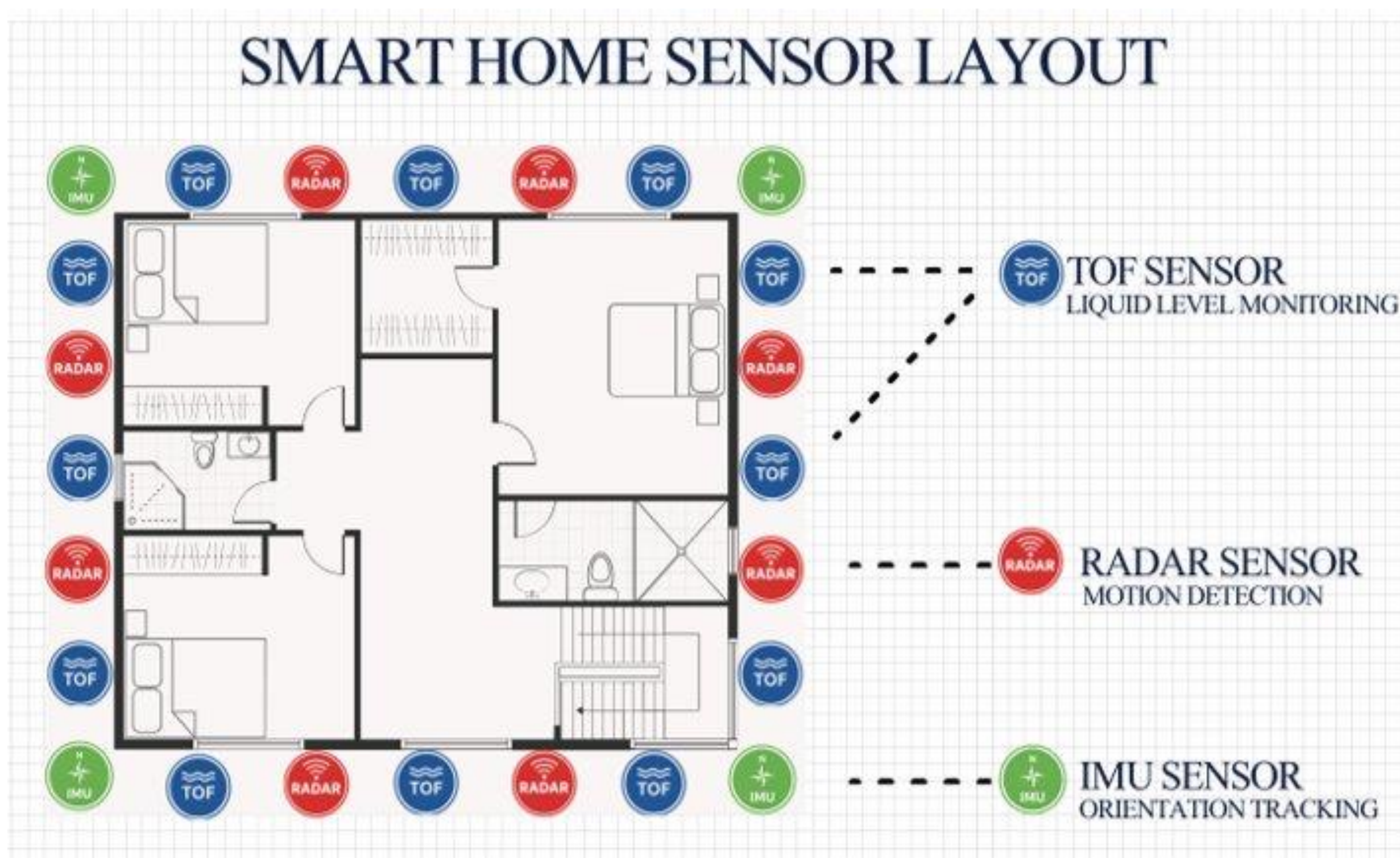


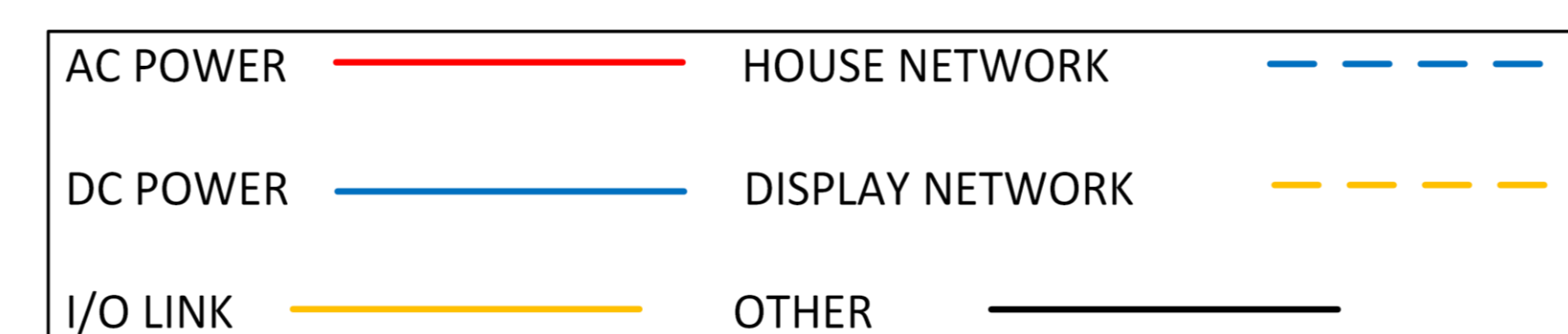
