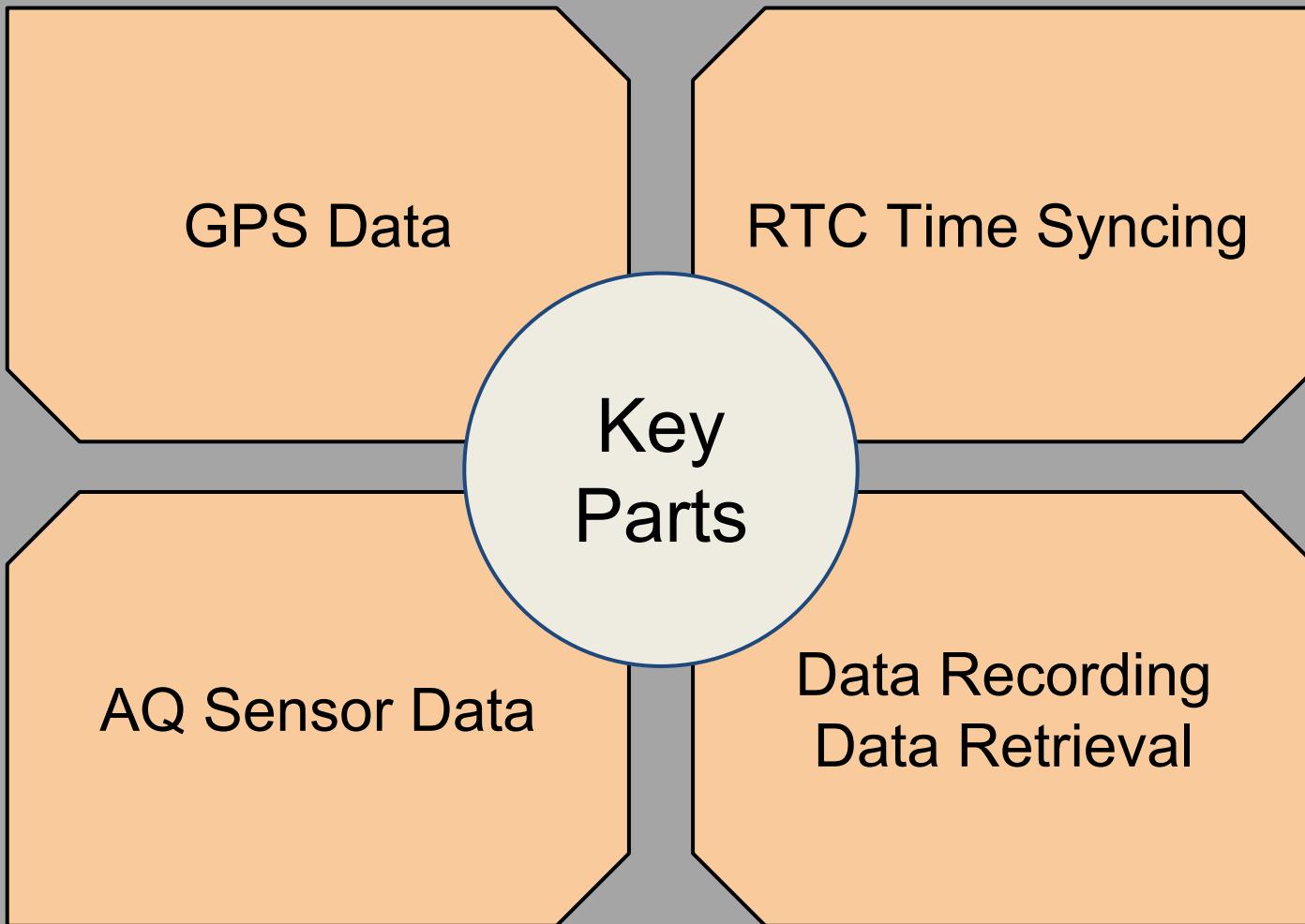
Schematic



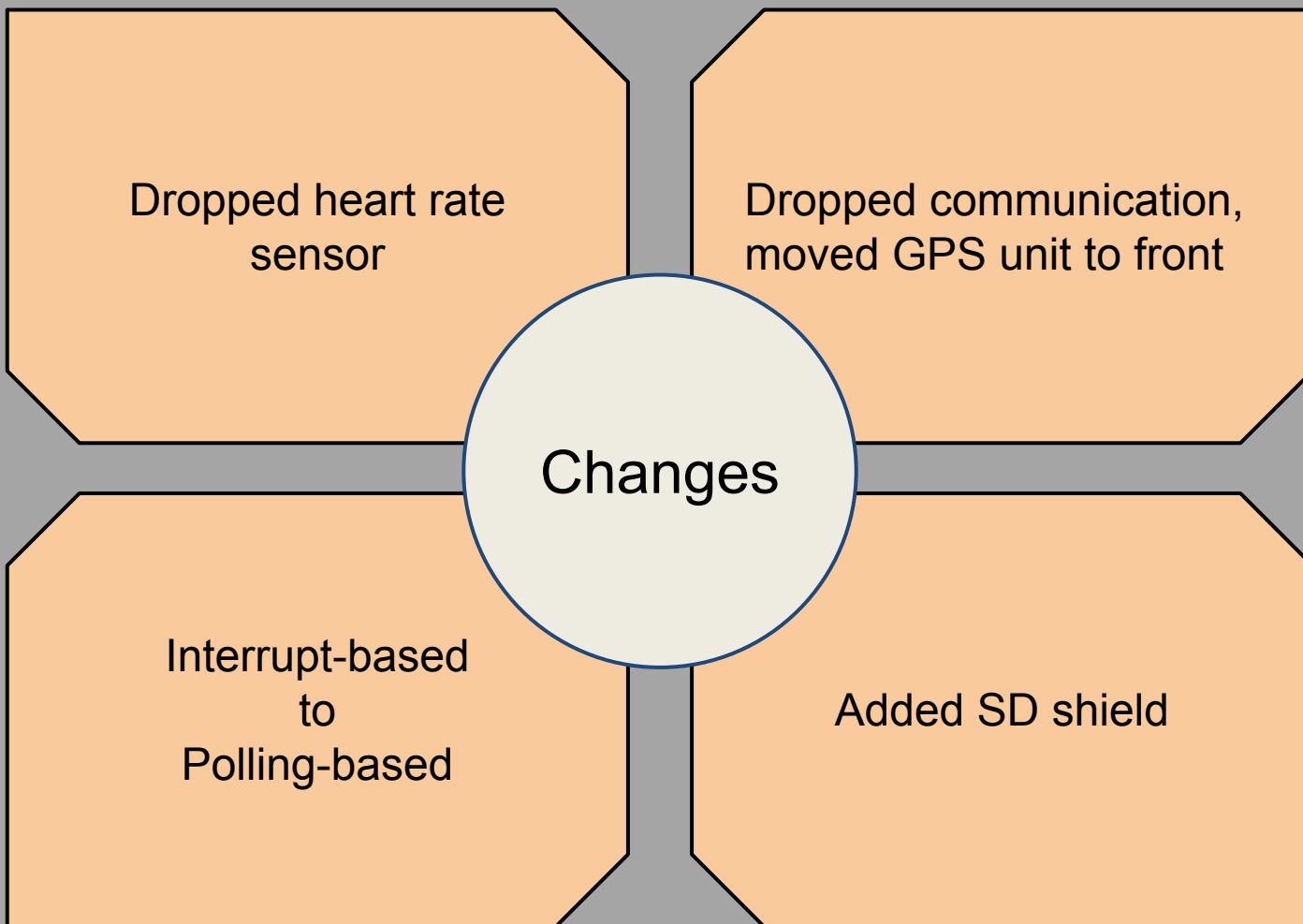
Layout



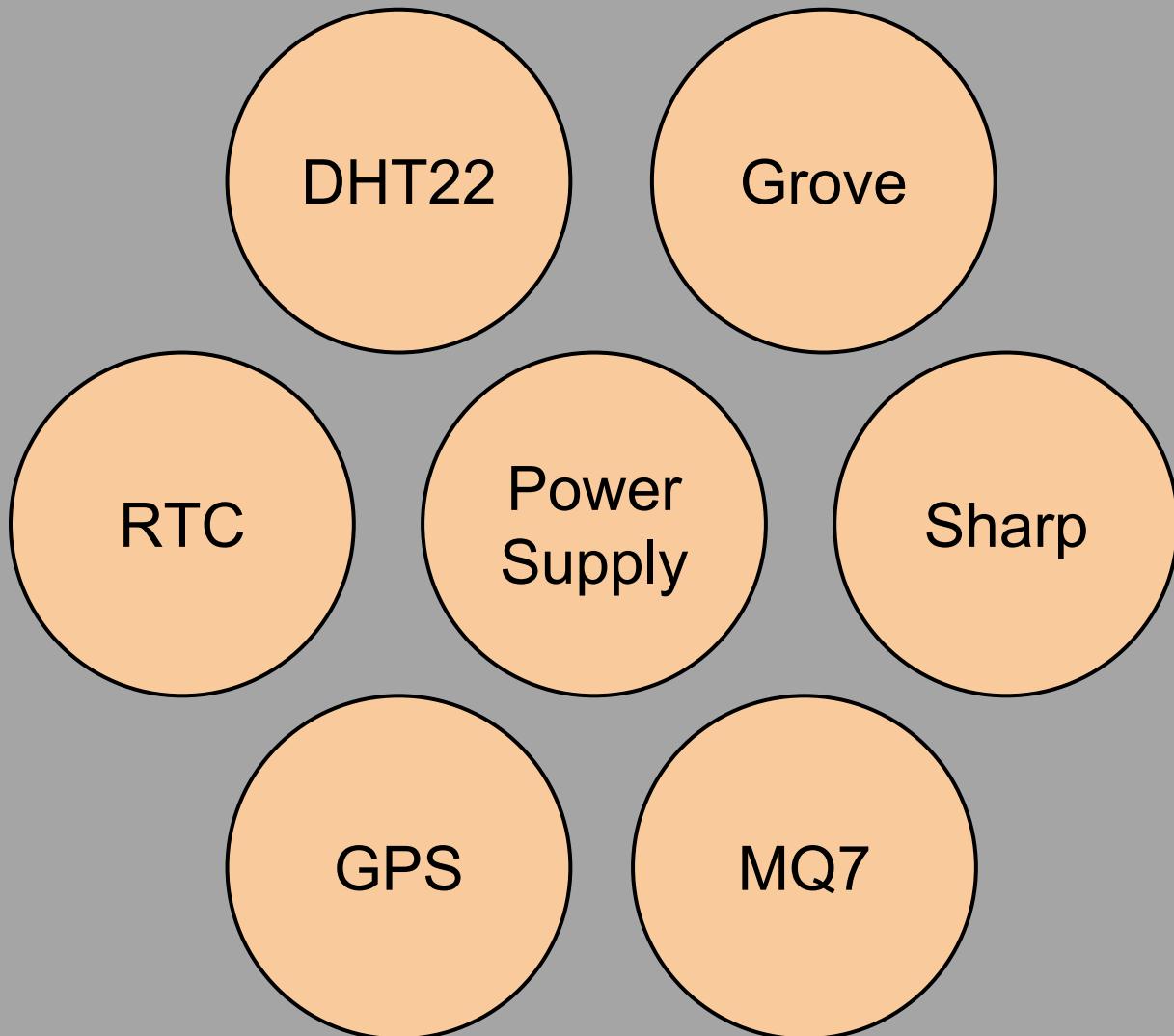
Programming



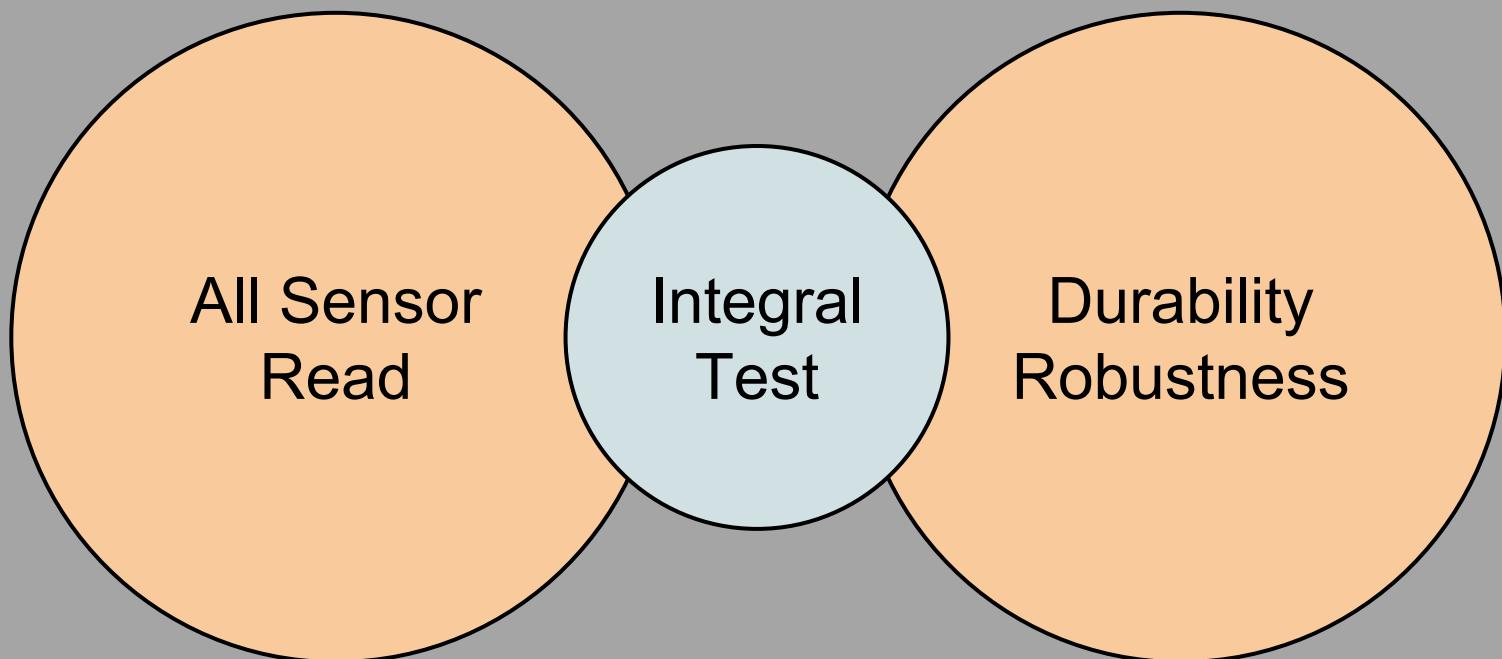