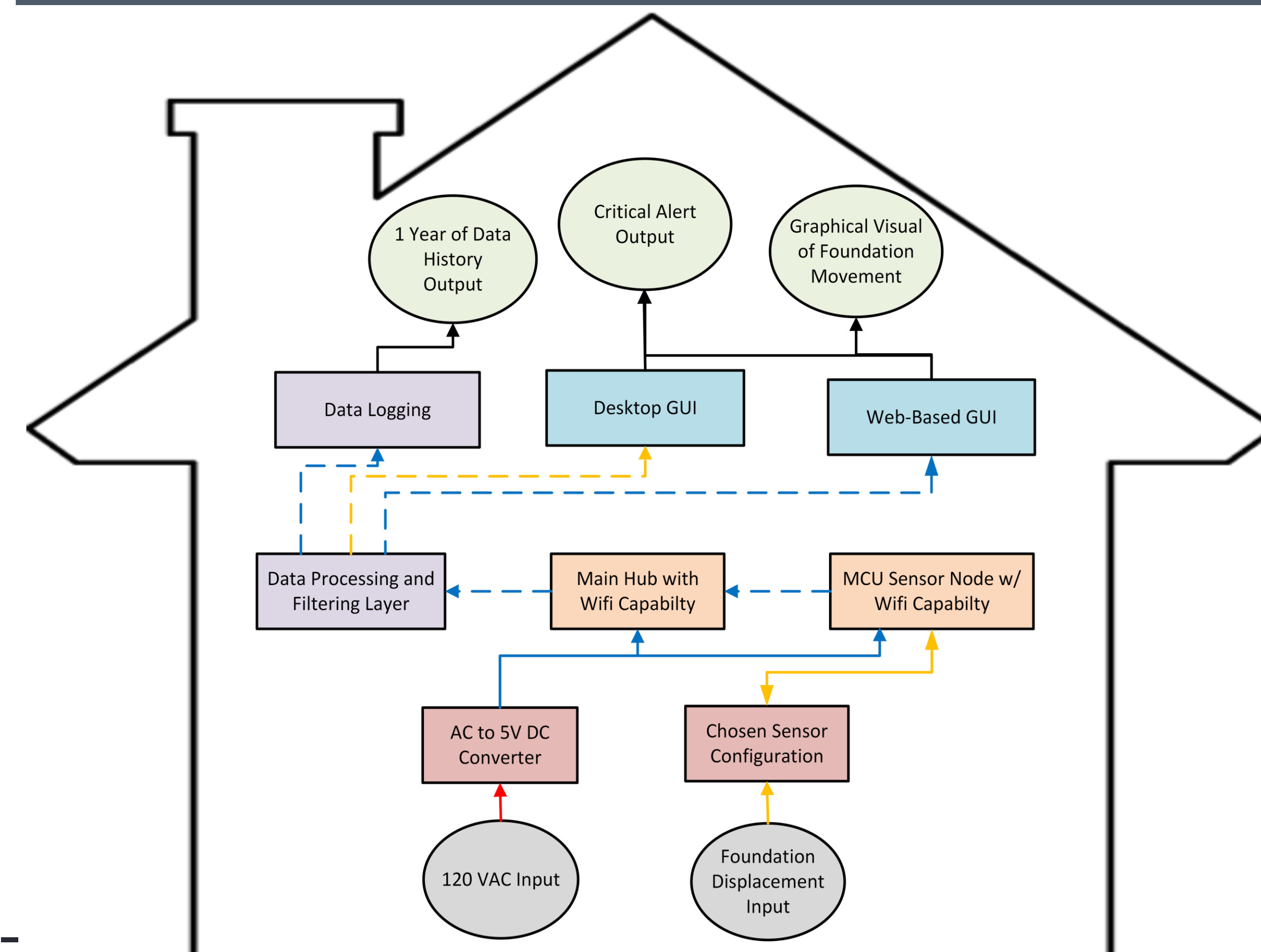


Overview



The Foundation Monitoring System tracks real-time structural movement using precision sensors and data processing. By catching early shifts, it helps prevent costly damage and supports proactive, research-backed maintenance.

Overall Block Diagram



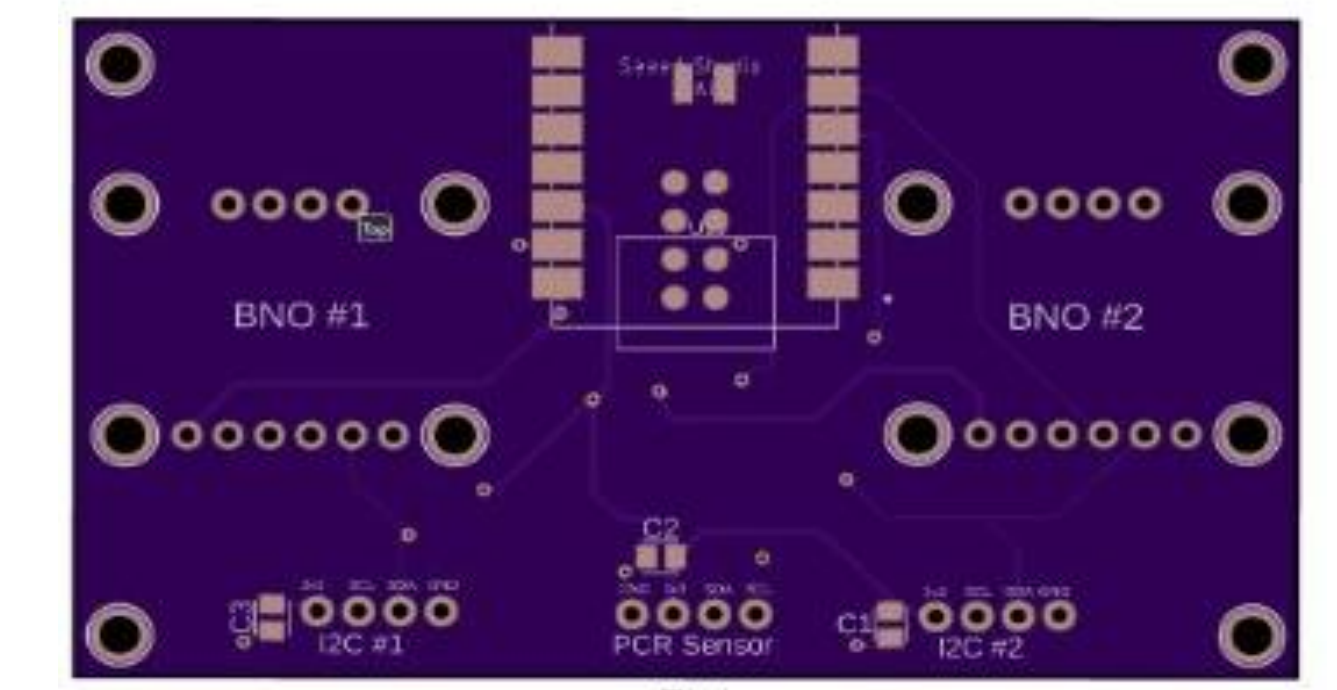
Accomplishments

- ✓ More than five functional sensors
- ✓ Wireless hub communicating with all sensor modules
- ✓ Laptop UI prototype showing live data
- ✓ Physical foundation model demonstrating displacement
- ✓ Floorplan UI with real-time sensor readings
- ✓ Mobile displacement alerts via MQTT → Home Assistant