Programming



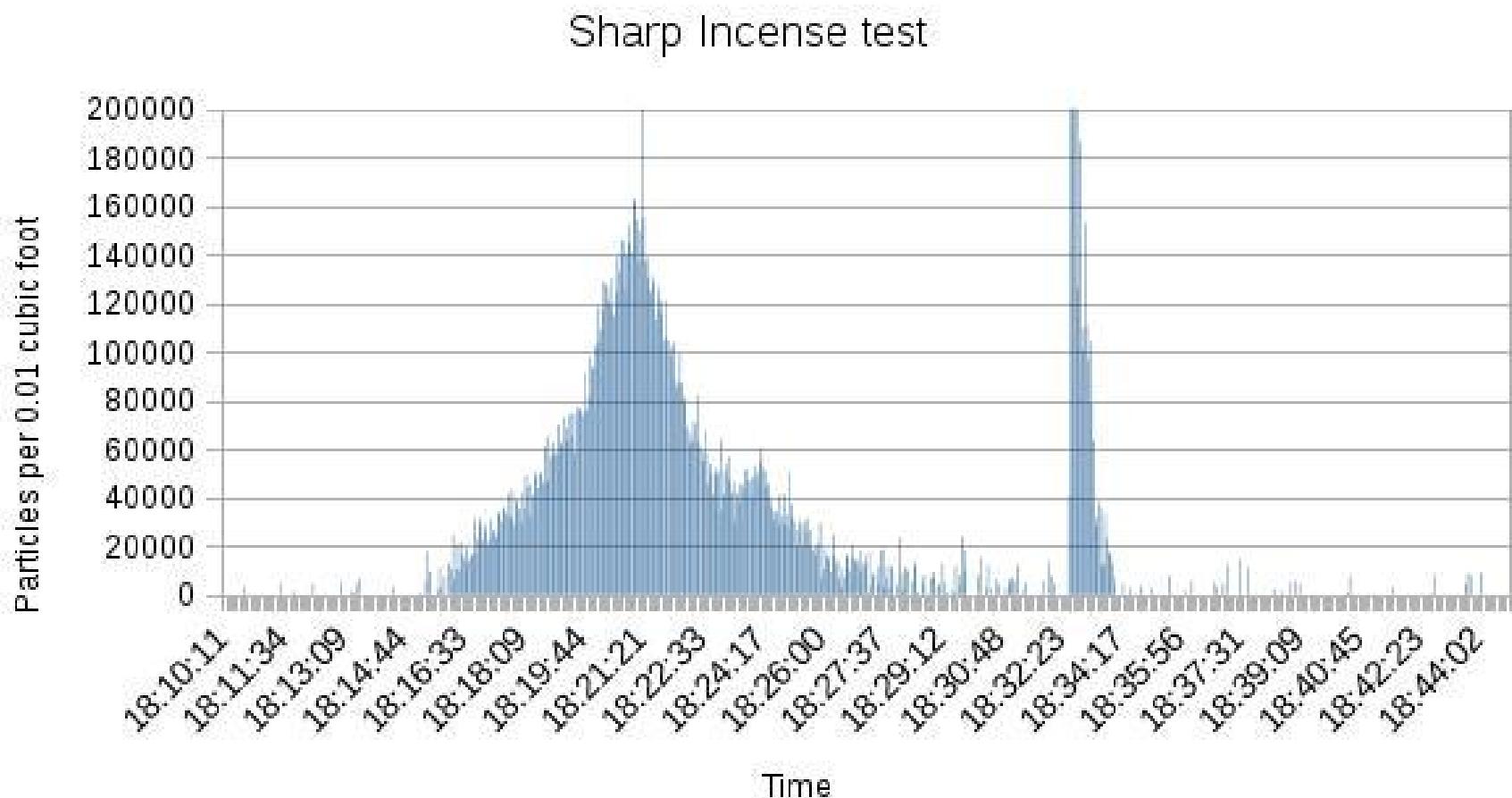
Testing



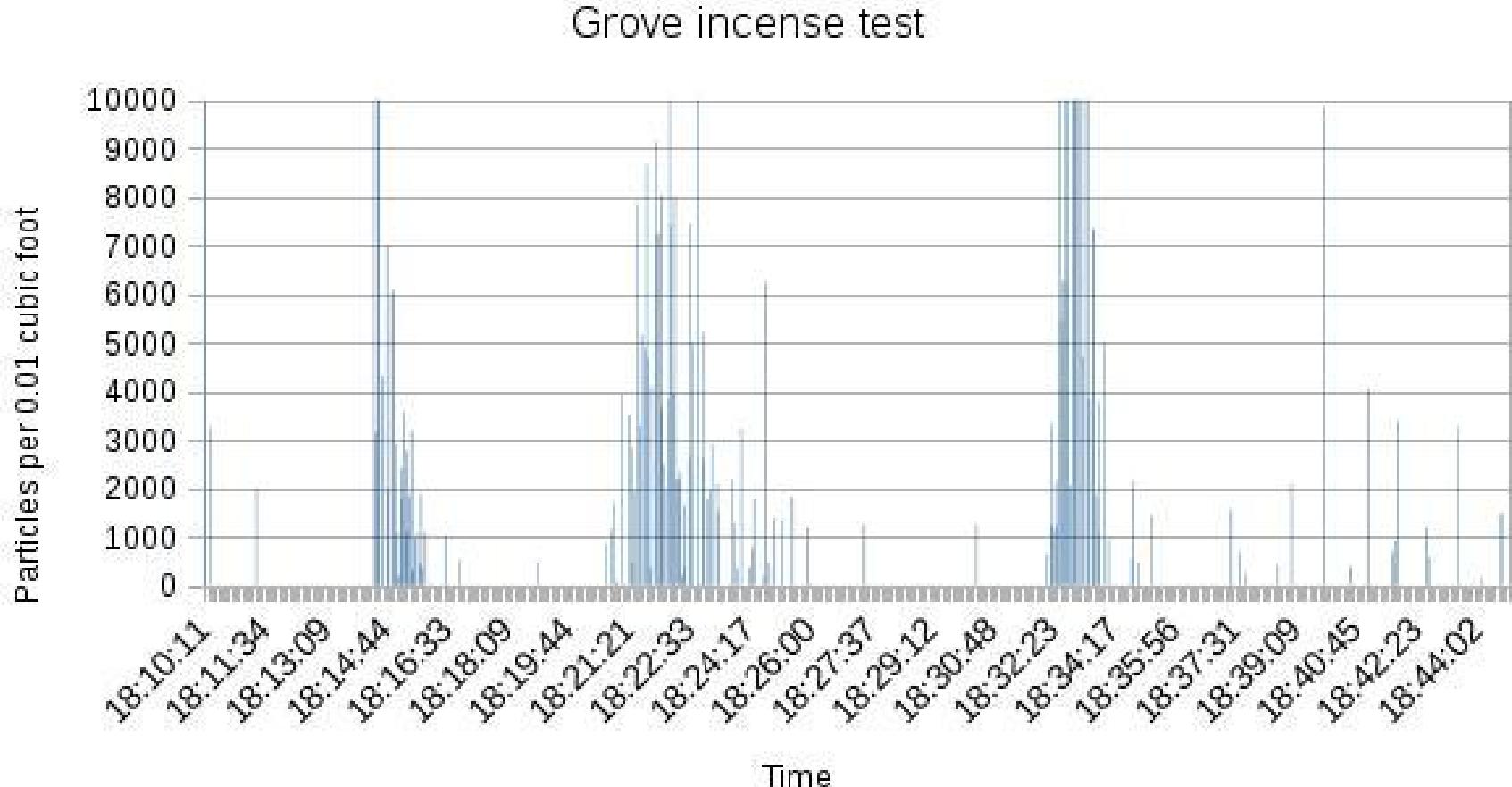
Testing



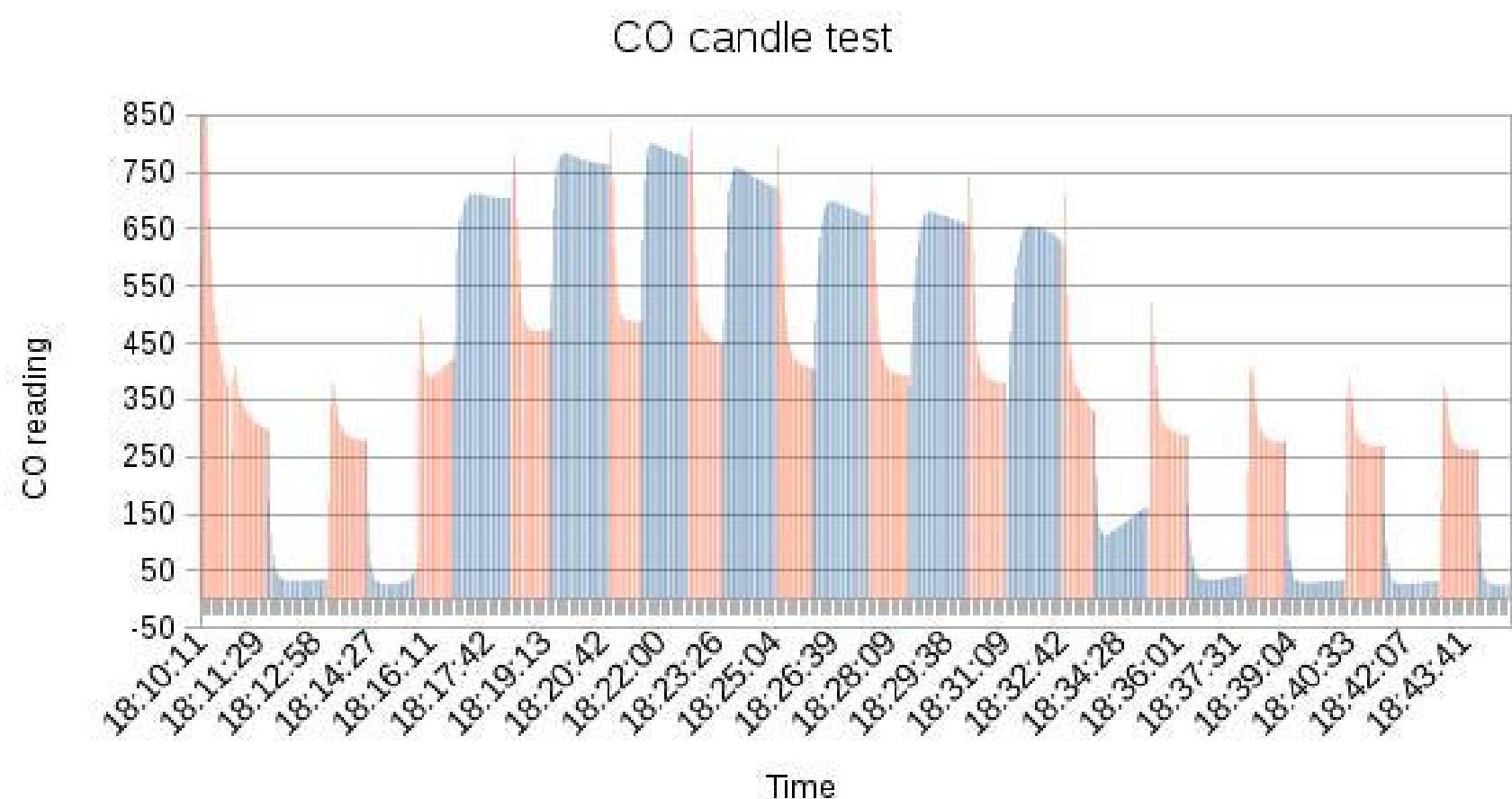