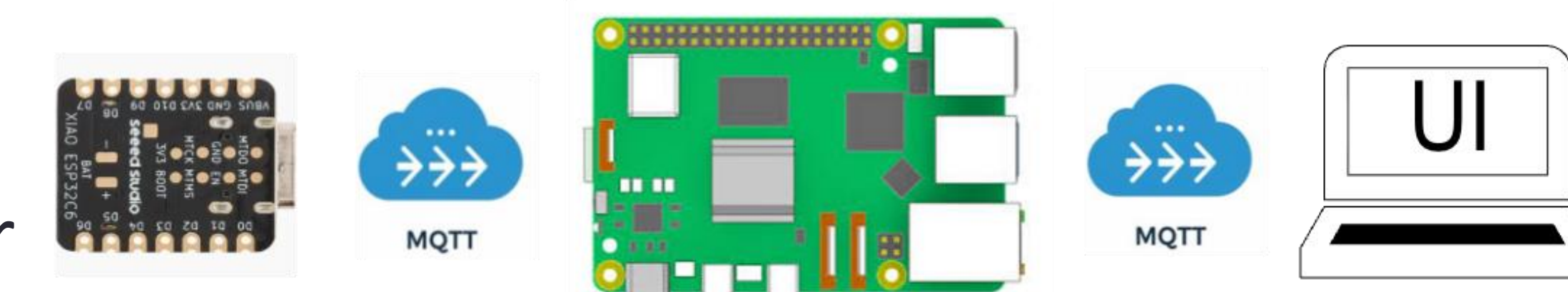
Will Rebenack	Orlando Torres	Sloan Louden-Robins	Cassidy Miskovitz
Sensor Integration & Hardware Development	Data Acquisition & Communication	Data Processing & Logging	GUI & Test Simulation Development

Features

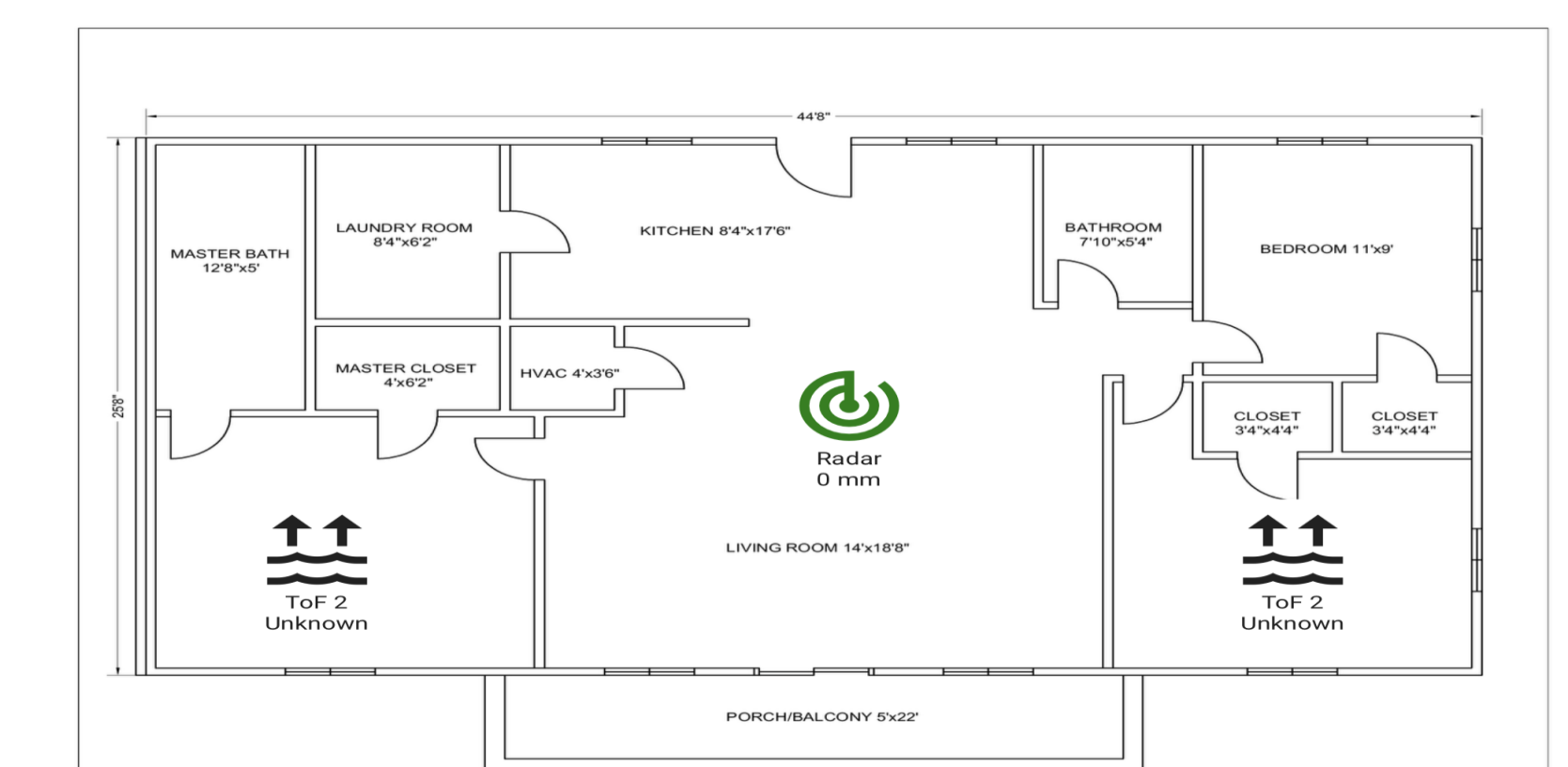
PCB for IMU, Radar, and ToF