Test Results



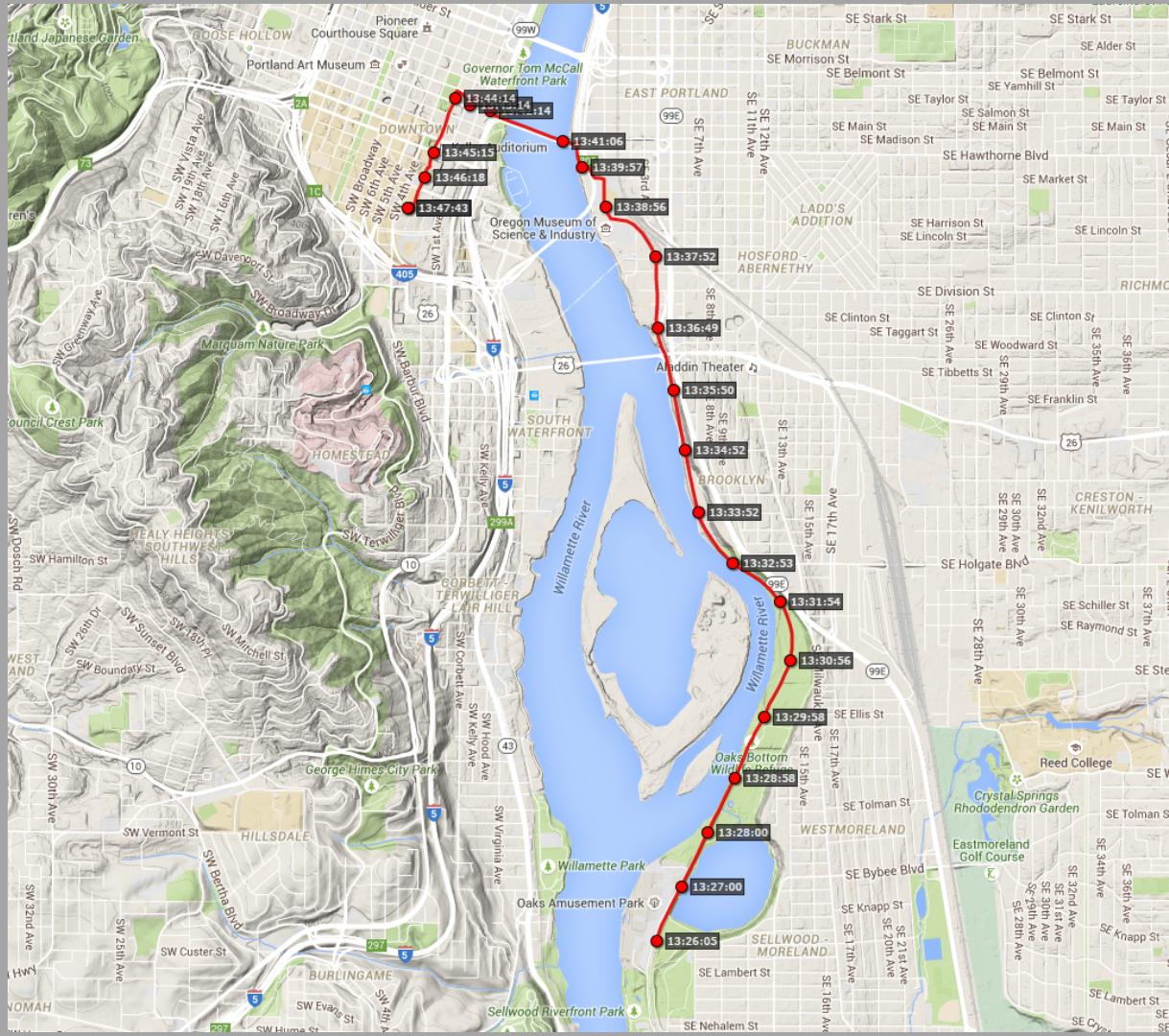
Test Results



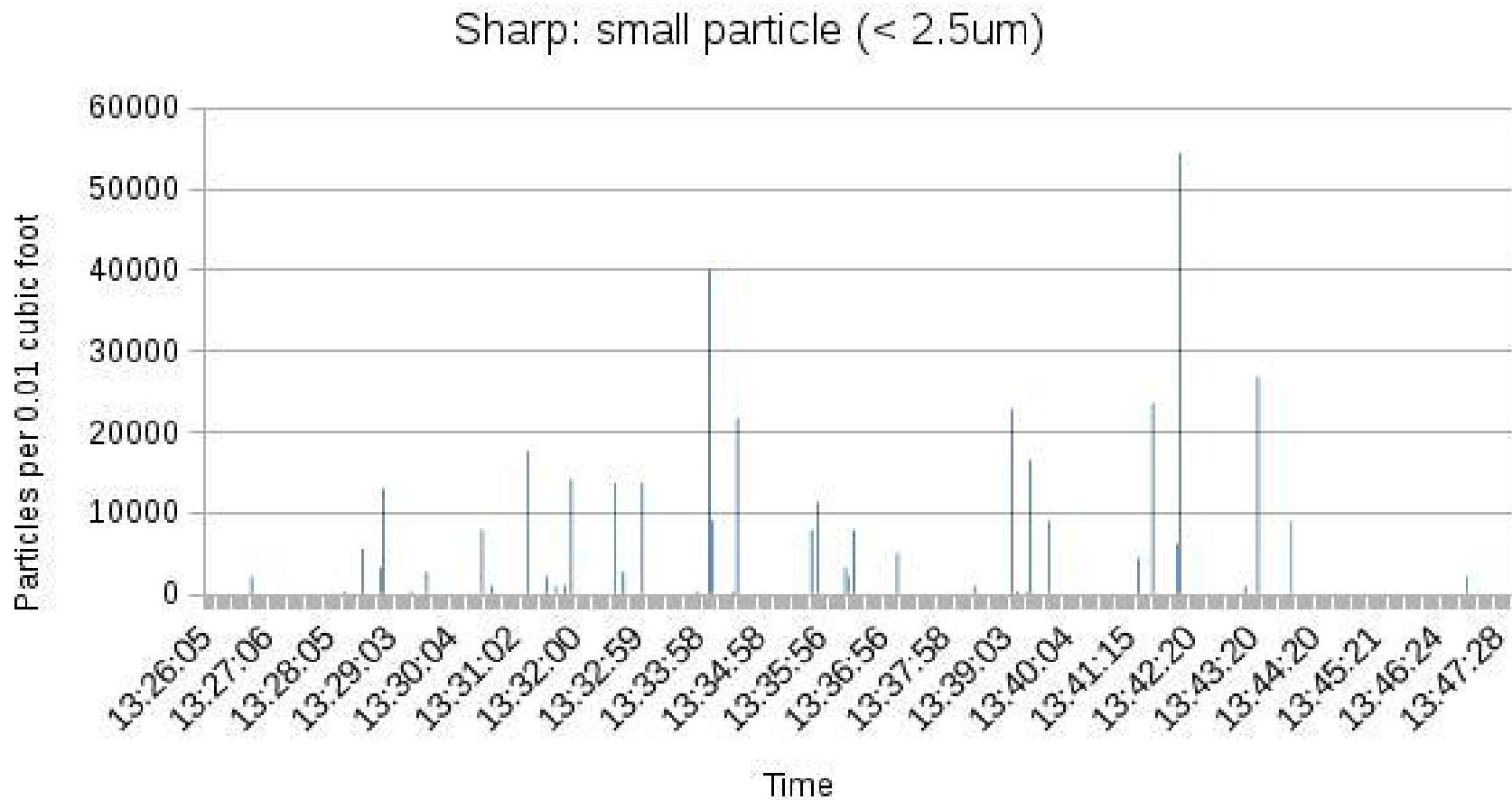
Test Results



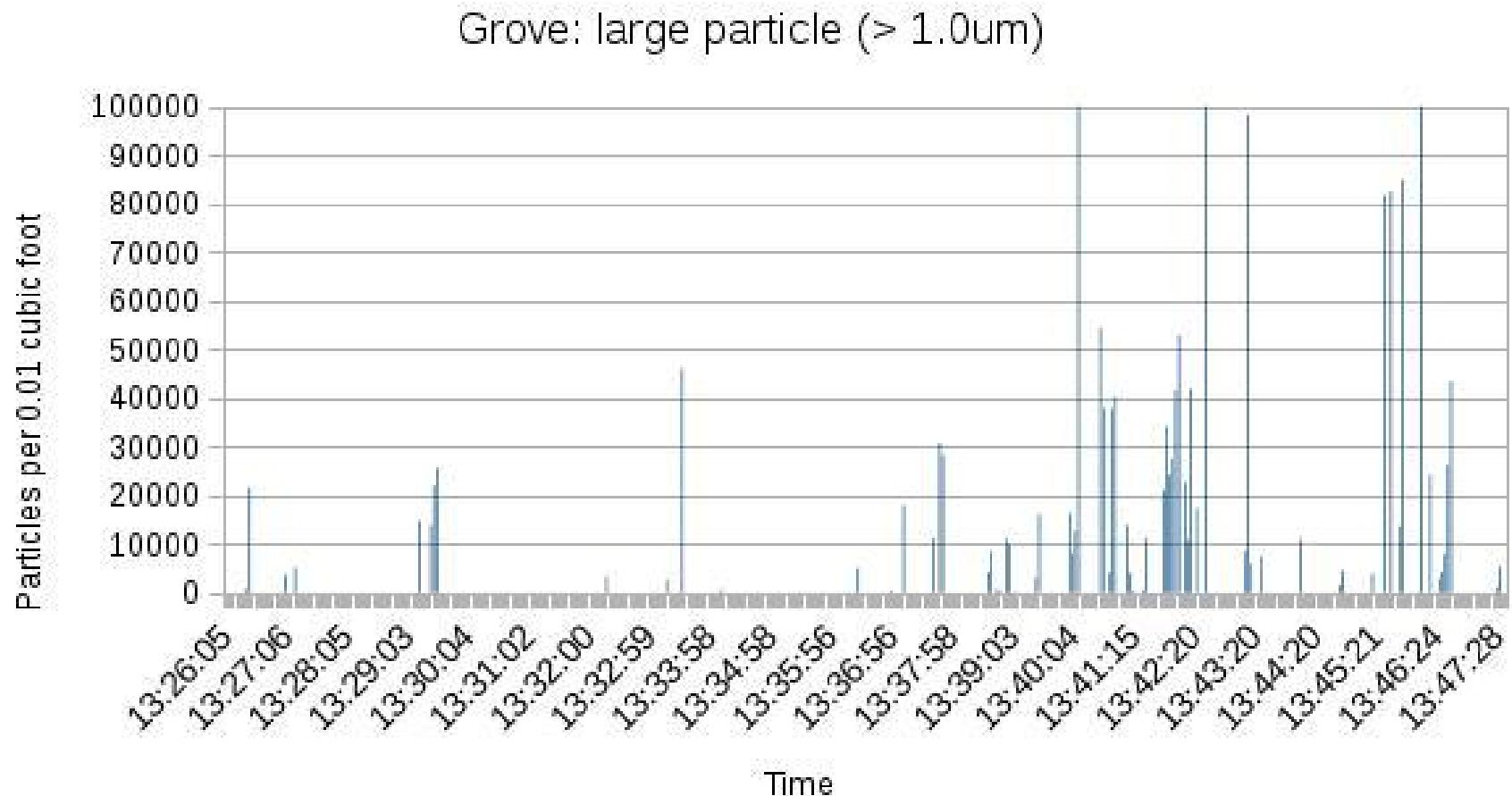
Sample Data