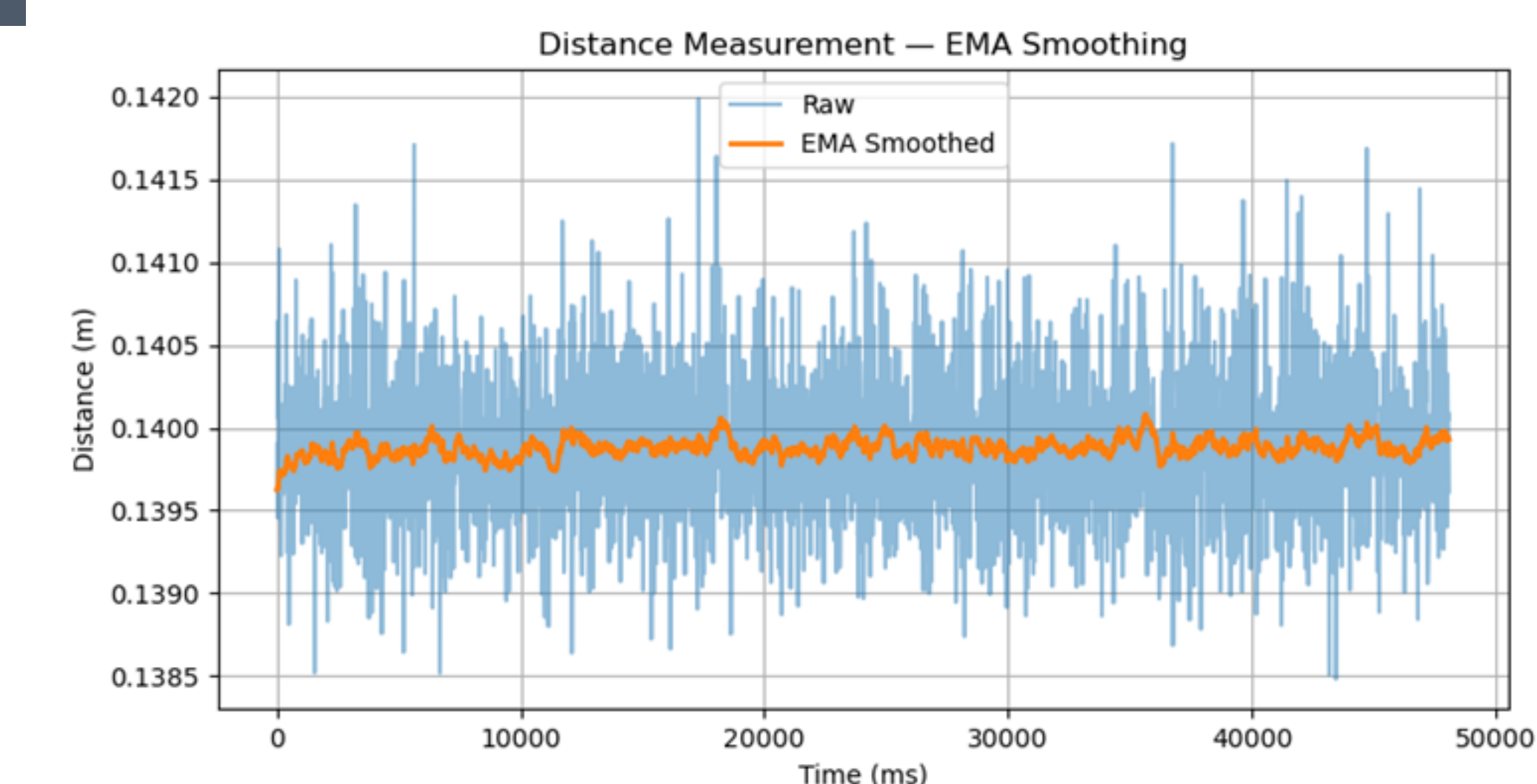
Full wireless pipeline



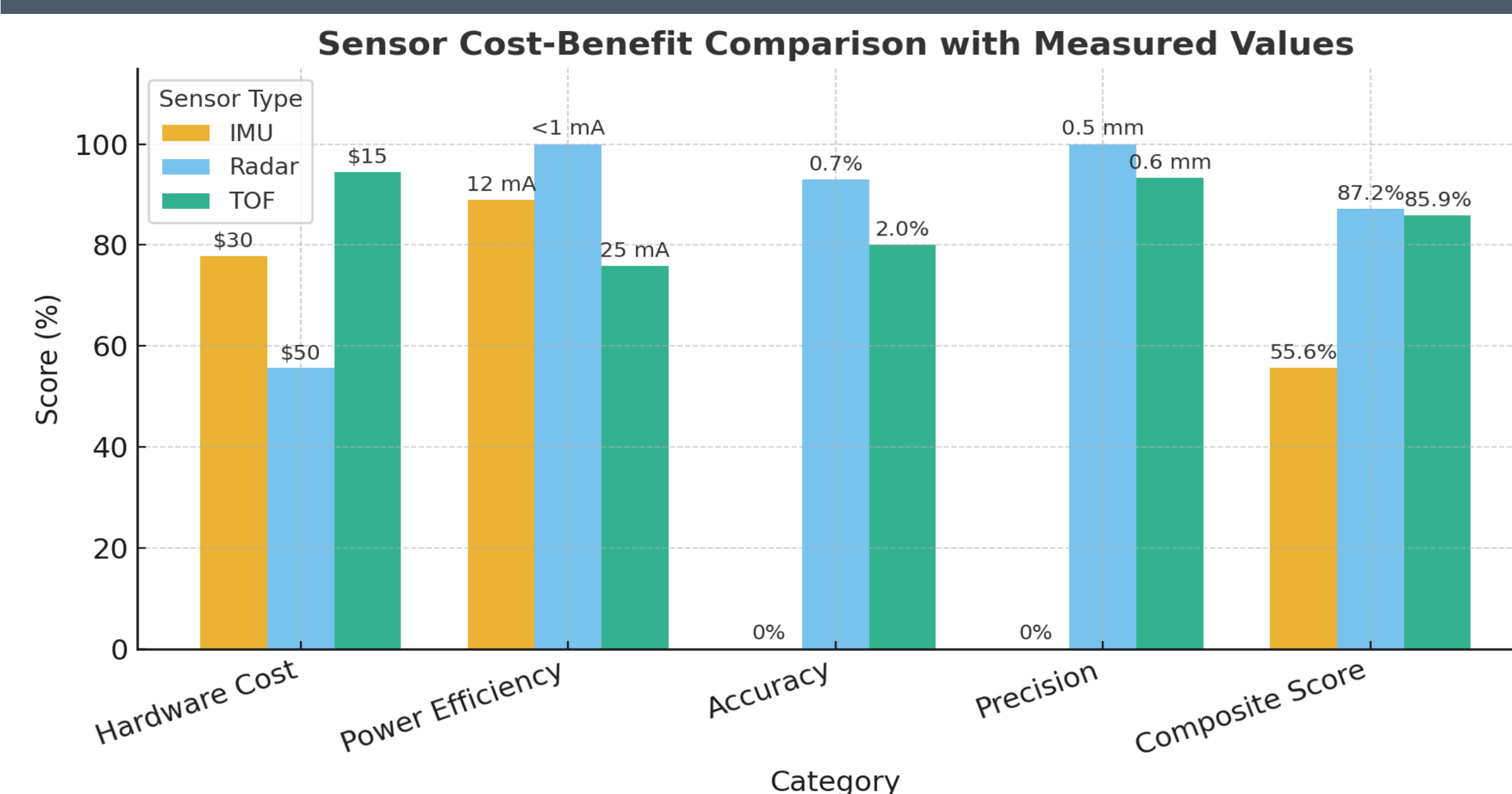
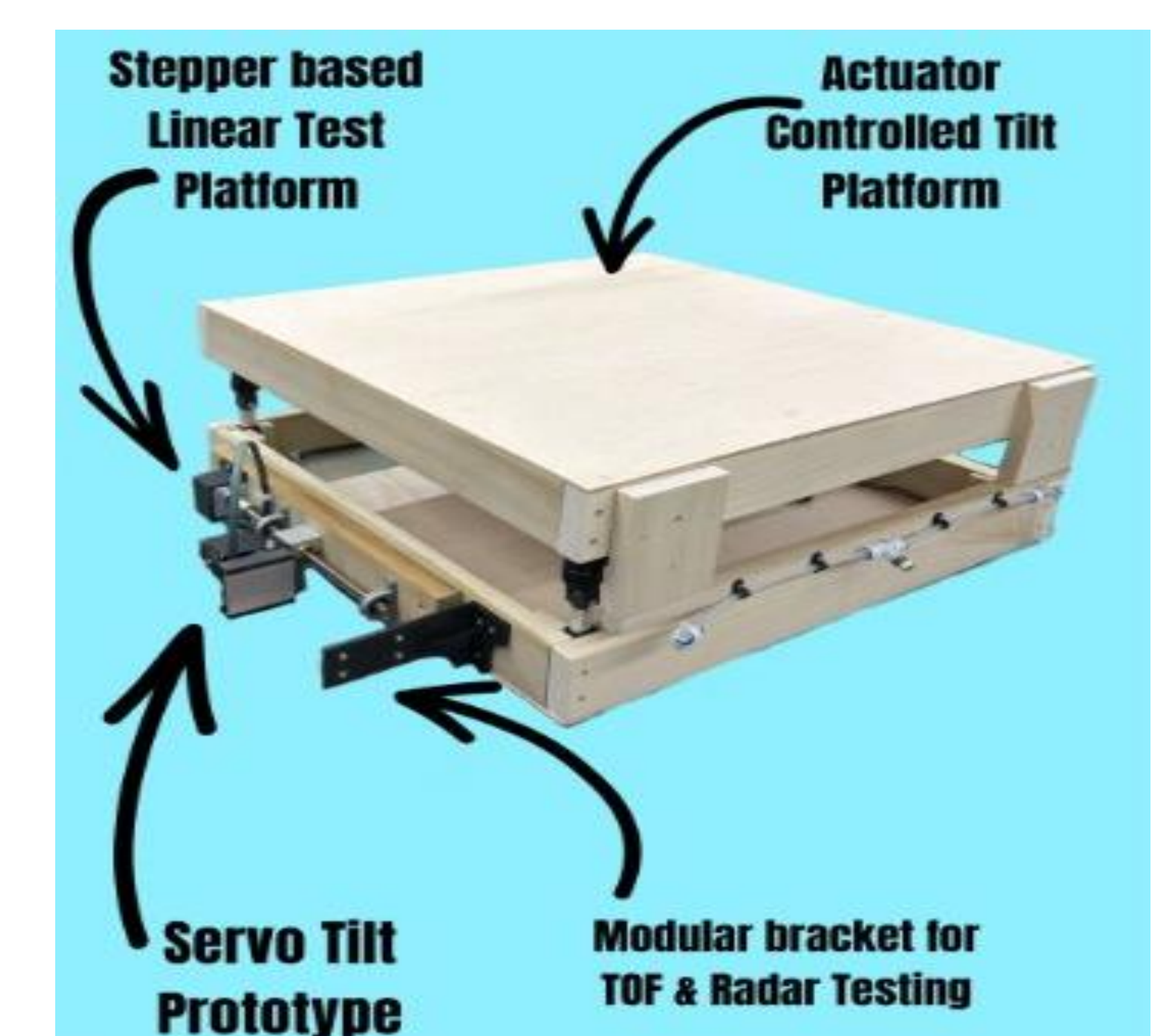
Real-time dashboards multi-node logging