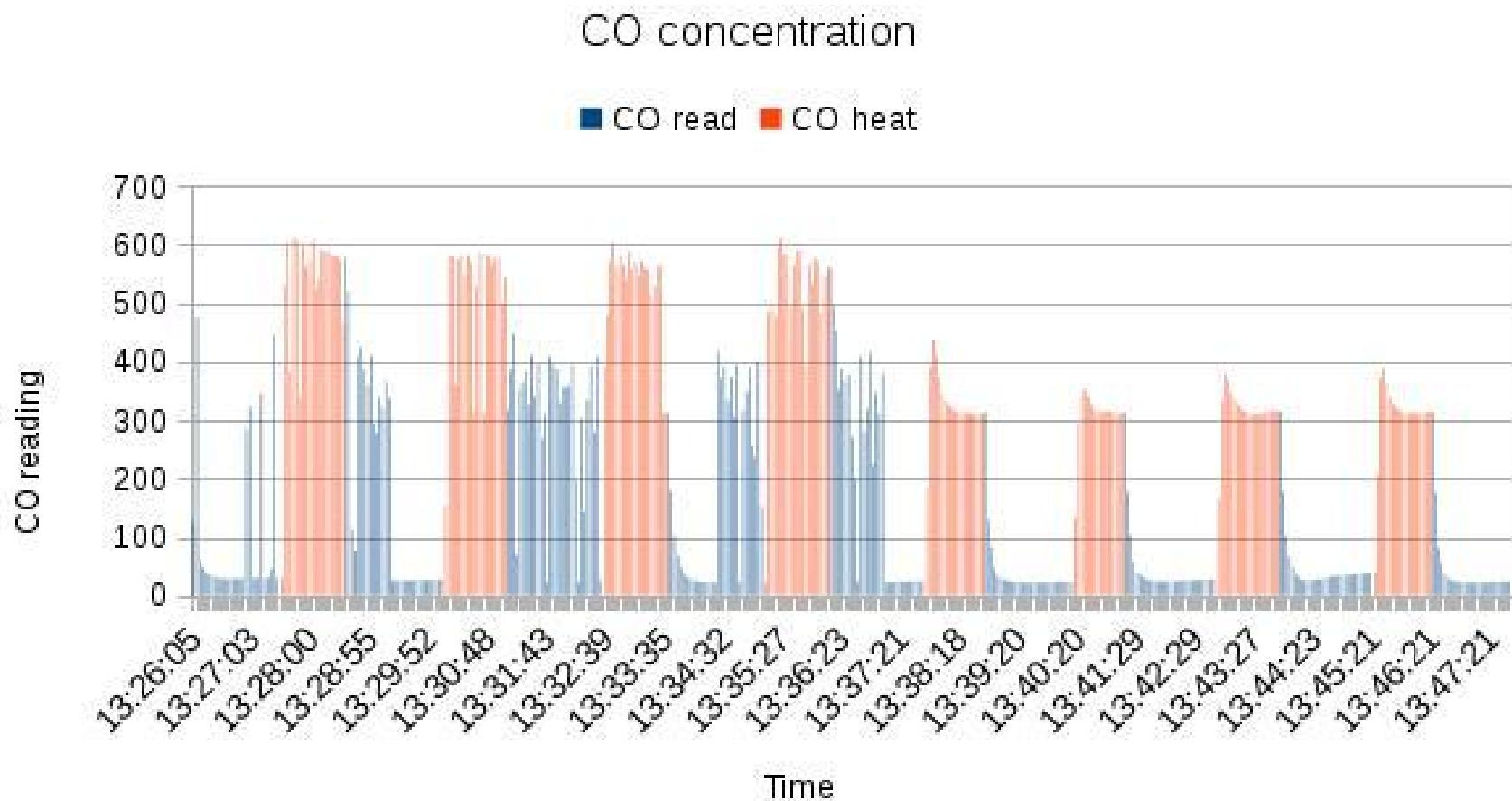
Sample Data



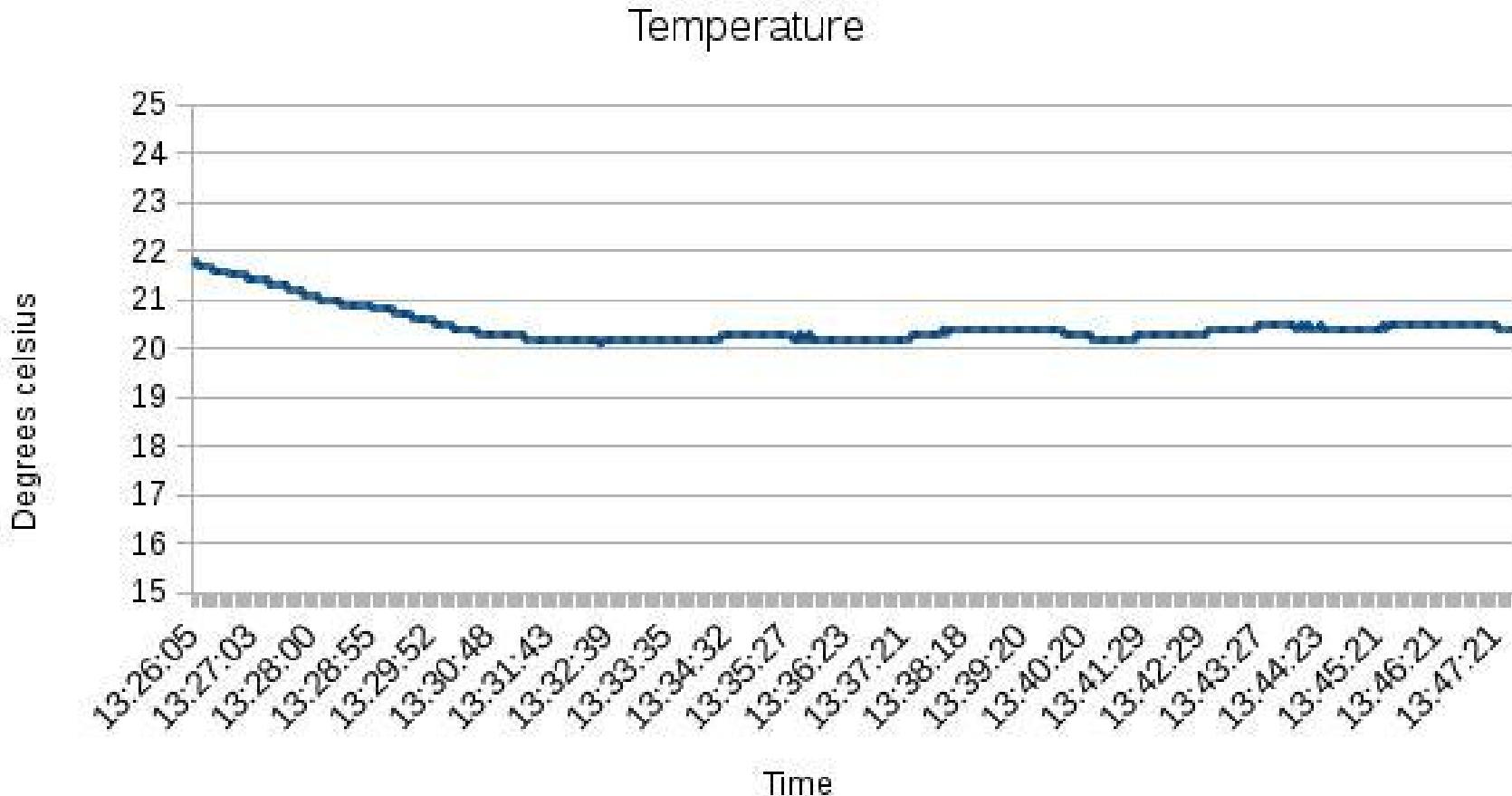
Sample Data



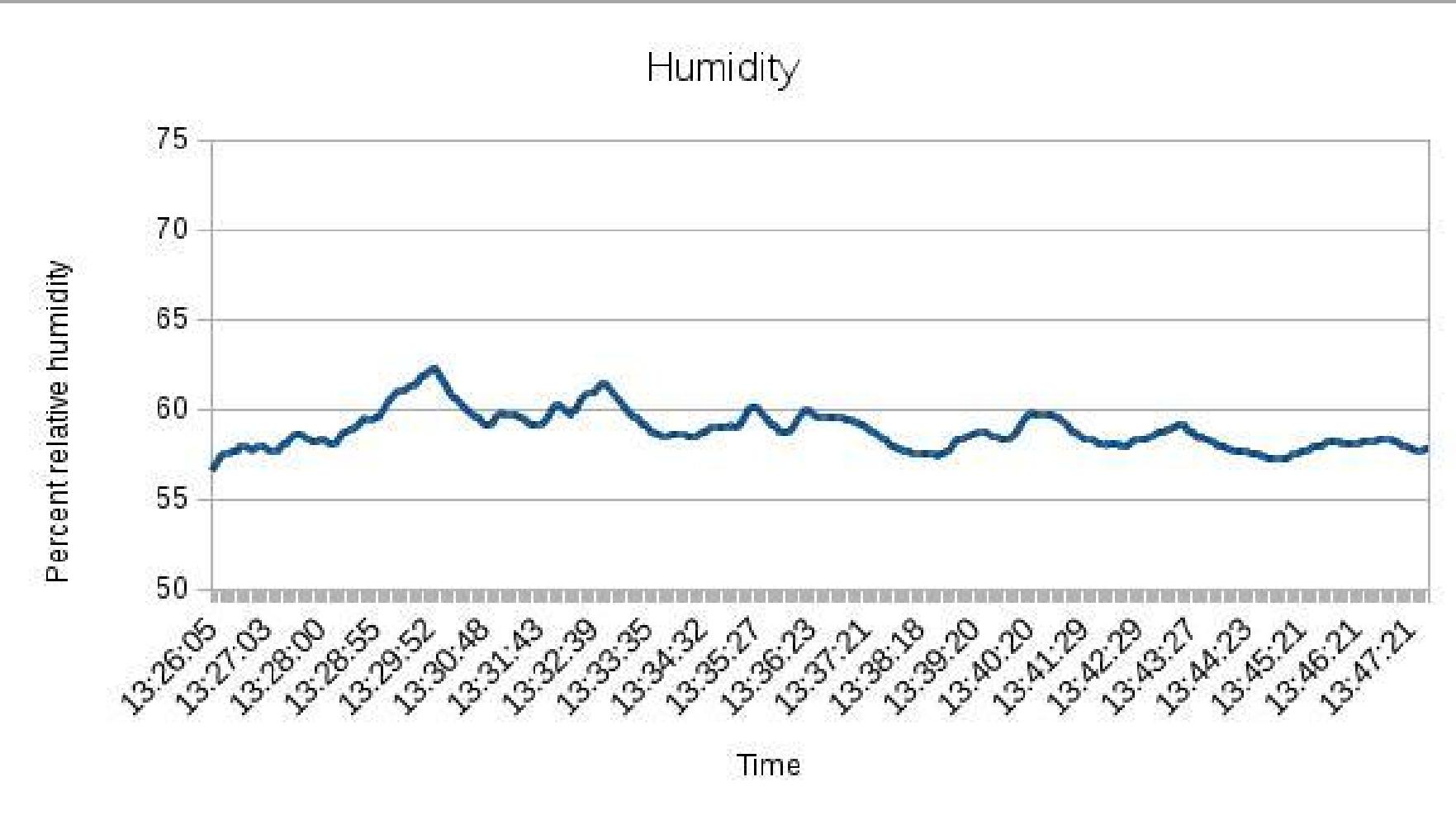
Sample Data



Sample Data