"Signal Syrup" filtering

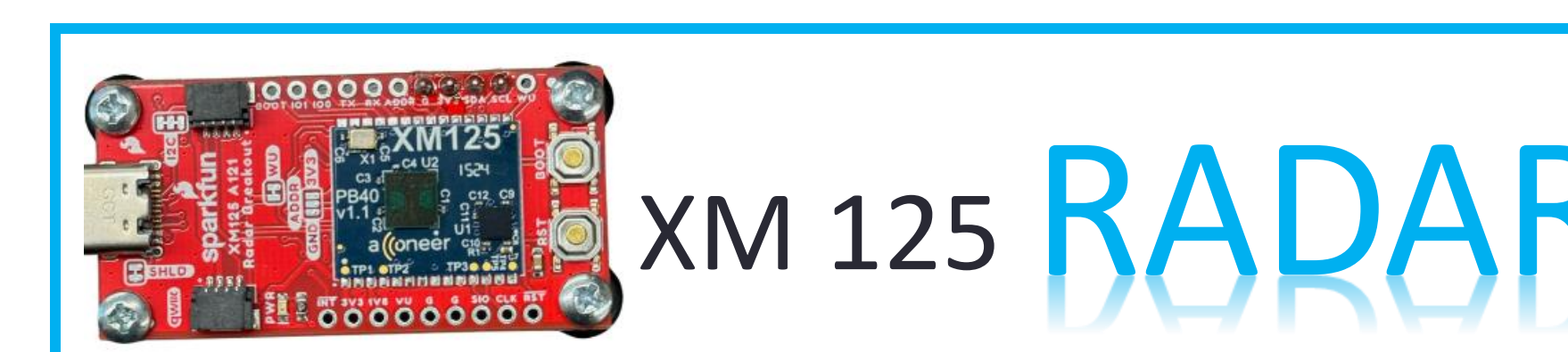


Precision test rig with <0.05% error



Sensor Tradeoff Analysis

- **Radar ranked highest (87.2%)** with top precision, accuracy, and power use.
- **ToF close behind (85.9%)**, offering best cost and reliable sub-mm performance.
- **IMU lowest (55.6%)** mainly due to accuracy drift in static tests.



Meet the Team



Sloan



Orlando



Cassidy



Will



Acknowledgments

- Chalmette Ray
Stable Options LLC.
- SATOP
- Advisor: Mark Welker
- Mentee Teams E1.14 & E1.07

Recommended Path Forward

- ❑ Expand long-term drift tests.
- ❑ Collect multi-week datasets for noise and stability analysis.
- ❑ Explore ML models for drift prediction and anomaly detection.
- ❑ Standardize data tagging for future ML training.