Sample Data



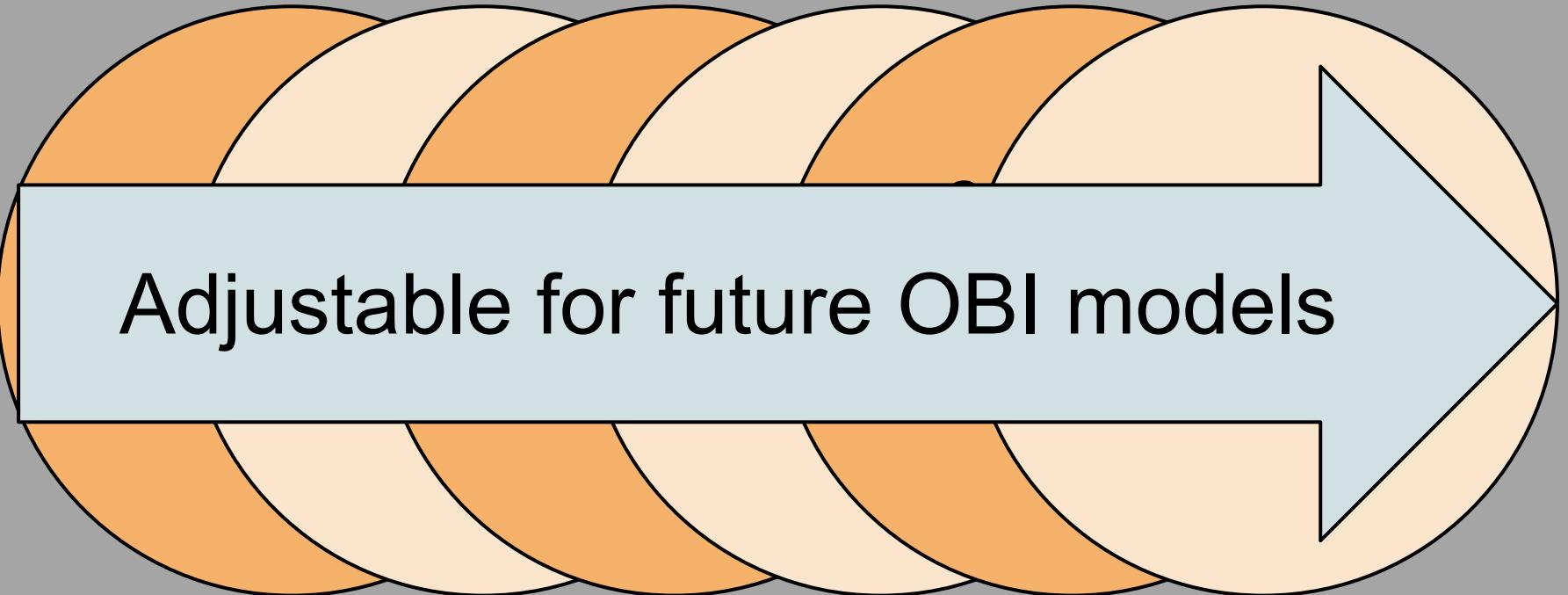
Discussion

- Moving target: Project scope was fluid.
- Final product still not ready for mainstream, however 2 working systems completed and data collected.
- Power supply (rechargeable batteries) still required -- Dynamo?
- SD card storage requires rider to submit data for analysis -- Wireless would be better.
- Serial communication workaround found, but original problem of using both serial and memory unresolved.
- More data needed before any conclusions can be drawn about air quality.

Cost Summary

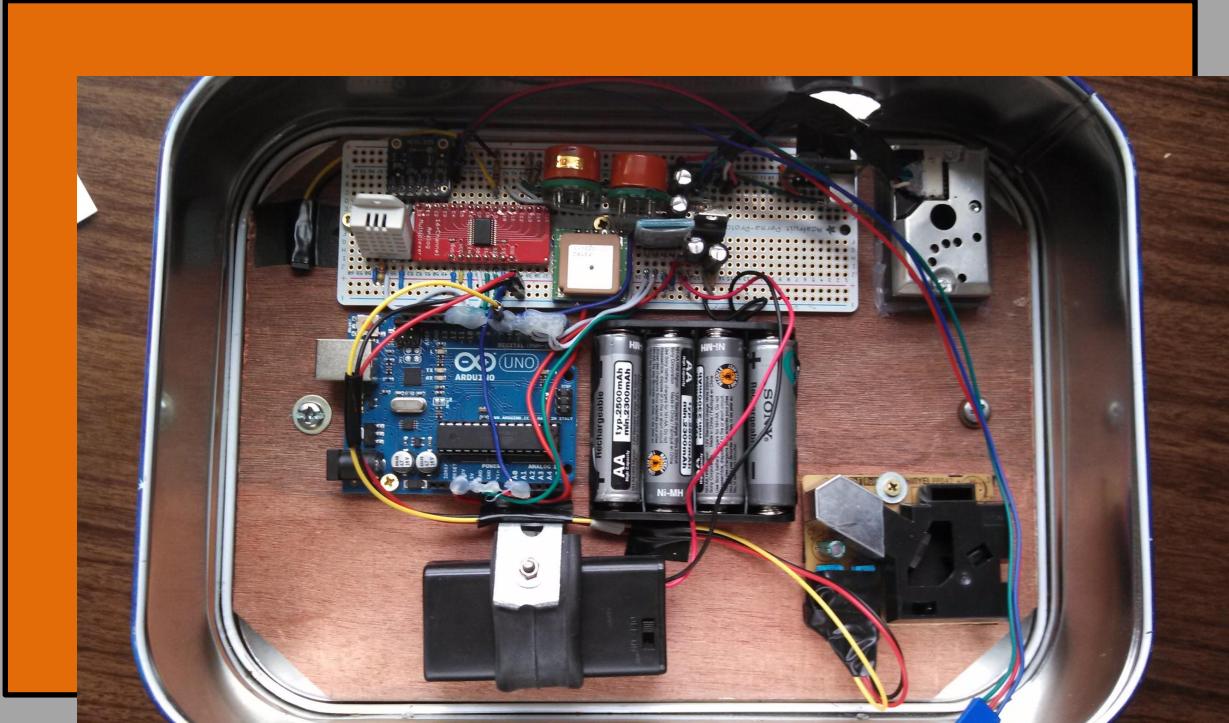
Original Specification	
AQ sensors for 4 systems:	\$241.55 (\$60.88 per set)
PCB fabrication (3 boards):	\$46.40 (\$15.47 per board)
Components to populate 4 boards:	\$152.87 (\$38.22 per board)*
Arduino Unos (2)	\$49.90
Total:	\$490.72
Additional Costs	
GPS receivers (2), SD shields (2)	Provided by Barrett (~\$120+shipping)
7.2V 3300mAh Batteries (2)	\$40.00
Grand Total:	\$650.72
Estimated cost for a complete system as built: \$180.00	

Conclusion

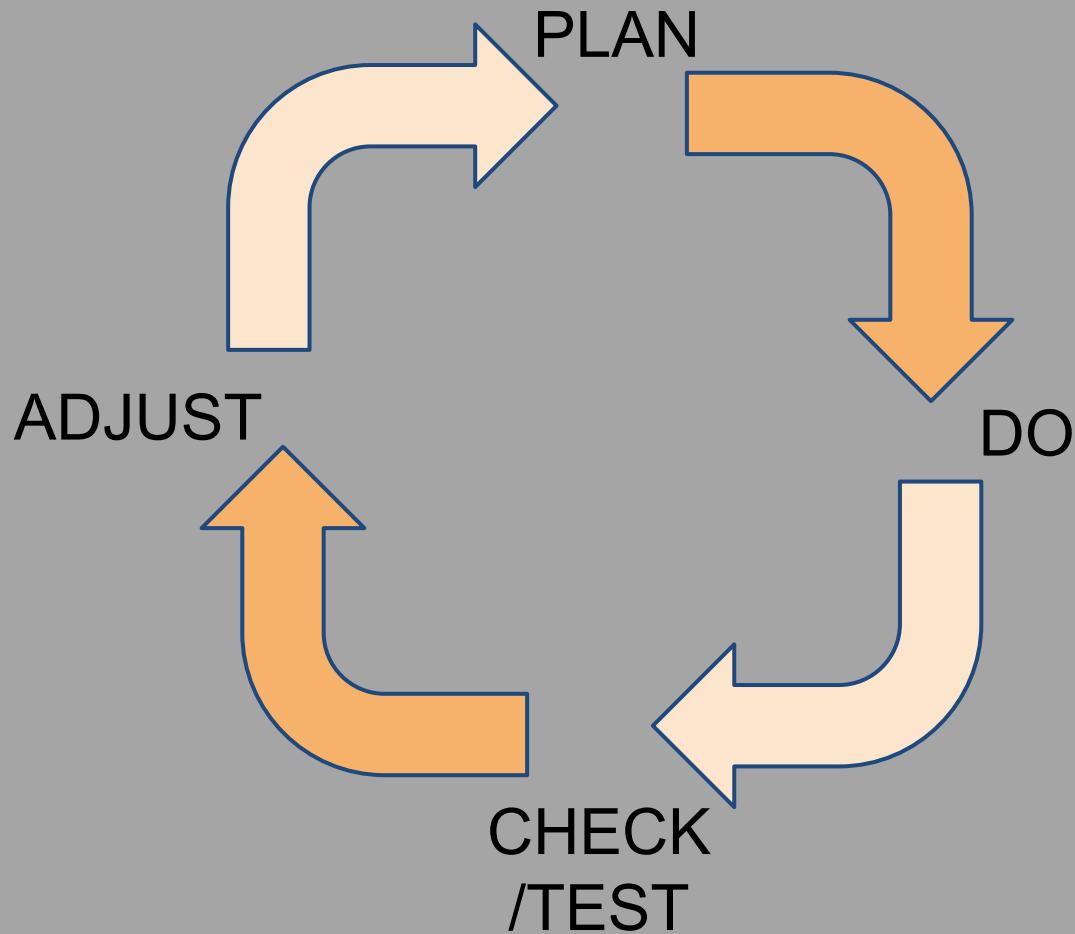


Adjustable for future OBI models

Intellectual Property



Lessons Learned



Questions

Thank You